No escaping the heat

Health and economic impacts of heat stress on informal workers in urban Bangladesh

Ritu Bharadwaj, N Karthikeyan, Swati Chaliha, Shakirul Islam and Urmi Jahan Tanni

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Published by IIED, August 2026

Bharadwaj, R, Karthikeyan, N, Chaliha, S, Islam, S and Tanni, UJ (2026) No escaping the heat: health and economic impacts of heat stress on informal workers in urban Bangladesh. IIED, London.

iied.org/22755iied

ISBN: 978-1-83759-226-5

This publication has been reviewed according to IIED's peer review policy, which sets out a rigorous, documented and accountable process. The reviewers were Dr K Shankarganesh, PhD, ARS, senior scientist (entomology), ICAR-Central Institute for Cotton Research and Dr Mohan Reddy, a climate policy expert who focuses on nature-based carbon markets, nationally determined contributions, and climate mitigation and adaptation strategies. For further information, see www.iied.org/research-excellence-impact

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Cover image: outdoor workers labour through the summer heat in Dhaka, Bangladesh. Photo: Md Riaz Uddin/OKUP

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Acknowledgements

We thank Ovibashi Karmi Unnayan Program (OKUP) and their team for making the fieldwork possible. The team conducted the household surveys, in-depth interviews and focus group discussions with informal workers, along with key informant interviews with experts across the health, labour, academia and disaster management sectors. They often worked outside regular hours, including late into the evening, to reach informal workers who were unavailable during the working day.

We are grateful to the doctors and health experts who helped design the research tools, reviewed the analysis and results, corroborated our field observations and shared their insights on localised trends of illness among workers during the summer months:

- Dr Akhilesh Sharma, MD, FRCP (Liverpool), CClin (USA), CPV (UK); president and CMO, Alkem Laboratories Ltd; and founding director and CEO, Alixer NexGen Therapeutics Ltd
- Dr Neeraj Pandey, professor and head of anatomy and vice principal, Maharshi Vishwamitra Autonomous State Medical College, Ghazipur, Uttar Pradesh
- Dr Sakina Sab Afroz, associate professor of paediatrics, Shaheed Suhrawardy Medical College and Hospital, Dhaka, who was interviewed for the video documentary
- Dr Syeda Nurun Nahar Islam, senior medical officer, Labour Welfare Centre, Tejgaon, Dhaka.

We also thank the following institutions, whose experts contributed to the key informant interviews: the Bangladesh Institute of Labour Studies; the Department of Geography and Environment, Jagannath University; and the Department of Disaster Management.

We thank Agni Bharadwaj, Stevenson High School, Lincolnshire, who helped organise the workers' quotes used in developing the case studies, as part of her school project.

We are grateful to Md Riaz Uddin, communication manager, OKUP, who led the photography and videography for the study.

We also thank David Ackers, editorial manager at IIED, for his guidance and support throughout the publication process; Lucy Southwood for copyediting the report; and Rosalind Cook for the design and layout. We thank Chandrakanth Vivekanandan, programme manager at IIED and Martin Cummins, project manager at IIED, for coordinating the production of the publication.

Abbreviations

AKI	Acute kidney injury
C-CIQ	Comprehensive Climate Impact Quantification
CKD	Chronic kidney disease
FGD	Focus group discussion
GDP	Gross domestic product
IIED	International Institute for Environment and Development
ILO	International Labour Organization
KII	Key informant interview
NID	National identity (card, system)
OKUP	Ovibashi Karmi Unnayan Program
SEWA	Self Employed Women's Association
SSK	Shasthyo Shuroksha Karmasuchi

Summary

The cost of extreme heat to Bangladesh's informal workers is large, rising and largely unrecorded. These workers make up 84.9% of all those employed in occupations such as construction, rickshaw pulling and garment manufacturing, where the body is the main productive asset and heat is unavoidable. Rising temperatures are reducing their productivity, eroding their incomes, worsening their health and deepening their poverty. Most of this goes unaccounted for, because conventional assessments rarely capture it.

This report measures that burden and sets out what it would take to reduce it. Using the Comprehensive Climate Impact Quantification (C-CIQ) toolkit and a survey of 175 informal worker households in Dhaka, covering outdoor workers in construction and rickshaw pulling and indoor workers in garment manufacturing, we examine how heat affects workers both at work and at home, quantify the resulting economic and non-economic loss and damage, and assess the policy responses needed to protect those most exposed.

Heat exposure does not end at work

Vulnerability is shaped by how workers live as much as by rising temperatures. Many of those surveyed were migrants, with 73.0% of outdoor worker households having moved to the city, compared to 52.8% of indoor worker households.

After work, many workers return to homes that provide no relief from heat. Among indoor worker households, 66.0% live under heat absorbing tin or asbestos roofs, compared with 54.1% of outdoor worker households. While 92.9% of indoor and 57.3% of outdoor worker households live below minimum living space standards. Homes are hot, crowded and subject to frequent power cuts during heatwaves, which prevents the use of fans when they are needed most. Asked to rate how hot their homes become during summer, on a scale of 0 to 5 where 5 is the hottest, outdoor workers scored 4.4 and indoor workers 4.3, with housing heat exposure index scores of 6.0 and 5.0, respectively, out of 10.

Living and working conditions leave workers highly exposed

Workers receive little respite during work. Access to drinking water, shade, rest areas, sanitation and medical support is poor, and the workplace facilities index scores just 3.1 out of 10 for outdoor workers and 5.0 for indoor workers. Provision is worst for outdoor workers, of whom only 27.0% always have cool water at work, 11.5% always have shaded rest, and 61.5% never have access to first aid.

Workers rely heavily on their own coping strategies, yet the most effective strategies lie beyond their control. The coping action index is 5.6 out of 10 for outdoor workers and 4.9 for indoor workers, the lower indoor score reflecting strict target-oriented production regimes that leave little room to rest, seek shade or drink water.

A central finding is that indoor workers are no better protected. Although they avoid direct sun, many work in enclosed, poorly ventilated garment units where heat builds through the day; and across several measures, they reported heat stress comparable to those working outdoors.

Heat is reducing productivity and incomes

Heat is already imposing measurable economic losses. Outdoor workers lose an average of 23.7 workdays a year due to heat and indoor workers 13.5. For both groups, illness is the largest cause of workdays lost to heat, at 15.3 days for outdoor and 8.1 for indoor workers, followed by reduced productivity.

These losses translate into annual wage losses of US$148.86 per outdoor worker and US$89.10 per indoor worker. These are significant sums for households on very low incomes, and are often absorbed through borrowing, reduced food consumption and delayed healthcare.

Heat is creating serious health risks

The health burden of heat is substantial and reaches well beyond short-term discomfort. Workers reported widespread heat cramp, heat exhaustion and heatstroke. During the hot season, the heat-related illness prevalence index reaches 9 out of 10 for cramp, 6.6 for exhaustion and 3.6 for heatstroke among outdoor workers, and 7.9, 6.6 and 1.5 respectively

among indoor workers. Heat exhaustion is almost identical across the two groups and around 1 in 3 outdoor and 1 in 7 indoor workers reach the threshold for heatstroke, which is a medical emergency. Almost none seek treatment: roughly 19 in 20 workers who had experienced heatstroke said they had received no medical care.

Repeated dehydration is a particular concern. The study found that 23.1% of workers show symptoms consistent with acute kidney injury (AKI), and around 6.0%, or 1 in 17, may eventually develop chronic kidney disease (CKD) from repeated heat exposure. Scaled nationally, that is roughly 3.56 million informal workers in physically demanding work, and an estimated loss of 0.61 billion workdays a year.

Heat also affects mental wellbeing. The psychological stress index more than doubles in the hot season, rising from 2.5 and 2.2 out of 10 in cooler months to 5.2 for outdoor and 4.9 for indoor workers. Disturbed sleep is identical across the two groups, indicating that the mental health impacts are tied to homes offering no rest.

Heat is deepening poverty and widening the living wage deficit

Surveyed households earn well below a living wage, even before heat losses are considered. Against the Anker living wage benchmark for Dhaka of US$2,997 a year, outdoor worker households earn an average of US$1,756 and indoor worker households, US$1,985, leaving them 41.4% and 33.8% below a living wage, respectively.

Heat widens these deficits. After heat-related wage losses, annual household income falls to US$1,607 for outdoor workers and US$1,896 for indoor workers, and the living wage deficit rises to 46.4% and 36.8%, respectively. Heat therefore acts as a poverty multiplier, pushing already vulnerable households further from a decent standard of living.

Heat generates both economic and non-economic loss and damage

Using the C-CIQ framework, we assessed both economic losses (lost workdays, forgone wages, healthcare costs and reduced earning capacity) and non-economic losses (physical pain, psychological stress, disrupted sleep, strain on family life and loss of dignity). Many of these do not appear in conventional economic accounts, so the true burden of heat extends far beyond what is visible in labour or economic statistics.

The economic case for acting early

The costs are substantial at both household and national scales. Across the three divisions with the highest heat exposure — Dhaka, Rajshahi and Rangpur — around 32.16 million workers undertake heat-exposed physical labour and together lose an estimated US$2.34 billion in wages each year. Nationally, the immediate loss during extreme heat comes to US$4.10 billion a year, or 0.91% of gross domestic product (GDP), and CKD linked to prolonged exposure adds US$2.12 billion, or 0.47% of GDP. So, combined seasonal and long-term losses reach 1.4% of GDP.

Acting before losses occur is far more cost-effective than responding afterwards. Our analysis across eight countries finds that every US$1 invested in anticipatory action generates US$2.06–5.17 in avoided losses and development gains.

Strengthening social protection for heat-exposed workers

Bangladesh already has many of the systems it needs to protect heat-exposed workers. A heat-triggered cash transfer, delivered through the bKash and Nagad mobile money platforms and targeted through the National Identity (NID) system, could provide income support when extreme heat prevents work, costing US$31.3–93.8 million a year, depending on the severity of the season. Interim health support to meet the cost of heat-related illness, and improved access to existing food programmes, would cost even less. Together with workplace protection, the full package would cost US$69.8–132.3 million a year, a small fraction of the losses workers currently bear.

Strengthening workplace protection and enforcement

Workplace protections are not in line with rising heat. The Bangladesh Labour Act 2006 and Labour Rules 2015 have set no temperature threshold, treat heat only as a matter for advisory warning and reach few of the most exposed workers. We recommend an enforceable heat threshold, with mandatory drinking water, shade and rest breaks once it is crossed; recognition of heat-related illness as an occupational disease and protection for every worker exposed to hazardous heat, regardless of the size of the establishment.

Financing protection against heat-related income losses

Experience with index-based heat insurance from India suggests that insurance alone cannot cover routine heat losses. A 2024 payout of around US$8 per worker under one such scheme replaced only 5–9% of the income workers lost. Parametric insurance has a role in exceptionally severe years, but direct cash transfers through social protection systems give more reliable and timely support. Bangladesh's experience with forecast-based anticipatory cash transfer can provide a foundation for this. We therefore recommend a layered approach, using direct transfers as the foundation and insurance as an add-on to manage extreme heat risk.

Moving from evidence to action

Most of these losses remain invisible and uncompensated. Yet Bangladesh already has much of what it needs to respond, from mobile money payments and the NID system to a track record of forecast-based anticipatory cash transfers and the weather information needed to trigger action. The main gap is in health, where no scheme yet reaches the urban informal workforce, so the task will be partly to build protection that is missing and partly to connect existing systems to heat. Doing this, activating these systems before losses occur and extending protection from the workplace into the home would protect livelihoods and health at a fraction of the current cost. As temperatures continue to rise, Bangladesh's labour laws, social protection programme and climate adaptation agenda must prioritise protecting informal workers from heat.

1

The hidden cost of heat

1.1 Heat stress: a threat to workers, productivity and economic growth

With its frequency, intensity and duration increasing due to climate change, extreme heat has become one of the world's most widespread occupational hazards. The International Labour Organization (ILO) estimates that 2.41 billion workers — 71% of the global workforce — are exposed to excessive heat at some point during their work, a share that has risen steadily since 2000 (ILO, 2024a). Heat stress is the leading cause of weather-related deaths and studies covering 2000 to 2019 attribute around 489,000 deaths a year to heat, 45% of them in Asia (WHO, 2024). Behind these mortality figures sits a much larger burden of illness, injury and lost earning capacity that rarely appears in any official assessment.

Bangladesh sits among the countries most exposed to this crisis. In April 2024, it recorded its longest heatwave since observations began in 1948, surpassing the previous record of 23 days set in 2019 and affecting around three-quarters of the country (The Straits Times, 2024). The heat forced nationwide school closures, impacting around 33 million children, and in Dhaka, daily maximum temperatures ran 4–5°C above the 30 year average for the period (Al Jazeera, 2024). The ILO projects that heat stress will result in the loss of 2 million full time jobs in Bangladesh by 2030 (ILO, 2019), with construction among the most affected sectors. These losses will fall overwhelmingly on informal workers, who make up almost 85% of the country's employed workforce (BBS, 2023). And it is this informal workforce that labours in the occupations where the body is the main productive asset, such as construction, road building, rickshaw pulling, and garment and other small-scale manufacturing.

For informal workers, heat exposure translates directly into lost earnings, illness and reduced productivity. A rickshaw puller who stops working during the hottest hours, a construction labourer who misses work due to heat-related illness or a garment worker who slows down in an overheated factory all experience immediate income losses. And it is largely these workers and their households who bear these losses, absorbing them through borrowing, reduced consumption or delayed healthcare, with little compensation or protection.

Heat exposure is not confined to outdoor work. Workers in garment factories and small workshops often labour for long hours in poorly-ventilated, heat-trapping spaces where temperatures can be as severe as those outdoors. And exposure does not end when the shift finishes, as many workers return to overcrowded homes with tin or tarpaulin roofs that hold heat late into the night, leaving little opportunity to recover before the next working day. Understanding heat exposure therefore requires looking beyond the workplace to the wider conditions in which workers live.

The policy response so far has not matched the nature of the problem. Insurance-based income protection, including parametric products that trigger payments when temperatures cross a threshold, is an important innovation. But payouts are often small relative to earnings lost and are typically not received until after the heat event has passed. Such schemes compensate a fraction of the losses and do not address the conditions that force people to keep working through dangerous heat or the longer-term effects on health and productivity.

Many other countries and regions face a similar situation. Across South and Southeast Asia, Africa and Latin America, developing and low-income countries with large informal workforces face the same combination of rising heat, physically demanding work and weak social protection. Evidence on what works in Bangladesh can inform responses in these settings. Developed countries are also increasingly exposed. Europe recorded an estimated 61,672 heat-related excess deaths in the summer of 2022, and occupational heat exposure is rising faster in Europe and Central Asia than in any other regions (WHO, 2024; ILO, 2024b). As outdoor and indoor work everywhere gets hotter, this report considers how to protect workers' health and incomes in ways that allow them to stop working when conditions become dangerous.

1.2 Why the economic and non-economic costs of heat go uncounted

Heat damage differs from other climate hazards, and as a result, its costs often go unmeasured. A rapid-onset event such as a cyclone or flood arrives on a specific date, in a specific place, and is usually followed by a damage assessment that records homes destroyed and crops lost. After the event, the government announces relief and compensation and enters the losses into national disaster statistics. A heatwave produces no comparable record. Its losses take the form of millions of small, individual or household-level impacts: a day's wages forgone, a saline drip paid for out of pocket, a slower afternoon's work, food that spoils before it can be eaten, a night without sleep. Households absorb these losses quietly, often through borrowing, untracked by any institution.

Even the most basic indicator — the number of heat-related deaths — is unreliable. During the 2024 heatwave, Bangladesh's health authorities began recording heatstroke deaths 20 days after the heatwave started, and it was the first time it had released such data. The official count of 15 deaths was drawn from government hospitals alone, while media compilations put the toll above 40 (The Daily Star, 2024; The Business Standard, 2024). The government figures do not include private healthcare facilities, which outnumber public ones, and deaths before 22 April were not attributed to heat. Deaths among informal workers are especially likely to go unrecorded, because heat is rarely noted as a cause. And if deaths are undercounted, the undercounting of non-fatal illness, lost work and chronic harm is far greater.

Where economic estimates exist, they are built from the top down. The job loss figures cited in Section 1.1 (ILO, 2019) are derived by applying physiological work capacity models to temperature data. These estimates are important in establishing the scale of the problem, but they cannot show how or where people actually experience loss. They do not show, for example, how many workdays a construction labourer or rickshaw puller in Dhaka loses in a year, how many days or hours a garment worker loses on an overheated factory floor, what share of a household's income disappears, what share is spent on treatment, or how the loss compares with what a household needs to live on.

The measurement gap is wider still for the following categories of loss:

- **Exposure of indoor workers**, which has been studied far less than exposure of those working outdoors under direct sun.
- **Exposure beyond the workplace**, as studies that measure heat stress during working hours assume the body recovers afterwards; but this is not the case for workers whose housing offers no relief. Studies do not tend to measure the housing, water and food dimensions of exposure alongside occupational dimensions.
- **Non-economic losses** — such as psychological distress, chronic fatigue, disturbed sleep, strained family relations and the indignity of working through illness for fear of dismissal — are real and recurring harms that are difficult to quantify; as a result, they are absent from both policy frameworks and assessments that determine where climate finance flows.

Some of the damage caused by heat exposure is also long lasting. Repeated dehydration and heat stress can injure the kidneys, and recurrent episodes of AKI may progress to irreversible CKD. In 2020, around 26.2 million people worldwide were living with CKD linked to workplace heat stress (ILO, 2024a). The costs of treatment, reduced earning capacity and declining health often emerge years after the original exposure and are rarely traced back to heat.

The result is a systematic underestimation of heat-related loss and damage. Economic losses, non-economic harms, workplace exposure, household exposure and long-term health impacts are measured separately or not at all. Capturing the full burden requires an approach that can assess these dimensions together and trace how vulnerability, exposure and protection interact to shape outcomes for workers and their households.

1.3 Study locations, workers surveyed and the indoor–outdoor comparison

This study took place in Dhaka, Bangladesh's capital and largest city, which holds one of the country's largest concentrations of informal workers. Dhaka experiences intense pre-monsoon heat between March and June, made more dangerous by high humidity; and its rapid, dense urbanisation produces a pronounced urban heat island effect that keeps temperatures high into the night. The city experienced the country's longest recorded heatwave in April 2024. We selected Dhaka for its high exposure to extreme heat, its large informal workforce and the presence of grassroots organisations and unions that could support fieldwork and reach workers who are otherwise hard to survey.

Within the city, we surveyed informal workers in two broad settings: outdoor and indoor. Outdoor workers were drawn mainly from construction, road work and rickshaw pulling, and indoor workers mainly from garment manufacturing. We chose these sectors because they employ large numbers of informal workers in physically demanding tasks and expose those workers to heat in different ways, including directly to the sun. Indoor workers were drawn predominantly from garment units, where they work in enclosed and often poorly-ventilated spaces where machinery and a lack of airflow can push temperatures as high as those outside. Setting the two groups side by side allowed us to see where their exposure and outcomes converge and differ, and therefore design protections that reach both groups.

We surveyed 175 informal worker households; 122 from outdoor sectors and 53 from indoor sectors. We grouped them by work setting to allow direct comparisons between the outdoor and indoor samples. The Dhaka sample forms part of a wider study, which surveyed over 700 informal workers across India and Bangladesh.

The household survey was the core instrument, capturing data on demographics, income, housing, food security, water and sanitation access, work patterns, physical and mental health symptoms linked to heat, healthcare spending and access to employer or government support. We complemented the survey with five further methods: time-motion studies of work and rest cycles; self-reported health risk scoring; focus group discussions (FGDs) with men, women and young workers; key informant interviews (KIIs) with employers, doctors, union leaders and officials; and in-depth family case studies of how heat accumulates across a season. The study design, sampling approach and instruments are set out in Appendix 1.

We undertook the fieldwork with support from local organisation and unions in Dhaka, and the trust they had already built meant people spoke openly about their working conditions, health and household circumstances. A panel of three doctors advised on the survey tools and reviewed the findings, and health professionals in Dhaka helped validate the symptoms workers reported, strengthening the health risk scoring.

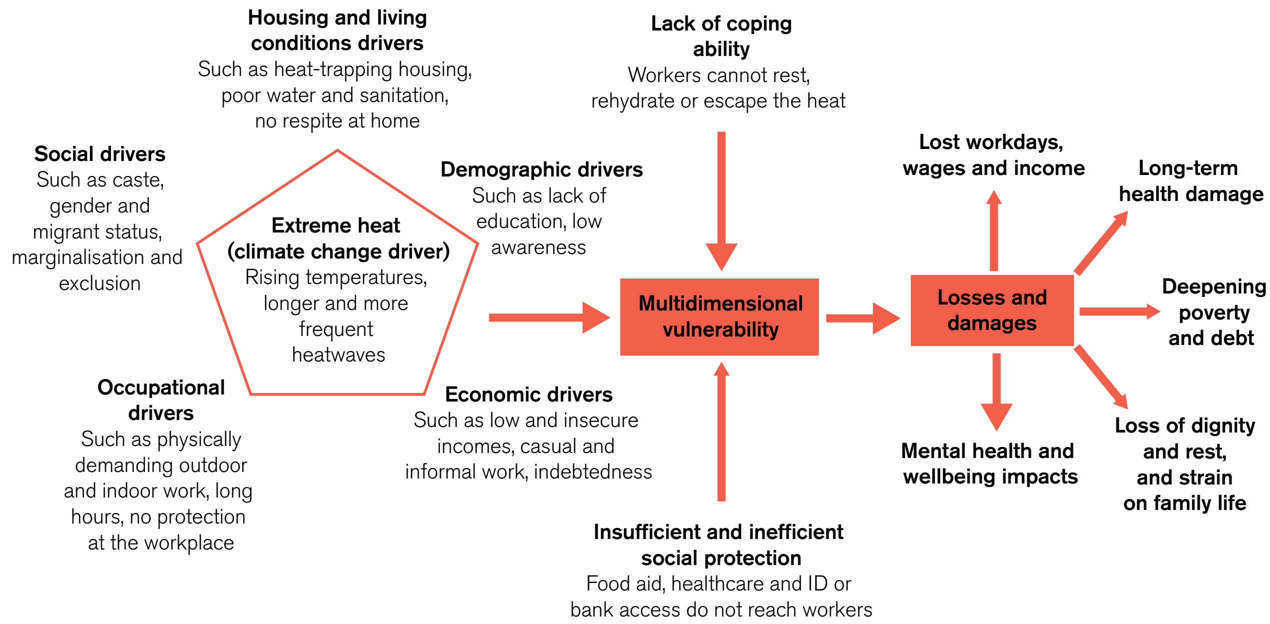
To capture the full range of heat-related loss and damage, we used two complementary approaches. First, we examined the underlying vulnerabilities that shape workers' exposure and sensitivity to heat. Second, we quantified the resulting economic and non-economic losses using the C-CIQ toolkit (Bharadwaj et al., 2024).

The C-CIQ toolkit combines economic valuation, composite indices and qualitative methods to assess impacts that range from measurable economic losses to non-economic harms that are difficult to value. Within this framework, we developed a series of indices covering housing heat exposure, social protection, workplace facilities, coping actions, heat-related illness prevalence and psychological stress, allowing comparisons across worker groups and settings.

Summarised in Figure 1, the overall analytical framework for assessing vulnerability and heat-related loss and damage traces the pathway from the factors that shape vulnerability, through heat exposure to the resulting economic and non-economic losses and damages experienced by workers and their households. The framework also provides the basis for identifying where interventions and investments are most needed to reduce heat-related risks.

The value of this approach for policymakers is that it quantifies and uncovers otherwise hidden losses, enabling them to be considered in policy and programmatic responses. By quantifying non-economic losses and damages alongside economic loss, and by tracing how losses in one domain trigger losses in another, it gives policymakers a basis for deciding where protection and finance are most needed and how they could deliver them.

Figure 1. From drivers of vulnerability to loss and damage



Source: adapted from Bharadwaj et al., 2024.

2

Underlying vulnerabilities and their interaction with heat

Heat does not affect every worker in the same way. A secure, well-housed worker may be able to absorb a temperature that pushes a poorly housed daily wage earner into lost work, illness and debt. The difference is not the heat, but the conditions in which workers live and work. To understand why some workers experience far greater losses and damages than others, we use the 3P framework (see Figure 2), which examines how vulnerability, heat exposure and protection interact to shape outcomes.

2.1 Examining underlying vulnerabilities and their interaction with heat

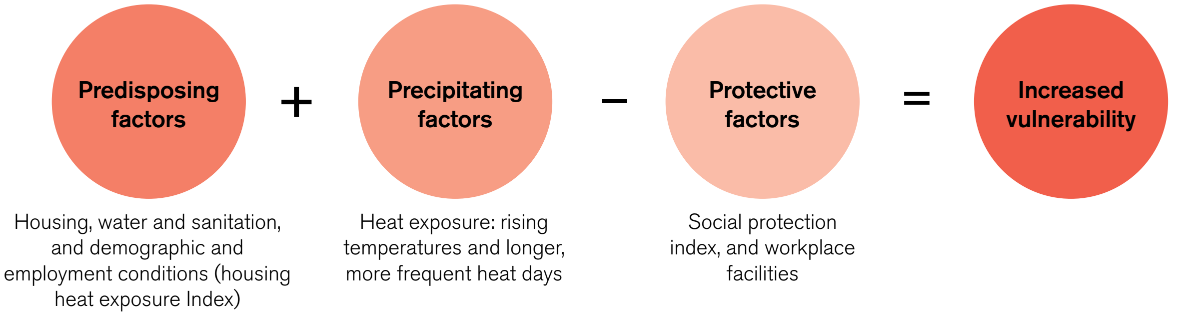
Figure 2 presents the 3P framework we use in this study, which is organised around three elements: predisposing, precipitating and protective factors.

Predisposing factors are the conditions that make workers and households more susceptible to heat-related loss and damage. They include demographic and social characteristics, employment conditions, income and indebtedness, and the quality of their housing, water and sanitation. A daily wage labourer living under a tin roof, sharing overcrowded accommodation, with limited access to water and cooling, is already vulnerable before temperatures rise.

Precipitating factors are the triggers that convert vulnerability into loss and damage. In this study, the principal precipitating factor is heat itself: rising average temperatures, more frequent and prolonged heatwaves, and increasingly extreme conditions during the working season. Understanding these trends, and how workers experience them, helps explain why heat-related losses are becoming more frequent and severe.

Protective factors are the measures and systems that can reduce vulnerability and harm when heat strikes. These include social protection programmes, food security schemes, healthcare access and workplace safeguards. Where these protections are absent or inaccessible — as is often the case for informal workers — households are left to absorb the resulting losses through reduced income, debt, food insecurity or by working through illness.

Figure 2. The 3P framework



Source: adapted from Bharadwaj et al., 2024.

2.2 Predisposing factors that shape vulnerability

2.2.1 Migration and household composition

Migration is common in both surveyed groups, and more so among outdoor workers, 73.0% of whom had migrated to the city, against 52.8% of indoor worker households. These are internal labour migrants who have moved from rural districts to Dhaka in search of work.

Migration is itself a predisposing factor, because entitlements to food assistance, healthcare and welfare support in Bangladesh are largely administered locally and oriented towards areas of origin. As a result, migrants often struggle to access support in the city where they work. So, when heat exposure leads to lost work or illness, many households cannot access the assistance that could help them cope. This disadvantage is more pronounced among outdoor workers, where migrants are more prevalent.

Many workers migrate as families rather than alone (see Figure 3). Working-age adults make up around 75.1% and 69.2 % of migrant household members among outdoor and indoor workers, respectively. In outdoor worker households, working-age men outnumber women by roughly two to one, at 51.7% against 23.4%, reflecting the predominance of men in construction and rickshaw pulling. In indoor worker households, the balance is closer, at 39.5% men against 29.7% women, with the larger female share consistent with women's greater presence in garment work. Children make up 28.6% of indoor worker households and 22.4% of outdoor worker households, while the elderly are largely absent, at 2.4% or less. Parents live and often work alongside their children in the same heat-exposed environments, while older relatives remain at their place of origin. This leaves migrant families without the support of an extended household and exposes women and children to many of the same heat risks faced by working men.

Migration to the city is relatively recent and ongoing: 34.8% of outdoor and 39.2% of indoor worker households first migrated within the last five years; and close to two-thirds of outdoor worker households and around 7 in 10 indoor worker households, within the last ten years (see Figure 4). A smaller share had been settled for much longer; in some cases, for more than 30 years. The predominance of recent arrivals becomes important because they are typically the least established and least able to draw on local support when heat exposure leads to lost work or illness. They have had less time to build the documentation, networks and familiarity with local services that would help them access assistance. This pattern also points to a continuing flow of migrants rather than a one-off movement, which suggests these vulnerabilities will keep affecting new arrivals.

Figure 3. Composition of migrant households at destination sites, by work setting

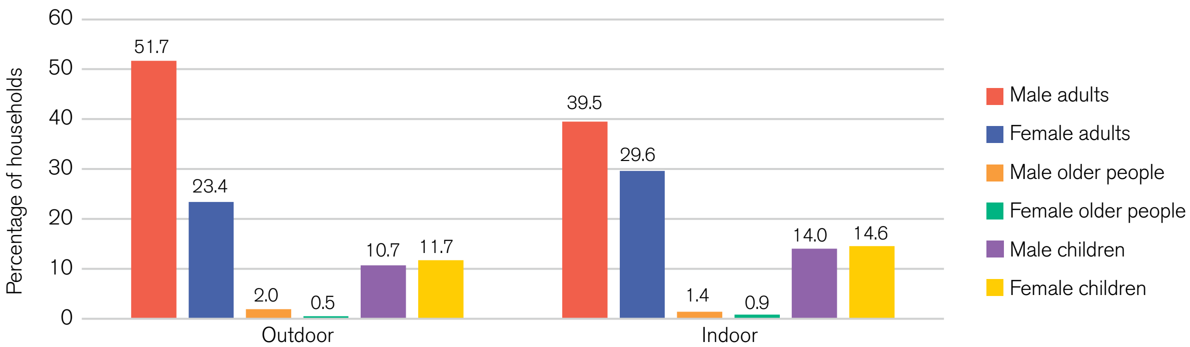
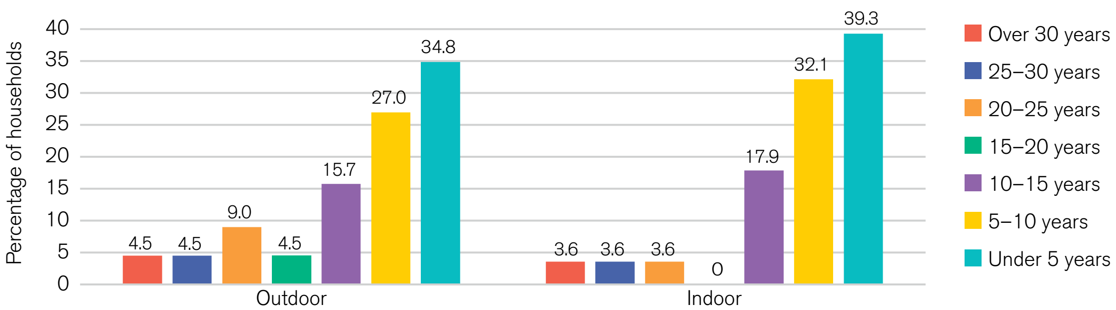


Figure 4. Years since the household first migrated, by work setting



2.2.2 Sex and education of the household head

Most households (98.4% of outdoor and 86.8% of indoor worker households) are headed by men (see Figure 5). Female-headed households are far more common among indoor workers, at 13.2%, compared with 1.6% among outdoor workers, reflecting women's greater presence in garment work. This is relevant to heat vulnerability because female-headed households are more likely to depend on a single earner, and women typically earn less than men for comparable informal work. When heat exposure causes illness or lost work, the impact therefore falls on an already smaller income base.

Levels of education among household heads are generally low, which limits both employment opportunities and the ability to navigate administrative systems (see Figure 6). Among outdoor worker households, 23.8% of household heads are illiterate, compared with 17.0% in indoor worker households. Only 3.3% of outdoor and 5.7% of indoor worker household heads have studied beyond the tenth standard. Low literacy makes it harder to move into less heat-exposed work, understand heat-related risks and access social protection schemes that require registration, documentation and administrative procedures. This compounds the disadvantages already faced by migrant households, who often lack local networks and familiarity with available services.

The picture improves when we look at the highest level of education reached by any household member rather than focusing on the household head alone (see Figure 7). Household-level illiteracy falls to 3.3% among outdoor worker households and to zero among indoor worker households, and most households have a member who has reached at least the sixth to tenth standard. Among outdoor and indoor worker households, 23.8% and 9.4% have a member educated beyond the tenth standard; respectively. These findings suggest that younger household members are generally better educated than their parents and may have greater opportunities to move into safer and better-paid work in future. But for now, decisions about employment and coping with heat remain largely with household heads, so these educational gains have yet to translate into lower exposure or greater protection.

Figure 5. Male and female-headed households, by work setting

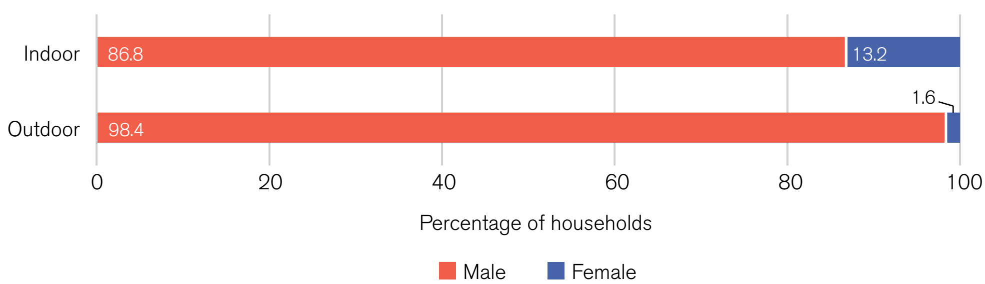


Figure 6. Level of education of the household head, by work setting

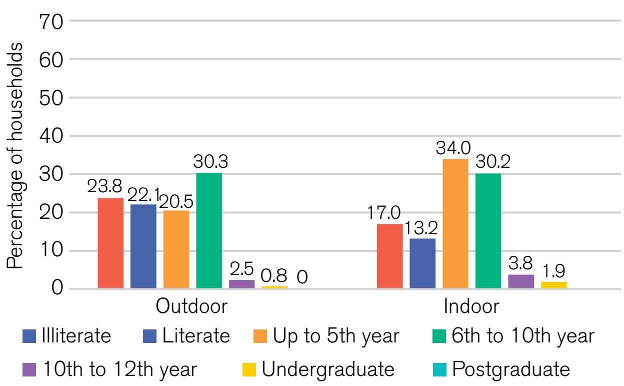
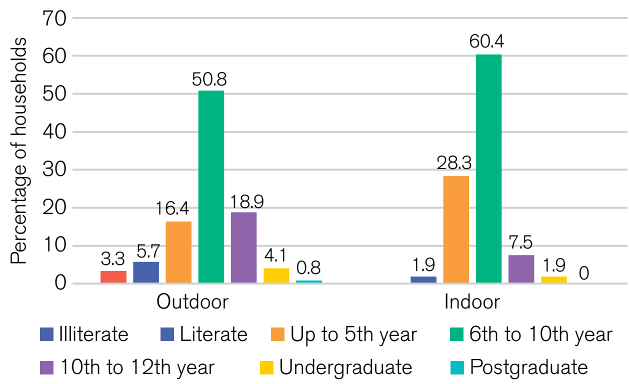


Figure 7. Maximum level of education in the household, by work setting



2.2.3 Income

The predisposing factors discussed so far converge on income. Daily wage earners' pay is low, irregular and dependent on physically demanding work. Migration status and limited education are among the factors that shape their earnings. Income becomes important because it determines a household's capacity to absorb loss when heat strikes.

For workers with little or no savings, and often existing debt, stopping work during extreme heat is rarely an option. A lost workday or spell of illness translates quickly into lost earnings, deeper borrowing, reduced consumption or delayed treatment. Income therefore shapes both living standards and the ability of workers and their households to protect themselves from heat-related loss and damage.

We must also assess income against what a household needs to live on. The same earnings can provide very different levels of security, depending on the cost of maintaining a basic but decent standard of living. For that reason, we do not present income in isolation. In Section 4.7, we compare household earnings against a living wage benchmark and examine how heat exposure widens the gap between what households earn and what they need to live on.

Overall, the analysis of predisposing factors shows that the workforce enters each hot season already disadvantaged. Both outdoor and indoor workers face multiple vulnerabilities, concentrated in slightly different ways. Outdoor workers are more likely to be migrants and their household heads are less likely to be educated, while indoor worker households include a higher share of female heads and depend heavily on garment work. Neither group has the resources needed to absorb the losses that heat exposure brings.

2.2.4 Living conditions that offer no respite from heat

Heat exposure does not end at the workplace. After a shift in the sun or a hot workshop, many workers return to homes that have absorbed the day's heat and release it through the evening and night, leaving little opportunity for recovery before the next working day. Most occupational studies overlook this dimension of heat exposure because they focus on workplace conditions alone. In this section, we examine the living conditions that shape exposure after work, covering home ownership, roof type, wall material, ceiling height, living space per person, perceived indoor heat and the availability of cooling equipment. The evidence shows that home often offers little respite from heat.

2.2.4.1 Housing and the built environment

The physical characteristics of a home determine how much heat it lets in, traps and retains. We examine five features: ownership, roof type, wall material, ceiling height and living space per person.

At 2.5% of outdoor and 1.9% of indoor worker households, very few workers own the homes they live in (see Figure 8). Among outdoor workers, 54.1% rent, 27.0% live in shared housing and 15.6% live in employer-provided shelter, much of the latter on or beside the workplace. The great majority of indoor workers (92.5%) rent. Insecure tenure becomes important because workers in rented, shared, employer-provided or temporary housing have little ability or incentive to invest in improvements that would make their homes cooler.

The roof is where most heat enters a low-rise home, and here indoor workers are no better off than outdoor workers — indeed, more indoor workers live under a heat-absorbing roof (see Figure 9). Among indoor worker households, 66.0% live under asbestos or tin sheet roofs and only 34.0% have a reinforced concrete roof. Among outdoor worker households, 54.1% live under asbestos or tin roofs and 44.3%, under reinforced concrete. Metal roofs can raise indoor temperatures well above the outside air temperature, particularly during prolonged extreme heat (Vellingiri et al., 2020).

Walls are more commonly built from durable materials, with 73.0% of outdoor and 86.8% of indoor worker households living in homes with brick walls. But 25.4% of outdoor and 13.2% of indoor worker households live in homes with tin or asbestos walls, which conduct heat into the living space (see Figure 10).

Ceilings are mostly low, which traps heat and limits air circulation. Using 10 feet or less as the threshold for a low ceiling (Farooq et al., 2020), around 96% of households in both groups fall into this category (see Figure 11). Combined with heat-absorbing roofs, low ceilings leave little room for hot air to rise and circulate, and there is little difference between the two groups on this measure.

Their homes are also crowded, particularly among indoor workers. Against an adequate housing standard of approximately 97 square feet of living space per person (Behr et al., 2021), 92.9% of indoor and 57.3% of outdoor worker households fall below the threshold (see Figure 12). Crowding contributes directly to indoor heat, as more people share limited space and air, making rest and recovery difficult, particularly at night when whole families occupy the same room.

Figure 8. House ownership status, by work setting

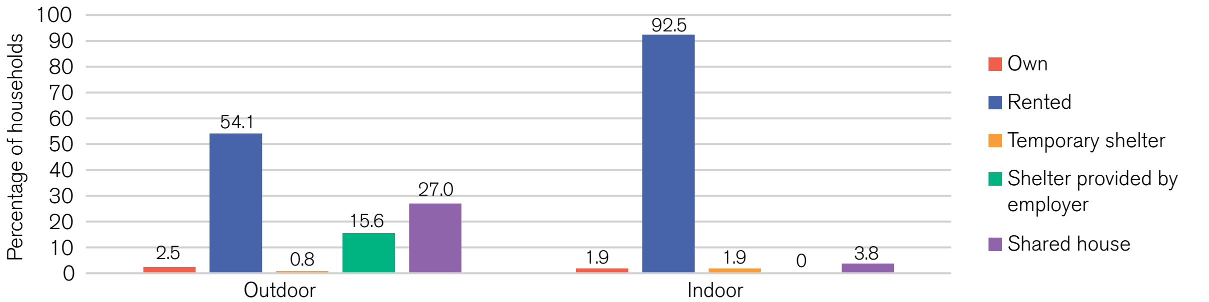


Figure 9. House roof type, by work setting

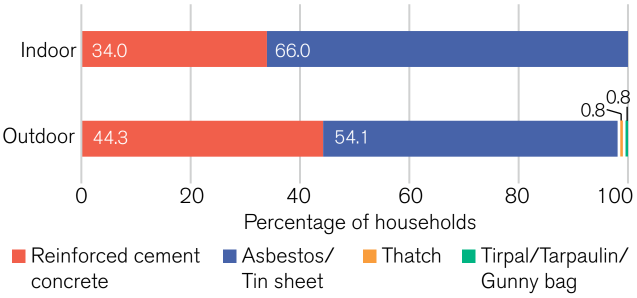


Figure 10. House wall type, by work setting

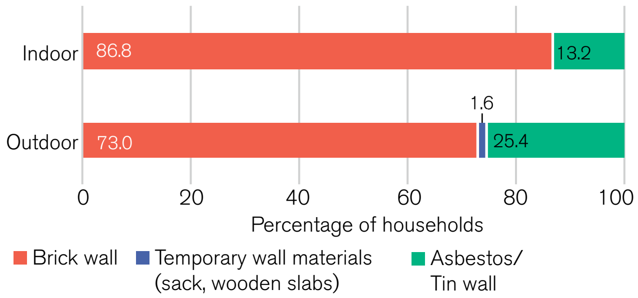


Figure 11. House roof height, by work setting

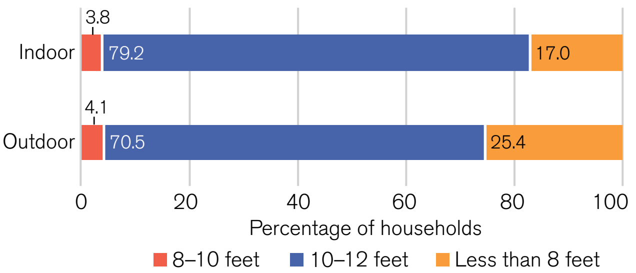
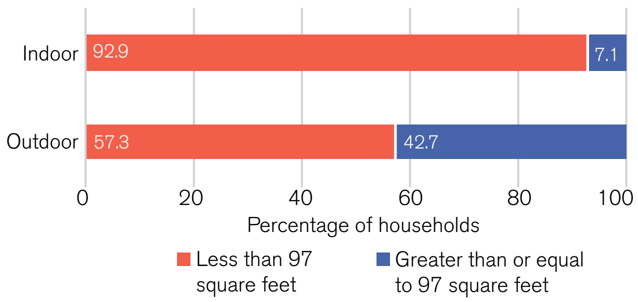


Figure 12. Per capita house area, by work setting



2.2.4.2 Indoor heat and cooling

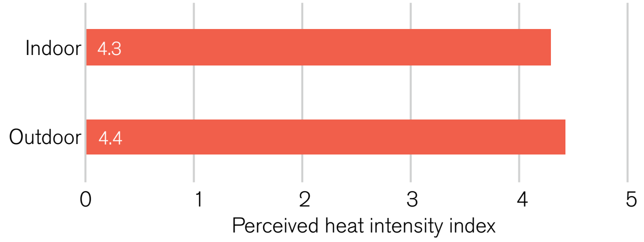
We asked workers how hot their homes become in summer and what they can do to cool them. The answers point in one direction: their homes are very hot and they have minimal means to cool them. On a five-point scale, outdoor workers put the heat inside their homes at the height of summer at 4.4, and indoor workers, at 4.3 (see Figure 13). Both sit close to the ceiling of the scale. That indoor workers' ratings of the heat in their homes are so close to outdoor workers' ratings, despite spending their working day under a roof, tells us the home does little to lower either group's heat load.

Respondents have limited means to cool their homes. What cooling exists is basic. Fans are the main and often the only device. Nearly every indoor worker household has at least one, with 82.1% owning a single fan and 17.9% two or more. Among outdoor worker households, 56.2% own one fan, 41.6% own two or more, and only 2.3% own none (see Figure 14). A fan, though, moves warm air without cooling it, and in a crowded room beneath a low ceiling, that movement offers little relief.

Beyond fans, active cooling is entirely absent. Not a single household in either group owned a water-based air cooler or air conditioner. Whatever heat builds up indoors stays there, unmanaged, until the weather itself turns.

Refrigerators are the one appliance in wider use, and here, the indoor group is worse served. Just under 70% of outdoor worker households own a refrigerator, against 39.3% of indoor worker households (see Figure 15). This gap is more important than comfort. Without a refrigerator, food gets spoiled quickly in the heat, and water, milk and medicines cannot be kept cool. For the 6 in 10 indoor worker households without a refrigerator, the everyday knock-on effects of extreme heat are harder to manage.

Figure 13. Perceived heat intensity index, by work setting



Note: Perceived heat intensity index is based on workers' ratings of the heat levels inside their homes. It ranges from 1 to 5; higher score indicates higher perceived heat intensity.

Figure 14. Availability of fans at home, by work setting

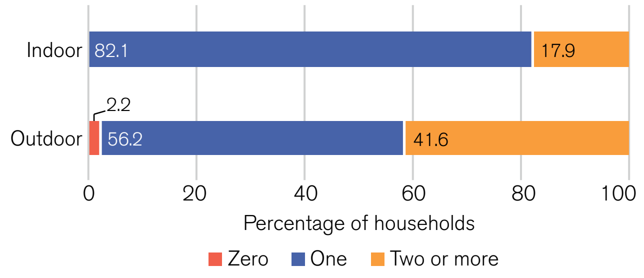
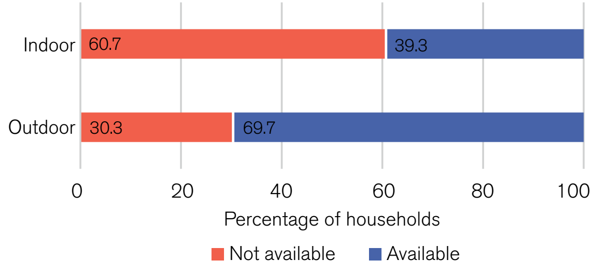


Figure 15. Availability of refrigerator at home, by work setting

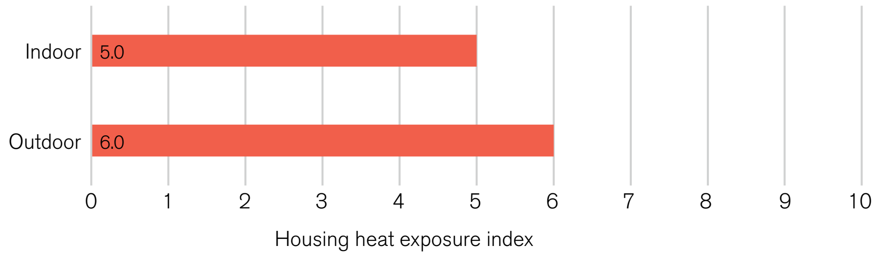


2.2.4.3 The housing heat exposure index

To bring the different features of the home together into a single comparable measure, we constructed a housing heat exposure index that combines the five housing variables examined here: roof type, ceiling height, living space per person, perceived indoor heat during summer and availability of cooling equipment. Following the C-CIQ approach, it is scaled from 0 to 10, with higher scores indicating greater heat exposure at home.

Outdoor worker households scored 6.0 on the index, compared with 5.0 for indoor worker households (see Figure 16). Outdoor workers are exposed to somewhat greater heat at home, but the gap between the two groups is narrow. Indoor workers scored just one point lower, even though on some measures, including roof material and crowding, their housing is worse. Both groups also reported almost the same level of perceived indoor heat, at 4.3 for indoor and 4.4 for outdoor workers on a five-point scale. This means that both groups have limited opportunity to recover after work.

Figure 16. Housing heat exposure index, by work setting



Note: The housing heat exposure index is a composite of variables, namely roof type, roof height, per capita housing area, heat intensity inside the house during summer months and fan availability. It ranges from 0 to 10, with higher scores meaning worse heat exposure.

2.2.5 Water and sanitation

Water and sanitation are basic factors for coping with heat. People need water to drink, wash and bathe, which help regulate body temperature, while access to a toilet supports both hydration and hygiene during hot periods. Dhaka households are better served on these measures than they are on housing and cooling, but gaps remain, particularly in the hot season.

Around three-quarters of all households have water available throughout the year (see Figure 17). The rest face scarcity during the hot season, when demand is highest. Moderate summer scarcity is reported by 22.5% of outdoor and 21.4% of indoor worker households, and extreme scarcity by 1.1% and 3.6%, respectively. Water is therefore available to most households for most of the year, but around a quarter still face shortages in the hottest months, when they must ration supplies and weigh drinking water against water for washing and bathing.

Indoor workers are also better served for sanitation (see Figure 18): 92.9% have a sanitary toilet, 7.1% use a pit latrine and none rely on open defecation. This compares to 69.7%, 29.2% and 1.1%, respectively, among outdoor workers. Open defecation is rare in both groups, and the main difference is outdoor workers' greater reliance on pit latrines. These and shared facilities still carry hygiene risks in hot weather and place a heavier burden on women, in terms of privacy, safety and the need to limit fluid intake.

So, unlike housing and cooling, water and sanitation are areas of relative strength. But even so, summer water scarcity for around a quarter of households, and outdoor workers' continued reliance on pit latrines, add to the pressures of the hot season.

Figure 17. Water availability at home, by work setting

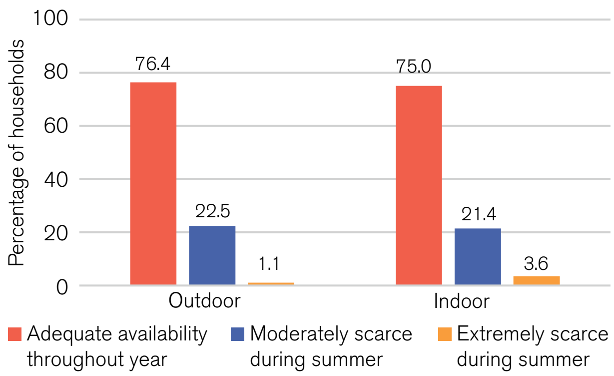
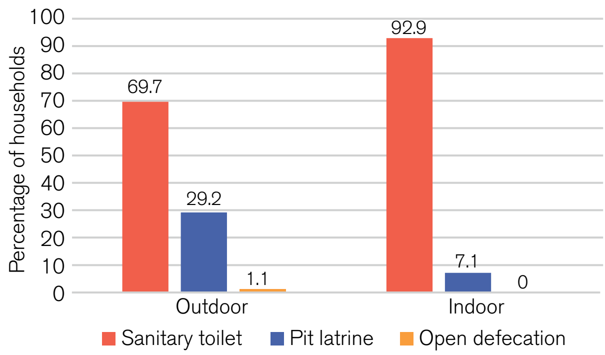


Figure 18. Toilet facilities at home, by work setting



2.2.6 Food security

Food security shapes how well the body withstands heat, since adequate nutrition supports the physical effort and recovery that hot work demands, while heat itself acts directly on food through spoilage (Misiou and Koutsoumanis, 2021). We examined meal frequency, food adequacy, seasonal shortages and spoilage to understand how heat affects food security among worker households.

At 77.9% of outdoor and 84.9% of indoor worker households, most eat three meals a day. Less than a quarter (22.1% and 13.2%, respectively) eat only two meals and hardly any eat just one meal or skip meals altogether (see Figure 19). On this measure, outright hunger appears uncommon. But meal frequency alone does not show whether food is sufficient or consistently available through the year.

Asked whether their food intake had been adequate day to day over the previous month, 36.1% of outdoor and 28.3% of indoor worker households said it had not (see Figure 20). On average, outdoor worker households had experienced 12.7 days and indoor worker households 12.5 days without adequate food the previous month (see Figure 21). This shows that, even among households that regard their food as generally adequate, shortfalls are common.

Food shortages are seasonal and concentrated in the hottest months (see Figure 22). Around 37.9% of outdoor and 44.9% of indoor worker households reported facing no food shortage at any point in the year. For the rest, shortages clustered in April to July, with May and June the worst months, coinciding with the highest temperatures, when the body most needs nourishment to cope with heat.

Heat also affects the food households already have. Food goes stale in the hot season at least sometimes for 63.9% of outdoor and 66.0% of indoor worker households, and 32.0% of outdoor and 41.5% of indoor worker households reported that this happens frequently or very frequently (see Figure 23). Indoor workers, who are less likely to own a refrigerator, reported frequent spoilage more often than outdoor workers, which points to storage rather than housing quality as the constraint. Spoilage increases both food waste and the risk of eating food that has turned.

The pattern shows heat impact on food security at the point the body most needs it. Food shortages peak in the hottest months, and spoilage reduces the value of the food households can obtain, adding to the vulnerabilities they carry into the hot season.

Figure 19. Number of meals per day, by work setting

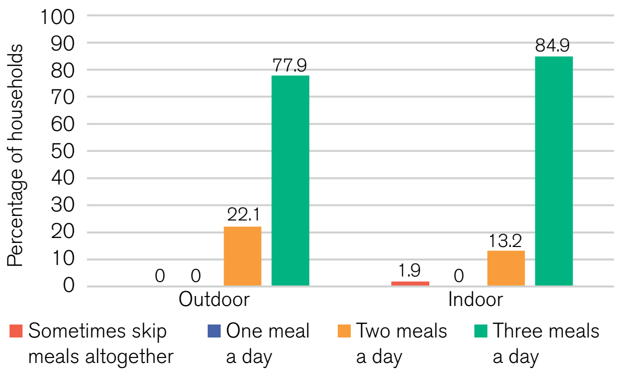


Figure 20. Share of households with adequate daily food in the last month, by work setting

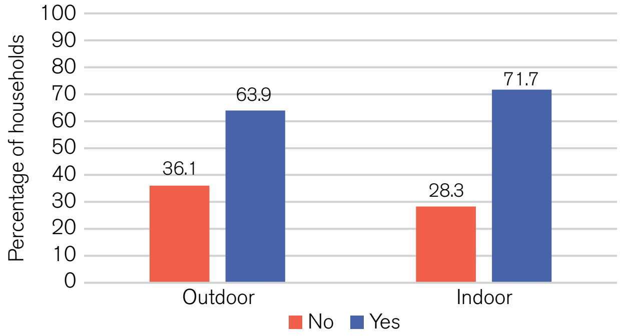


Figure 21. Average number of days without adequate food in the last month, by work setting

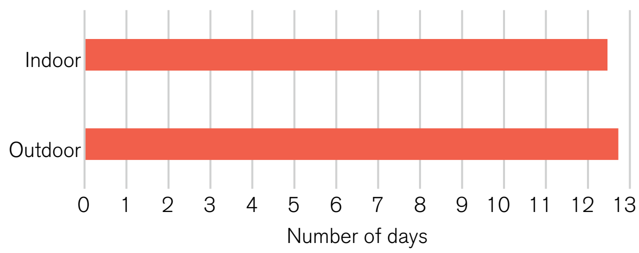


Figure 22. Months in which the family faces food shortages, by work setting

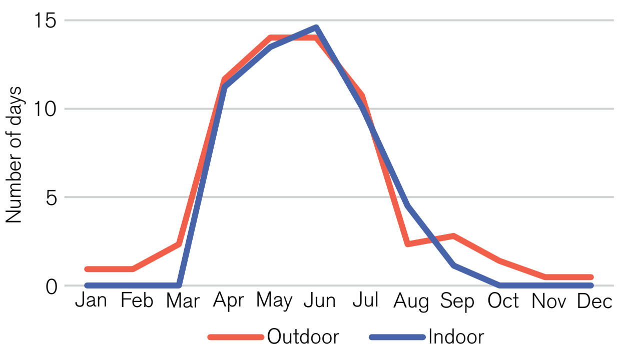
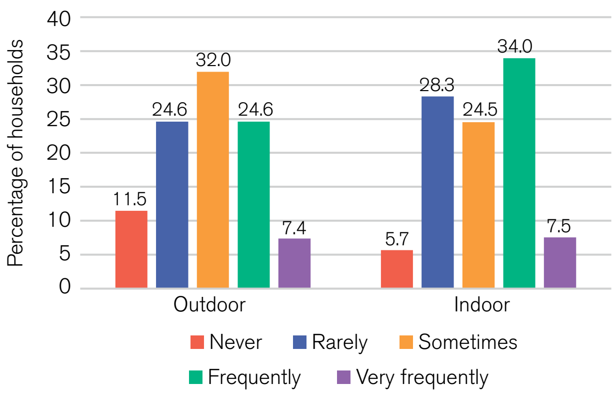


Figure 23. Frequency with which food goes stale in summer, by work setting



2.3 Precipitating factor: heat

Within the 3P framework, heat is the precipitating factor that turns underlying vulnerabilities into loss and damage. In this section we examine how temperatures have changed over time, the seasonal pattern of heat exposure, how workers perceive these changes and the part that climate stress has played in driving migration.

2.3.1 Long-term temperature and anomaly trends

To establish how much hotter Bangladesh has become, we drew on the observed all-Bangladesh temperature series for 1901 to 2024 and measured each year against the long-term average for that period.

Mean temperatures have risen over the period, with most recent years sitting above the long-term average. Against a long-term annual mean of 25.48°C, the warmest year on record is 2009, with an annual mean of 26.49°C, 1.01°C above average; 2010 and 2024 are also among the warmest, at 0.90°C and 0.70°C above average. Figure 24 shows the annual mean temperature and its deviation from the long-term average.

Maximum temperatures, which matter to workers because they determine conditions during the working day, follow the same pattern. Against a long-term annual maximum of 30.26°C, 2009 again stands out as the warmest year, at 1.21°C above average, while 2024 was a more modest 0.39°C above average. Figure 25 presents the annual maximum temperature and its anomaly over the same period.

The warmest years cluster in the 2000s and 2020s, with a few earlier exceptions. By mean temperature, the five warmest years since 1901 are 2009, 2010, 2006, 2024 and 1958, four of them from 2006 onwards (see Table 1). The ranking by maximum temperature is led again by 2009 and 2010, with 1958 and 1999 also among the five warmest (see Table 2).

The record shows a warming trend, though not a uniform year-on-year rise. But looking at trends understates the experience of extreme heat, because annual averages smooth out events such as the April 2024 heatwave (see Section 1.1), which set records for duration and coverage even though that year's annual mean did not. For workers, heat is a present and recurring factor that acts on the vulnerabilities described in Section 2.2.

Figure 24. Annual mean temperature and anomaly, 1901–2024

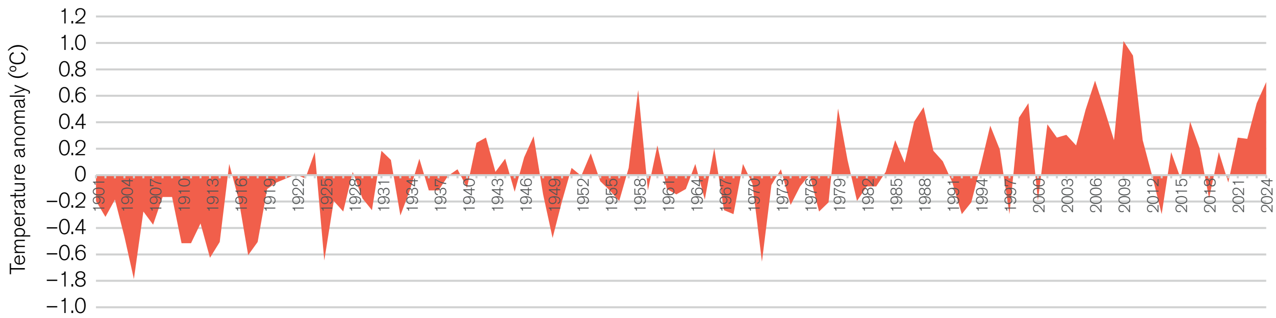


Figure 25. Annual maximum temperature and anomaly, 1901–2024

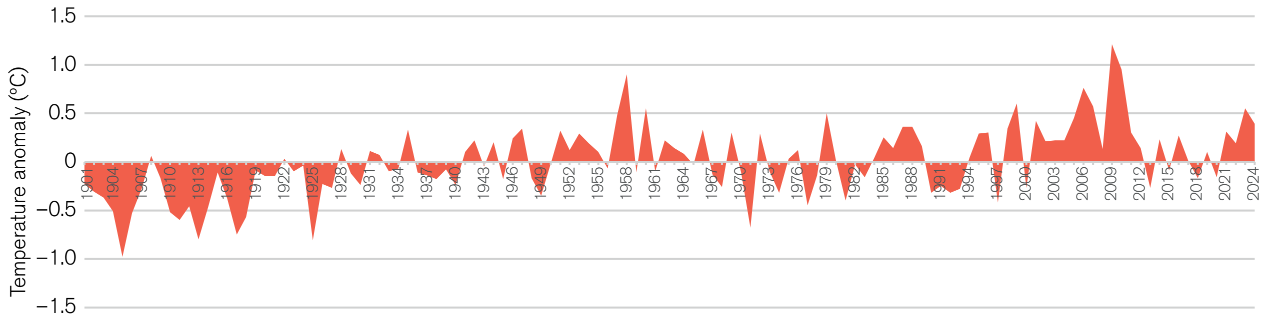


Table 1. The five warmest years in Bangladesh by mean temperature, 1901–2024

Rank	Year	Anomaly above long-term average (°C)
1	2009	1.01
2	2010	0.90
3	2006	0.71
4	2024	0.70
5	1958	0.64

Table 2. The five warmest years in Bangladesh by maximum temperature, 1901–2024

Rank	Year	Anomaly above long-term average (°C)
1	2009	1.21
2	2010	0.95
3	1958	0.90
4	2006	0.76
5	1999	0.60

2.3.2 The seasonal profile of heat

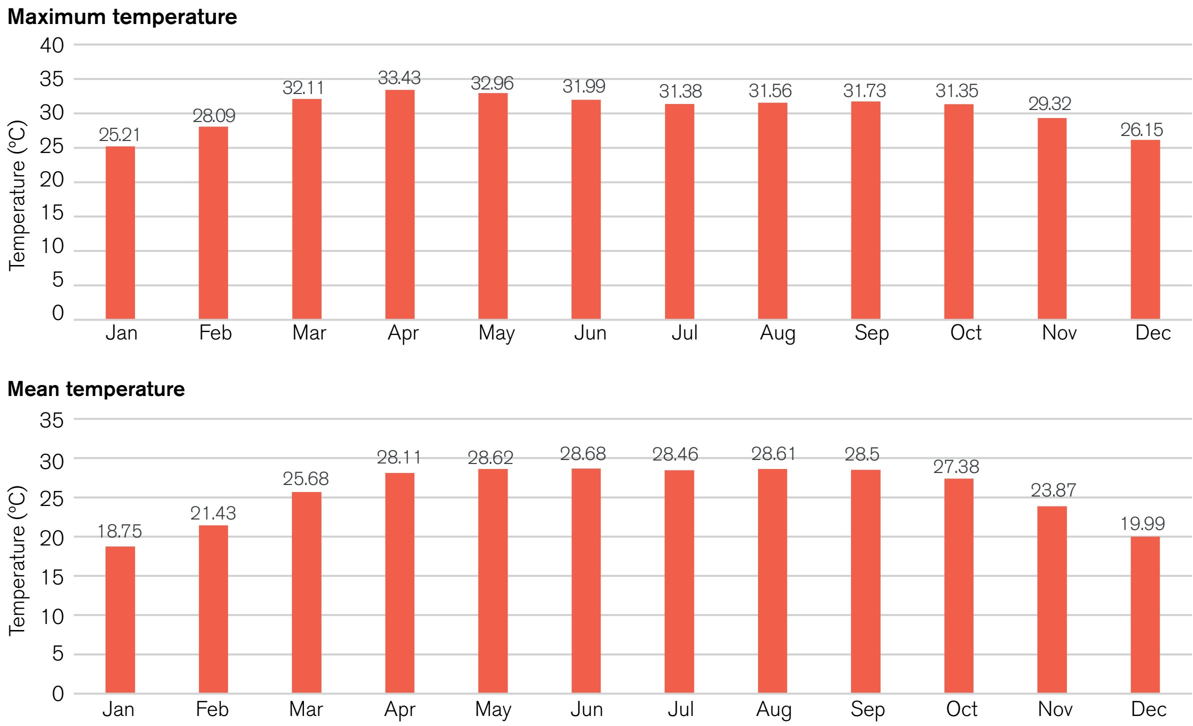
The annual temperature averages conceal a strong seasonal pattern, and it is the distribution of heat across the year, rather than the annual mean, that workers experience. Drawing on monthly climate normals for 1991–2020, Figure 26 presents the average monthly mean and maximum temperatures for Bangladesh.

Daytime heat builds from the start of the year and peaks before the monsoon. Average maximum temperatures rise from 25.21°C in January to 32.11°C in March and 33.43°C in April, the hottest month, before easing to 32.96°C in May and 31.99°C in June as the monsoon sets in. These are long-term averages, and the daily maximums during heatwaves run considerably higher, as experienced in the April 2024 heatwave. Average maximum temperatures stay above 31°C from March to October, so heat exposure extends across much of the year and is not confined to a short hot season.

Mean monthly temperatures follow a similar pattern, peaking at 28.68°C in June and holding between 28 and 29°C from April to September. The monsoon lowers daytime maximums but brings heavy rain and high humidity, which keep the felt heat high. Even when daytime temperatures fall, the warm nights give little relief. For workers in Dhaka, humidity is a large part of what makes the heat hard to bear.

This seasonal pattern is important for the rest of the analysis. April to June, when daytime heat is most intense, coincide with the months when respondents face the most frequent food shortages (see Section 2.2.6). The hot season also extends across several months, which means the heat exposure documented in this report reflects sustained rather than episodic exposure.

Figure 26. Average monthly maximum and monthly mean temperatures, 1991–2020



2.3.3 How workers perceive the change

The temperature record in Section 2.3.2 describes the change from a meteorological perspective. We also asked workers how summer heat has changed over their working lives, both to set their lived experience against the temperature record and because, in a participatory approach, the perceptions of those affected are evidence in their own right. Workers' responses closely matched the trends in the climate data, including its year-to-year variability.

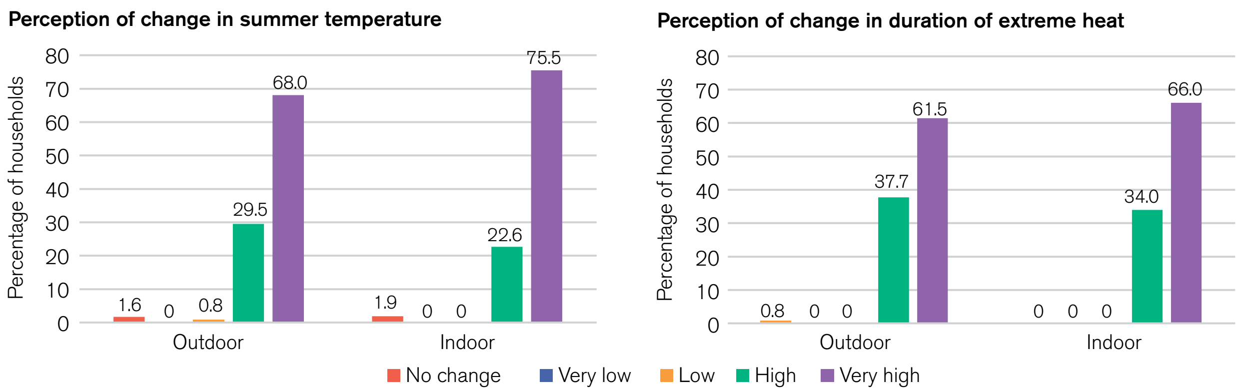
Asked how summer temperatures had changed in recent years, almost all workers said they had risen. Among outdoor workers, 68.0% rated the increase as very high and 29.5% as high, so 97.5% perceived a rise. Among indoor workers, 75.5% rated it very high and 22.6% high, a combined 98.1% (see Figure 27). Fewer than 2% of either group reported no change. One worker captured both the rise and its unevenness:

"If I consider the last ten years, the temperature has increased a lot. It goes up and down, rising one year, falling the next." Participant in FGD with construction workers, Dhaka

Workers also saw extreme heat lasting longer than before. Asked whether the number of extremely hot days has changed, 99.2% of outdoor workers and all indoor workers reported that periods of extreme heat have lengthened, with 61.5% of outdoor and 66.0% of indoor workers rating the increase as very high (see Figure 27). This matches the longer and more sustained hot season evident in the climate data.

Two findings stand out. First, workers' lived experience aligns closely with the meteorological record, including the sense that warming has been real but uneven from year to year. Second, indoor workers perceive the changes slightly more strongly than outdoor workers.

Figure 27. Workers' perception of change in summer temperature and duration of extreme heat days compared to previous years, by work setting



2.3.4 Heat as a driver of migration

Heat and climate change shape workers' lives in the city, but for many, climate stress also played a part in their decision to migrate in the first place. We asked workers to rank the reasons for their migration and combined the responses into an index, where higher scores indicate greater importance. Climate-related factors emerged as the most important drivers.

For both groups, the two highest-ranked reasons were tied to climate shocks in their places of origin (see Figure 28). Outdoor workers gave the highest score to a lack of adequate employment caused by drought, floods and cyclones (9.2), followed by agriculture no longer supporting the family after those same events (8.7), inadequate benefits from government schemes (8.4), a more general lack of employment (7.9) and the absence of agricultural land or other income-earning assets (7.6). Indoor workers reported a similar order, with the two climate-related reasons at the top (9 and 8.8).

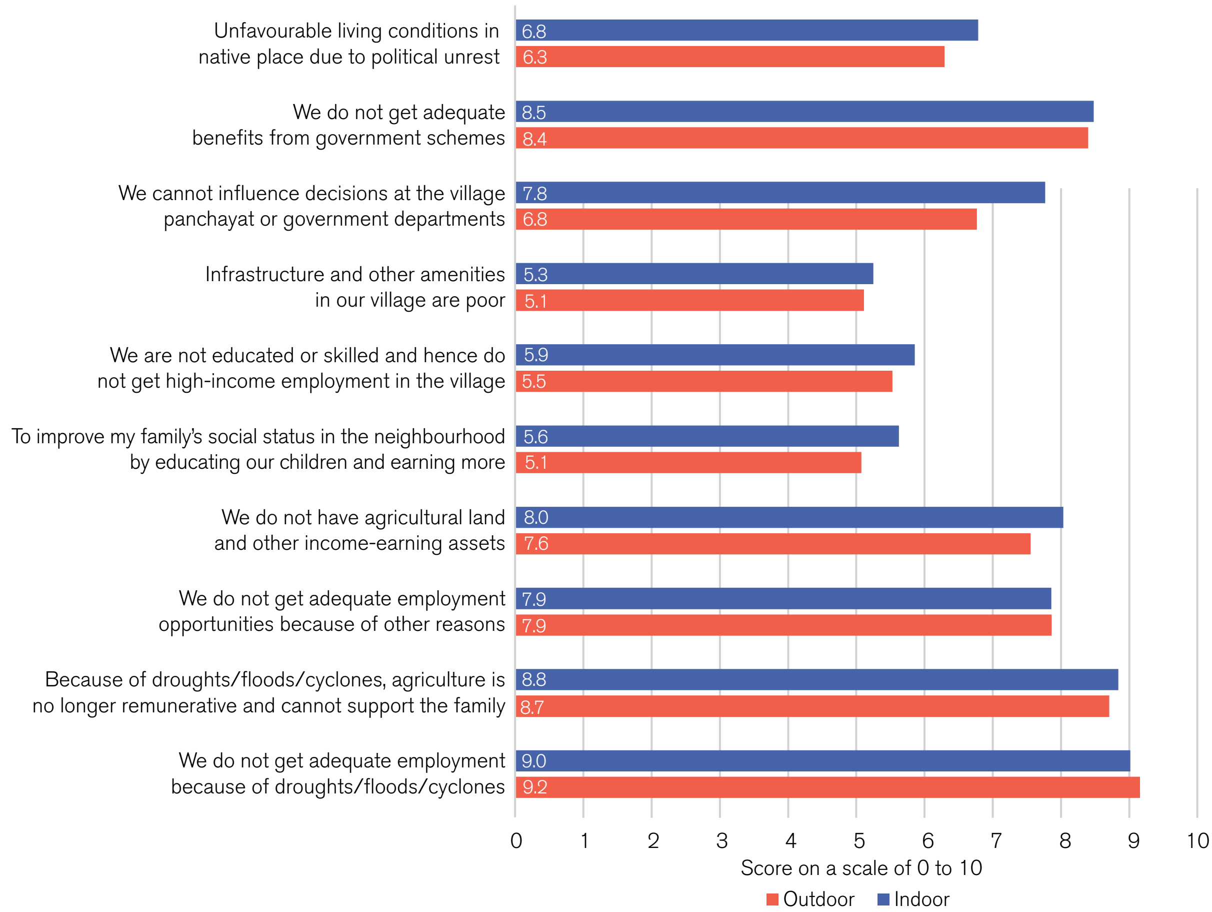
This pattern suggests that many workers have been pushed out of their rural livelihoods by climate and weather shocks that made farming and local employment unreliable. This is consistent with the rise in migration in recent years. The shocks workers named were specific to Bangladesh's coastal and riverine geography, from salinity and flooding to repeated cyclones and drought.

"I am a migrant. I came from Satkhira because our farmland was damaged by salinity and floods."
Participant in FGD with rickshaw pullers, Dhaka

Others described leaving Khulna and Bagerhat after cyclones destroyed their homes and crops, and Barisal after drought and floods made farming impossible. Although many enter informal occupations that expose them to extreme heat when they arrive in Dhaka, their vulnerability did not begin in the city. Urban heat exposure is merely part of a longer chain of climate-related pressures acting on their livelihoods and wellbeing.

This has implications for policy. Responses that focus only on urban workplace conditions overlook the role climate stress has already played in shaping migration and vulnerability. For many workers, heat-related loss and damage began before they reached the city, and effective responses need to recognise this wider trajectory.

Figure 28. Reasons for migration, by work setting



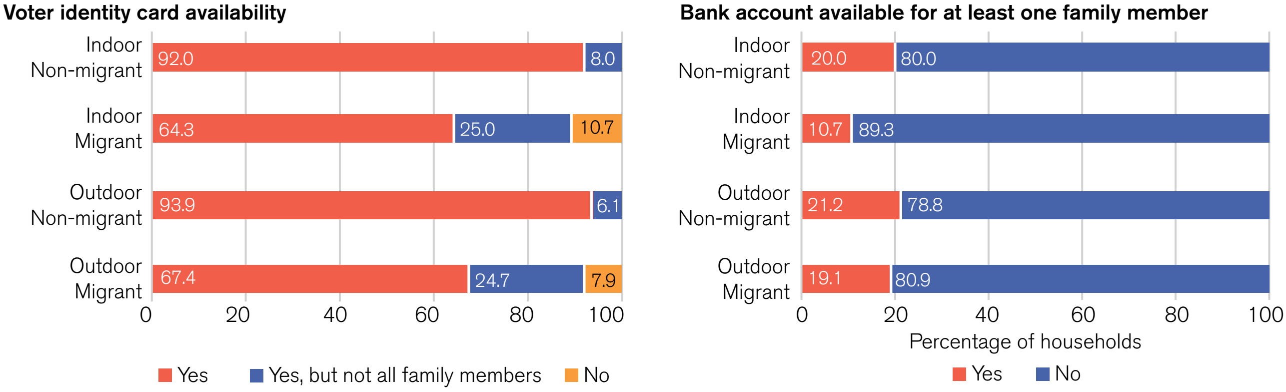
2.4 Protective factors: the social protection safety net and its gaps

The third element of the 3P framework is protection: the support that should reduce the losses and damages caused by heat exposure. Bangladesh has a substantial social protection system, set out in its National Social Security Strategy and delivered through food assistance, allowances and health programmes. In principle, these should help workers manage the income, health and food security effects of extreme heat. In practice, we found large gaps in coverage, particularly for migrants and urban informal workers.

2.4.1 Identity and financial inclusion

To access most social protection programmes, workers need proof of identity and a means of receiving benefits. The NID card, issued by the Bangladesh Election Commission, is the foundational identity document and gateway to public and financial services (Bangladesh Election Commission, no date). Benefits are paid into bank or, increasingly, mobile financial service accounts. We examined household coverage of the NID card and bank accounts, by work setting and migration status (see Figure 29).

Figure 29. Identity documents and financial inclusion, by work setting and migration status



Full household NID coverage is markedly lower among migrants. Among non-migrants, more than 90% of outdoor and indoor worker households hold NID cards for all family members, against 64.3–67.4% of migrant households. Around a quarter of migrant households hold cards for only some members (24.7% outdoor workers, 25.0% indoor workers), while in 7.9% of migrant outdoor and 10.7% of migrant indoor worker households, no family members have a NID card. There are no non-migrant households where no family member has a NID card. This reflects the NID's link to voter registration and permanent address, which means many migrants are registered in their home districts rather than Dhaka.

Formal bank account ownership is low across all groups. At least one family member holds a bank account in only 19.1% of migrant outdoor, 21.2% of non-migrant outdoor, 10.7% of migrant indoor and 20.0% of non-migrant indoor worker households. Unlike NID coverage, this is not primarily a migrant gap. It reflects the wider picture in Bangladesh, where financial inclusion has been driven mainly by mobile financial services such as bKash and Nagad rather than traditional bank accounts, and where government transfers increasingly use these mobile channels (World Bank, 2022). The survey recorded formal bank accounts rather than mobile accounts, so it understates workers' financial access, but it does show that few hold the bank accounts that some schemes require.

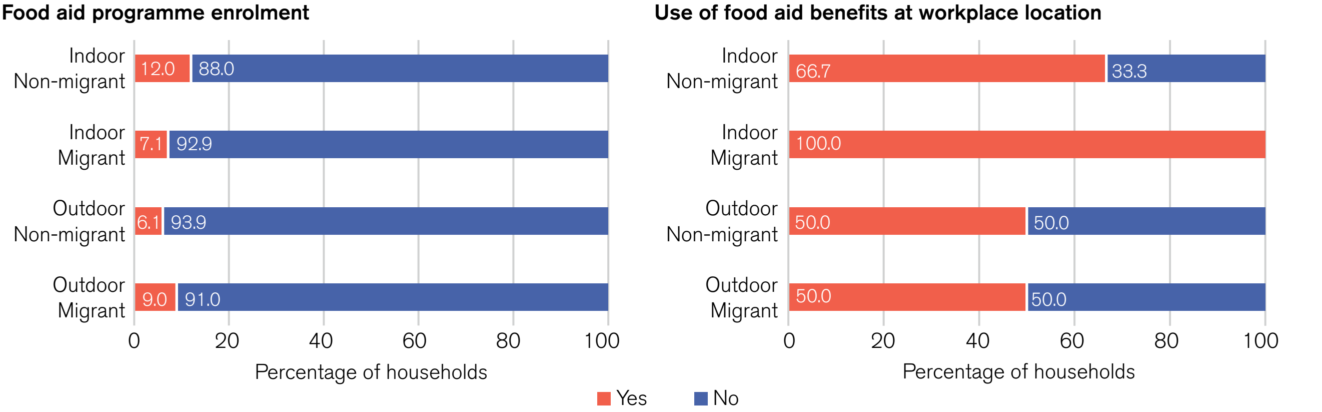
These findings show two things. NID coverage — the gateway to entitlements — is weakest among the migrants who make up most of the workforce, and who often remain registered at their place of origin rather than where they now live and work. And while mobile financial services have widened financial access, formal bank account ownership remains low, which matters when schemes only pay into bank accounts. Documentation and a bank account are necessary conditions for protection, and for many migrants, these are not yet in place.

2.4.2 Food assistance

Bangladesh delivers food support through several programmes. The Ministry of Food runs the Food Friendly Programme, which sells subsidised rice to eligible households during set months, and the Open Market Sales programme, which offers subsidised rice and flour, mainly in urban areas. The Department of Disaster Management runs the Vulnerable Group Feeding and Vulnerable Group Development programmes, which provide food transfers to poor and disaster-affected households, and the Trading Corporation of Bangladesh sells subsidised essentials through family cards. But most of these programmes are targeted at the rural poor and ultra poor, or tied to the lean season and disasters; as such, the urban informal workforce is largely outside their design (GED, 2015).

These programmes could be an important source of support for workers facing heat-related income loss, particularly in the hottest months when food shortages are most common (see Section 2.2.6). In practice, few of the households we surveyed are enrolled in any of these programmes (see Figure 30). Only 9.0% and 6.1% of non-migrant outdoor, 7.1% of migrant indoor and 12.0% of non-migrant indoor worker households are enrolled in food aid programmes, and around 9 in 10 households in every group receive no food assistance at all.

Figure 30. Food aid enrolment and access at the workplace location, by work setting and migration status



This exclusion is common to both work settings, and workers linked this exclusion both to the way the schemes are targeted and to their migration status. One described trying (and paying) to get support, with no result:

"The government provides subsidised food items through the TCB [Trading Corporation of Bangladesh], like rice and lentils, but I don't receive any social protection like that. My mother went to two or three chairmen and submitted papers along with my photo and voter ID, but we have received nothing yet. It costs 4,000 taka to get that support." Participant in FGD with construction workers, Dhaka

Others explained that the schemes reach their home villages rather than the city, and that migrants registered in their home districts cannot claim support in Dhaka. Food assistance is therefore largely absent for this workforce, in the months when heat and food insecurity are greatest. But rather than the portability gap seen in other settings, the problem here is near total non-enrolment in a system that is built around rural poverty and disaster relief, not the urban informal poor.

2.4.3 Health protection

From treatment for dehydration and heatstroke to the longer-term care associated with kidney disease, heat-related illness generates recurring healthcare costs. How far workers are shielded from these costs depends on the health financing system they can access.

Bangladesh has no national health protection scheme for informal workers. The only government health protection scheme, Shasthyo Shurokhsha Karmasuchi (SSK) — a pilot for people living below the poverty line in selected sub-districts, covering inpatient care at designated government hospitals — does not extend to the urban informal workforce (MOHFW, 2023). Health financing is dominated by out-of-pocket payments, which make up around 68.5% of total health expenditure (among the highest shares in the region) and push millions of people into poverty each year (MOHFW, 2023). For informal workers, the cost of illness falls almost entirely on the household.

Our survey did not record health cover enrolment for the Dhaka sample because there is no scheme for them to enrol in. Our health and cost findings (see Section 3.5 and Chapter 4), together with workers' accounts, show what this unprotected exposure means in practice. Workers described paying for treatment out of pocket, self-medicating to avoid costs and borrowing to cover medical bills.

"On one occasion, I earned 500 taka for the day, but because I became ill, my medical expenses ended up being 5,000 taka — ten times more than what I earned. It forces me to borrow money at high interest rates just to cover medical bills." Participant in FGD with rickshaw pullers, Dhaka

Others said they avoid the doctor because it is too costly and rely instead on over-the-counter medicine and home remedies, with medical spending rising in summer. With no health cover to fall back on, heat-related illness becomes a direct and sometimes catastrophic cost for these households, while also reducing their capacity to earn.

2.4.4 Gaps in the safety net

Across the three elements examined here, the safety net reaches few informal workers. NID coverage is weakest among the migrants who make up most of the workforce and often remain registered in their home districts. Food assistance is almost entirely absent, with around 9 in 10 households enrolled in no programme. And there is no health cover to meet the cost of heat-related illness, which instead falls on the household. The common thread between these is that Bangladesh's social protection system is built around rural poverty and disaster relief, and was not designed to reach the urban informal workforce. A government official described the gap directly:

"We do not have any specific programmes in urban areas like Dhaka designed to address the challenges faced by informal workers such as rickshaw pullers, construction labourers or daily wage workers. There is no targeted scheme or intervention that caters specifically to these urban informal workers." KII with a Department of Disaster Management official, Dhaka

This absence is important for the analysis that follows. With little protection to draw on, the economic and non-economic losses that heat imposes, set out in chapters 3 and 4, are borne almost entirely by workers and their households.

3

Exposure, health and lived experience of working in the heat

In Bangladesh, informal workers make up a large majority (84.9%) of the workforce and typically lack written contracts, social security and the protections of formal employment (BBS, 2023). This pattern is not unique to Bangladesh. Informal employment accounts for around 60% of workers globally and close to 90% in low-income countries (ILO, 2023). These workers are concentrated in some of the most physically demanding and least-protected occupations, many of them highly exposed to extreme heat.

This chapter examines the consequences of that exposure. Some impacts — such as heat cramp, exhaustion, heatstroke and lost work during the summer — are immediate. Others, such as kidney damage (see Section 3.6), accumulate over years and can become permanent. We begin by examining work conditions, heat exposure and workplace facilities, before analysing coping strategies workers rely on in their absence. We then assess the resulting health impacts, psychological and other non-economic effects, and use regression analysis to identify the factors most strongly associated with heat-related illness.

3.1 Work conditions and heat exposure in the workplace

Before examining the health impacts of heat, we first consider the conditions that shape exposure. The two factors that matter most are job security, which influences whether workers feel able to protect themselves from heat, and the extent of heat exposure during the working day.

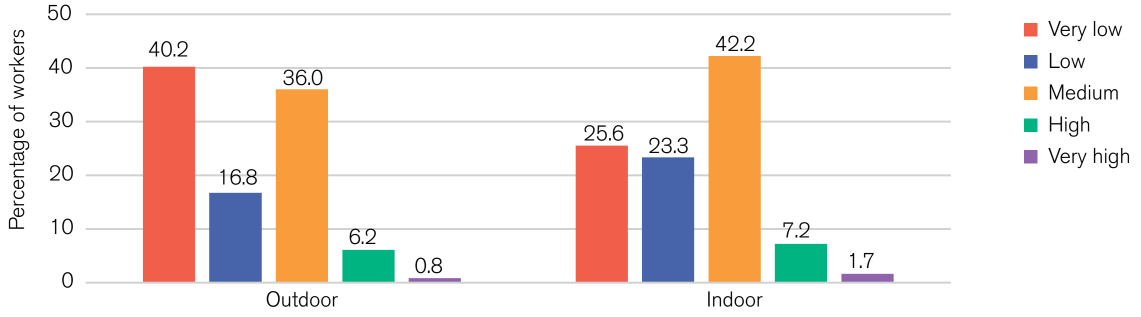
3.1.1 Employment type and job security

Job insecurity is itself a heat risk. Workers who cannot rely on continued employment or income are rarely able to stop, slow down or take time off when heat becomes dangerous. We examined how workers obtain employment and how secure they feel in it.

Employment terms differ sharply between the two groups. Among outdoor workers, 47.5% hold a contract that covers a full month, but 39.3% search for work on a daily basis and a further 10.7% are contracted for only part of a month. Indoor workers are far more settled, with 98.1% holding full-month contracts, which reflects the monthly employment that garment factories provide. Insecure, day-to-day work is largely an outdoor phenomenon here.

Perceived job security follows the same pattern. Among indoor workers, only 11.3% rated their security as low or very low, while 43.4% rated it as high or very high. Among outdoor workers, 35.3% said they feel insecure and 36.9% said they feel secure, with the rest in between (see Figure 31). Unlike the housing and health findings in this report, indoor workers are better placed on job security than outdoor workers.

Figure 31. Perceived job security, by work setting



This difference is important for how each group experiences heat, but it does not shield either from it. Outdoor day labourers lose the day's income if they stop work in extreme heat, so they rarely do. Indoor garment workers hold steadier jobs, but that steadiness comes with fixed production targets and little room to slow down when the factory overheats. Both groups therefore tend to work through dangerous heat, for different reasons, a point that runs through the coping strategies in Section 3.3 and the health outcomes in Sections 3.5–3.7.

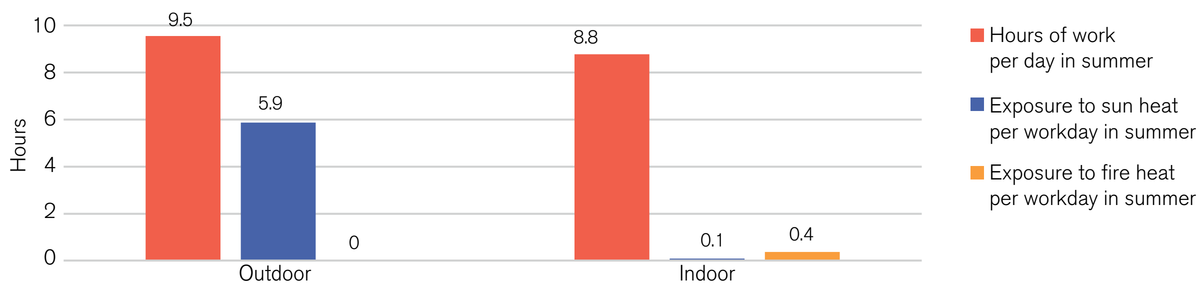
3.1.2 Hours of heat exposure

The working day is long for both groups. Outdoor workers reported an average of 9.6 hours a day in the hot season, and indoor workers, 8.8 hours (see Figure 32). What differs is the route by which heat reaches them. Outdoor construction workers and rickshaw pullers are exposed to direct sun for an average of 5.9 hours a day, with almost no exposure to radiant heat from fire or hot surfaces. Indoor workers reported very little of either, averaging 0.1 hours of direct sun and 0.4 hours of radiant heat from machinery.

This does not mean indoor work is cooler. Instead, it reflects a different type of exposure. Indoor workers spend long hours in enclosed, poorly ventilated units where heat builds up through the day. This is consistent with the high perceived indoor heat reported in Section 2.2.4.2 and the health outcomes in Sections 3.5–3.7, which show that indoor workers experience heat-related illness at rates close to those of outdoor workers. Measures based only on direct sun and radiant heat therefore hugely understate the heat burden on indoor workers.

Heat can also take paid time from workers before they reach the workplace, if they have to collect scarce water (see Section 2.2.5). In the hot season, 5.6% of outdoor and 3.6% of indoor workers reported missing work for this reason. The share is lower than in settings with poorer water access, consistent with the relatively good year-round water availability found in Dhaka. Both groups work long and heat-intensive days and then return to homes that offer little opportunity to recover (see Section 2.2.4).

Figure 32. Daily work hours and heat exposure at work in summer months, by work setting



3.2 Workplace facilities and adaptable work practices

If the work itself is hot and insecure, making facilities — such as rest areas, water, shade and medical cover — available at the workplace and adopting practices that adapt to extreme heat can help workers tolerate the conditions.

Some of these protections are set out in labour law. The Bangladesh Labour Act 2006, amended in 2013 and 2018, and the Bangladesh Labour Rules 2015 require employers to provide wholesome drinking water, adequate ventilation, a tolerable workroom temperature, rest areas where there are more than 50 workers, first aid provision and cool drinking water in hot weather in larger factories (Government of Bangladesh, 2006, 2015). These provisions have two limitations for the workers in this study. First, several apply only to establishments above set worker count thresholds, so small units, and outdoor and informal workplaces, are not covered. Second, none of the statutes set a temperature threshold at which higher heat would trigger additional protection or a pause in work.

Within these limits, some employer-side measures are mandatory, but we found most of them were missing. This section considers rest, water, electrolytes and shade; medical provision; protective work practices; and sanitation; before drawing our findings together in a workplace facilities index.

3.2.1 Rest, water, electrolytes and shade

The simplest measures for preventing heat-related illness are regular rest, cool drinking water, electrolyte replacement and a shaded place to recover. We found gaps in all four, though the pattern differs between the two groups.

Multiple rest breaks are more common in Dhaka than the single daily break reported in other settings, but the number of breaks does not increase as temperatures rise. Outdoor workers take an average of 2.9 breaks a day in summer, compared to 2.7 in cooler months. Indoor workers take fewer breaks — on average, 1.6 a day — and 56.6% take only one break (see Figure 33). The lower figure for indoor workers reflects production line work in the garment units, where fixed targets leave little room to stop. The number of rest breaks does not increase for either group when the need for recovery is greatest.

Availability of cool drinking water is uneven, and least reliable for outdoor workers. Only 27.0% of outdoor workers always have cool water at work, while 15.6% never do and a further 13.9% have it only rarely, so around 3 in 10 lack a dependable supply. Indoor workers are much better served: 62.3% always have cool water and none reported that they never do (see Figure 34).

Electrolyte replacement is patchy for both groups. Around a quarter of outdoor (26.2%) and indoor workers (24.5%) reported that electrolytes are never available at work, and only 16.4% of outdoor and 26.4% of indoor workers can access them throughout the extreme heat period. This is better provision than in some settings, but it still leaves a cheap and effective measure against dehydration out of reach for many.

Shaded rest is where there is the highest gap. Because they work indoors, 75.5% of indoor workers always have a shaded place to rest, and none lack one. For outdoor workers, shade is far less certain: only 11.5% always have it, while 13.9% never do and 19.7% have it only rarely, so one-third of these workers lack reliable access (see Figure 34). The same gap appears in access to a mobile cooling shelter, available at all times to 60.4% of indoor workers but to only 0.8% of outdoor workers, more than half of whom (53.3%) never have one.

Figure 33. Number of work breaks per day, by work setting

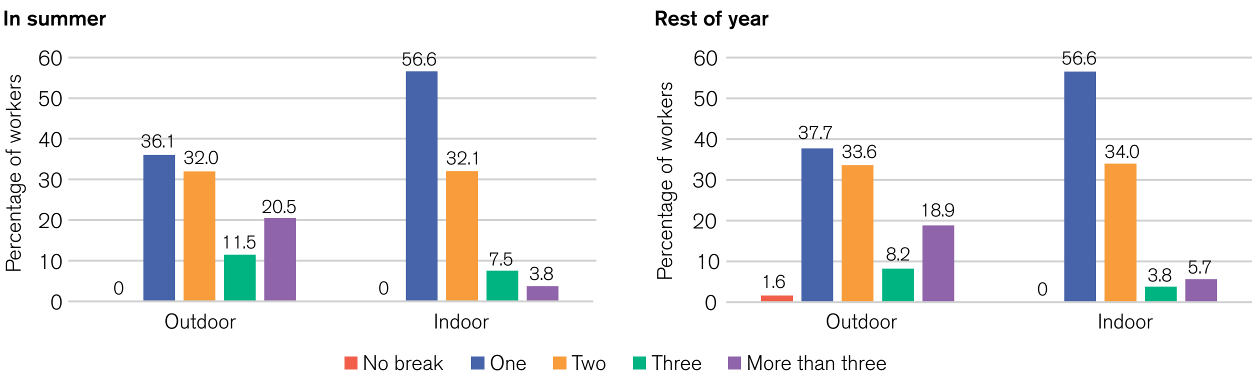
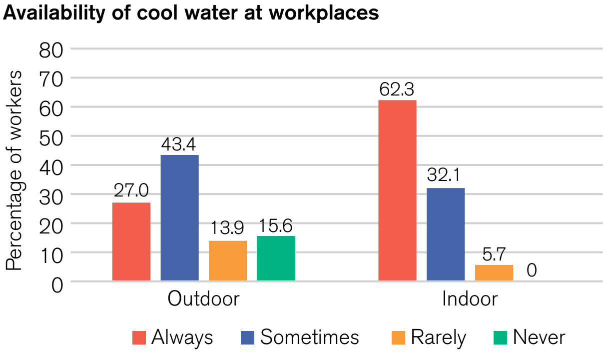
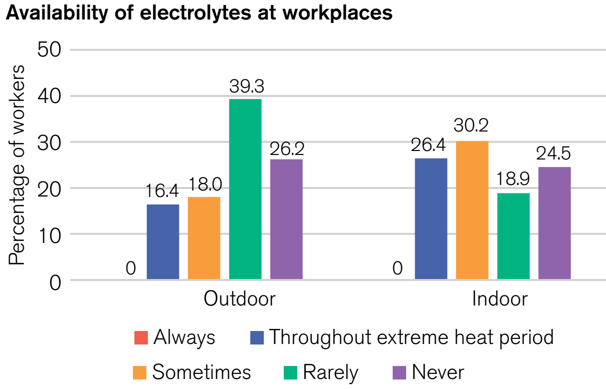
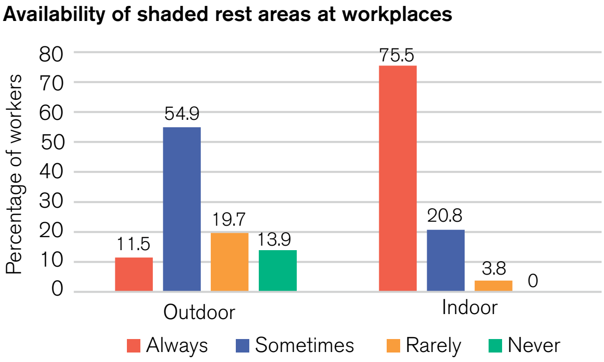


Figure 34. Availability of cool water, electrolytes and shaded rest at work, by work setting







Across the four measures, the gaps fall unevenly. Indoor workers are better served on water and shade, since they work under a roof, but get fewer breaks under production pressure. Outdoor workers move more freely and rest more often, but face the least reliable water, shade and electrolyte provision. For both groups, the basic protections that would blunt heat exposure are only partly in place.

"Daily wage workers understand that when they feel sick, they might need to rest or perhaps buy a saline packet from the pharmacy. But the idea that they must drink more fluids and take breaks during the day, especially when they are working under direct sun — that doesn't come naturally to them. This isn't only a matter of awareness. It is also a matter of accessibility." Dr Sakina Sab Afroz, associate professor of paediatrics at Shaheed Suhrawardy Medical College, Dhaka

3.2.2 Medical provision

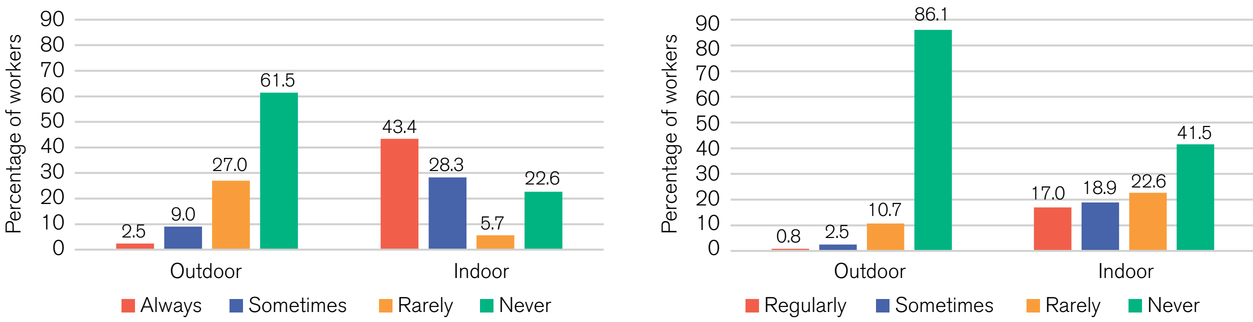
When heat-related illness occurs, access to medical support is vital. Two forms of provision matter most: workplace first aid, which can respond to heat cramp, exhaustion or heatstroke on site, and periodic medical check-up camps, which can catch dehydration and other problems before they become severe. We examined both and found them largely absent for outdoor workers and uneven for indoor workers (see Figure 35).

Heatstroke is a medical emergency in which rapid treatment is critical. But most outdoor workers have no immediate source of help, as first aid is scarce at outdoor workplaces. Only 2.5% of outdoor workers always have a first aid clinic at work, while 61.5% never do. Indoor workers are far better served: 43.4% always have access and 22.6% never do (see Figure 35). This reflects that factories are required to have first aid provision, whereas building sites and rickshaw stands do not.

There is a similar divide for preventive medical camps, but they are rarer for both groups. Among outdoor workers, 86.1% reported that check-up camps are never organised at their workplace and only 0.8% have them regularly. Although indoor workers fare better, 41.5% reported that these are never organised and only 17.0% reported having regular camps at work (see Figure 35). Opportunities to identify dehydration, early kidney stress and other heat-related problems before they become serious are very limited and almost non-existent for outdoor workers.

Figure 35. Medical provision at work, by work setting

Availability of first aid clinics at workplaces | **Medical checkup camps organised at workplaces**



The scale of untreated heat illness in the factories is visible even to those who work with the sector:

"Every year when the heat is intense, you often see news reporting that many workers fainted on the factory floor, sometimes 300, sometimes 500 workers falling ill and needing hospitalisation. Such incidents happen frequently." KII with a nongovernmental organisation representative, Dhaka

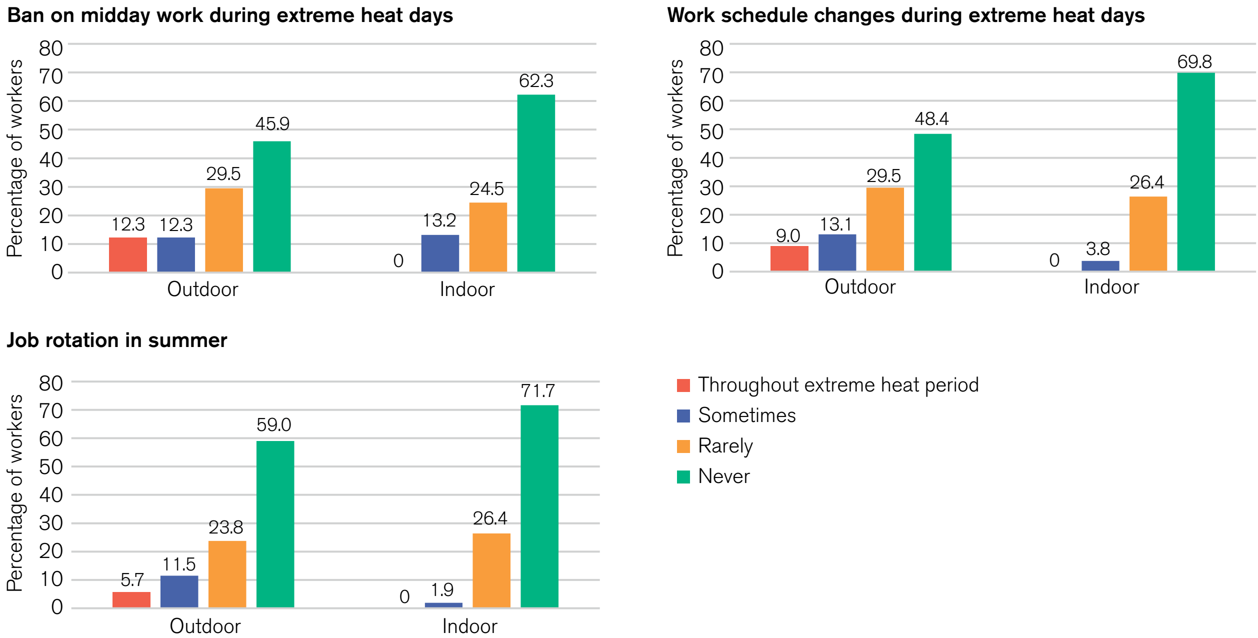
Medical support is largely absent at the point where heat exposure occurs. Indoor workers are better served than outdoor workers, in line with the buyer-driven provision discussed in Section 3.2.5. But for both groups, immediate treatment and preventive monitoring are limited, and heat-related illness on the scale reported here goes largely untreated at the workplace.

"Most workers don't take any precautions, and they don't come for medical advice — not until they faint or collapse from dehydration or heat stroke." Dr Sakina Sab Afroz, associate professor of paediatrics at Shaheed Suhrawardy Medical College, Dhaka

3.2.3 Protective work practices

Beyond facilities, employers can organise the work itself to reduce heat exposure. Three measures matter most: stopping work during the hottest part of the day, shifting work to cooler hours and rotating workers between hotter and cooler tasks. Examining how often each is used during extreme heat, we found that work routines change little as temperatures rise (see Figure 36).

Figure 36. Heat-protective work practices at work, by work setting



The most basic measure — suspending work during the hottest midday hours — is applied inconsistently. Among outdoor workers, 45.9% reported that midday work bans are never used and 12.3% said they apply throughout the hot season. Among indoor workers, 62.3% reported that they are never used and no workers reported that they apply throughout the hot season.

This reflects the regulatory framework. The Bangladesh Meteorological Department issues heat alerts during heatwaves, but these are simply advisories and neither the alerts nor labour legislation set a temperature threshold at which work must stop or additional protections apply (Government of Bangladesh, 2006).

The other two measures are similarly uncommon. Work schedules are never adjusted in extreme heat for 48.4% of outdoor and 69.8% of indoor workers, and job rotation is never used for 59.0% and 71.7%, respectively. Only a fraction of outdoor workers, and no indoor workers, reported that these measures are applied throughout the hot season (see Figure 36).

On all three measures, indoor workplaces adapt less than outdoor ones, reflecting garment production systems that run to fixed targets regardless of temperature. Outdoor workers, being self-paced, can stop or shift work more often, but forgo income on doing so. Where outdoor workers stop at midday, it is usually their own decision, and rickshaw pullers in particular often lose two hours or more of earnings in the afternoon. Neither arrangement protects workers: outdoor workers pay for adaptation with lost wages, while indoor workers endure.

"We try not to miss work because losing a day means losing wages. Many of us force ourselves to keep working despite the heat, but our productivity goes down and sometimes we cannot continue for the whole day. Some workers faint inside the factory and need rest." Participant in FGD with garment workers, Dhaka

The findings suggest that work organisation changes little during extreme heat. Most workers manage exposure through endurance rather than adaptation.

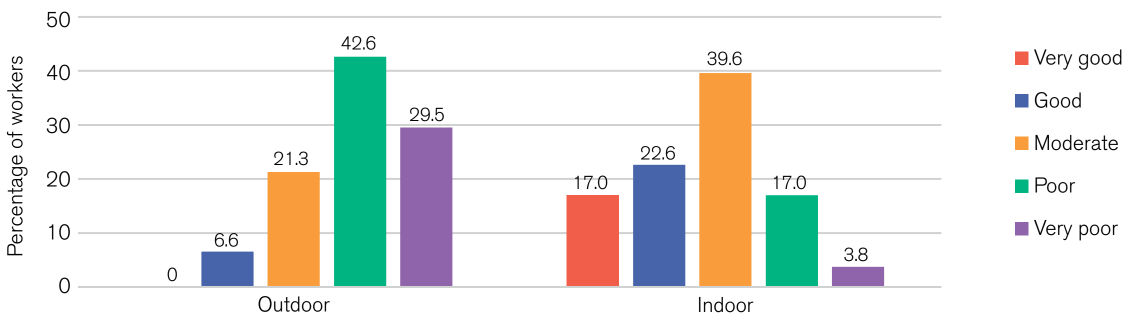
3.2.4 Workplace sanitation

Sanitation at work is as much a heat issue as a matter of dignity, because the quality of toilet facilities affects how much water workers are willing to drink during the day. We asked workers to rate the toilets available at their workplace (see Figure 37).

For outdoor workers, sanitation is poor. Almost three quarters (72.1%) rated toilet facilities as poor (42.6%) or very poor (29.5%), only 6.6% rated them good, and none rated them very good. Indoor workers are much better served, with 39.6% rating facilities as good or very good, a further 39.6% as moderate, and 20.8% rated them poor or very poor (see Figure 37). As with first aid and cool water, the better provision in garment factories reflects legal requirements around facilities, which building sites and the roadside do not have.

The implications reach beyond hygiene. When toilets are dirty or unusable, or lack privacy, workers often cut their water intake to avoid using them, which raises the risk of dehydration in extreme heat. Women are particularly affected, because inadequate sanitation provision increases concerns about privacy and safety. As Section 3.3 discusses, restricting fluid intake is one of the coping strategies workers adopt in response to poor workplace sanitation provision, which has direct consequences for heat-related health.

Figure 37. Quality of toilet facilities at work, by work setting



3.2.5 The workplace facilities index

To bring together the facilities and work practices that help workers cope with heat, we constructed a workplace facilities index. The index combines the availability of work breaks, cool drinking water, electrolytes, shaded rest, first aid and medical camps with the use of midday work bans, schedule changes and job rotation during the hot season. Following the C-CIQ approach, it is scaled from 0 to 10, with higher scores indicating better protection at work.

Outdoor workers scored 3.1 on the index and indoor workers, 5.0 (see Figure 38). Both are low, showing that the facilities and practices needed to reduce heat exposure are only partly in place for either group. Indoor workers scored higher, reflecting their better access to cool water, shaded rest, first aid and sanitation, though that advantage is tempered by the lower likelihood of garment factories adapting to extreme heat through midday work bans, schedule changes and job rotation.

The relative advantage of indoor workers has a specific cause. Bangladesh's garment sector, which accounts for more than 80% of the country's exports and employs around 4 million workers, is closely tied to global buyers. After the Rana Plaza building collapse in April 2013, which killed more than 1,100 garment workers, brands and retailers signed the Accord on Fire and Building Safety in Bangladesh, a legally binding agreement to fund independent factory inspections and remediation, later carried forward as the International Accord and the RMG (Ready-made Garment) Sustainability Council (International Accord, 2021). Buyer codes of conduct and social audits also require suppliers to provide basic welfare facilities such as drinking water, ventilation and first aid. This external accountability helps explain why garment workers are better served on water, shade, first aid and sanitation than outdoor workers.

But that accountability has clear limits. Although the accord and the schemes that followed addressed fire, electrical and structural safety, they did not address heat stress. Coverage is also uneven, and many subcontracting units and smaller factories are outside of its remit. The same buyer relationship also works against workers in other ways: the downward pressure brands place on prices pushes factories to hold down wages and rely on day wage and contract labour with fewer benefits (Kashyap, 2023).

Our data show these limitations directly. Despite having more reliable water and shade, garment workers take fewer rest breaks than outdoor workers (on average, 1.6 a day, compared to 2.9 during summer months) because production targets leave little room for them to stop, and around a quarter never have electrolytes at work. Their homes give them no more respite from heat than outdoor workers' homes do (see Section 2.2.4) and they suffer substantial heat-related illness despite working under a roof (see Sections 3.5–3.7). So, while brand pressure has improved building safety and some other basic provisions, it has not made the garment workplace any cooler.

Outdoor workers sit entirely outside of this system. Construction and rickshaw work answer to no global buyer, face neither a code of conduct nor an audit system, and have no mechanism for improving conditions. This is apparent in their consistently poorer access to water, shade, first aid and sanitation, and is why they have the widest protection gap. For both groups, the overall picture is one of limited protection, with workers left to manage heat exposure largely on their own.

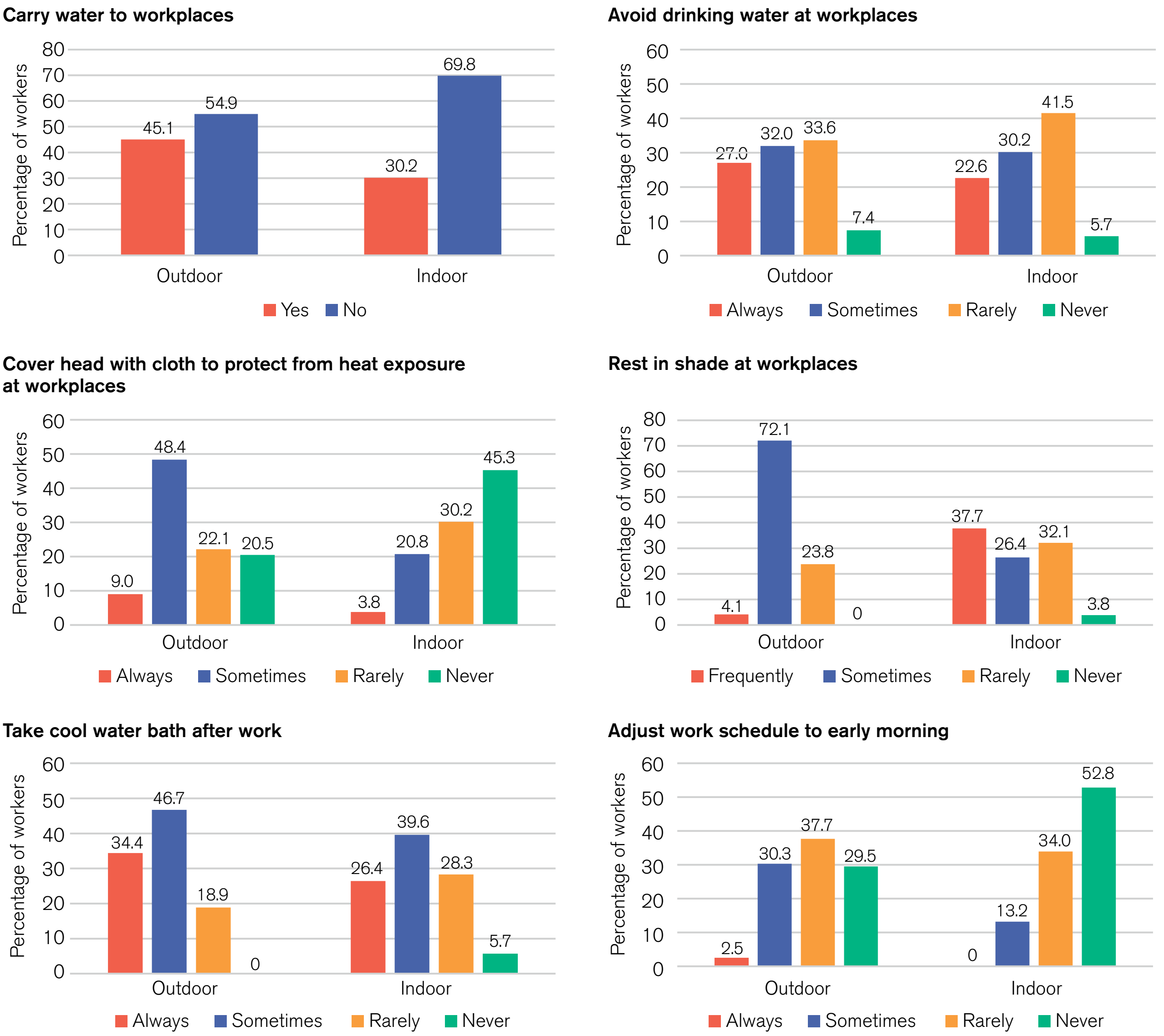
Figure 38. Workplace facilities index, by work setting

Note: The workplace facilities index is a composite of variables, namely number of breaks, availability of cool water, electrolytes, shaded rest areas and first aid clinics, conduct of health camps, practice of work ban during extreme heat days, job rotation and work schedule changes during summer days. It ranges from 0 to 10, with higher scores meaning better workplace facilities.

3.3 Workplace coping strategies

We asked workers what they do to cope with heat exposure. The findings show that coping is largely an individual matter rather than something the workplace supports, and that workers often have limited control over the actions that would protect them most (see Figure 39).

Figure 39. Coping strategies adopted by workers, by work setting



Only 45.1% of outdoor and 30.2% of indoor workers carry water to work, leaving most dependent on the often unreliable supply there. Many also limit how much they drink. Around 4 in 10 outdoor workers (41.0%) and just under half of all indoor workers (47.2%) avoid drinking water at work at least sometimes. For outdoor workers, this is closely tied to the poor sanitation described in Section 3.2.4. For indoor workers, whose toilets are better, it more likely reflects the limited toilet breaks allowed on production lines. In both cases, restricting water raises the risk of dehydration.

Where the work allows, workers use sun protection and shade. Among outdoor workers, 57.4% cover their head against the sun at least sometimes, and 76.2% rest in the shade at least sometimes, with none reporting that they never do. Indoor workers, who are sheltered from direct sun, are less reliant on these measures. The fact that outdoor workers rest in shade so readily reflects the self-paced nature of construction and rickshaw work, which allows them to pause when they can, unlike the production line.

"I only have a small fan, but it is not enough to deal with the extreme heat during summer. We just try to drink plenty of water and stay in shaded corners." Participant in FGD with construction workers, Dhaka

After work, most workers try to cool down. Cool baths are common, taken at least sometimes by 81.1% of outdoor and 66.0% of indoor workers, though some cannot because water is scarce at home. Adjusting working hours to avoid the worst heat is harder. Among indoor workers, 52.8% never adjust their schedule, compared with 29.5% of outdoor workers, because factory schedules are fixed to production targets. Indoor workers have the least flexibility to shift their work.

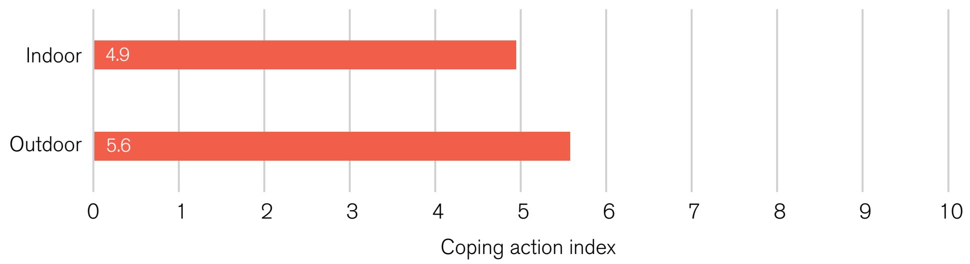
"Even though informal workers don't always get this opportunity, the reality is that if they drink enough fluids throughout the day — coconut water, fruit juices, and rice starch (ie, the water left after straining cooked rice) that help prevent dehydration — and take breaks while working directly under the sun, they can prevent the worst effects of extreme heat."

Dr Sakina Sab Afroz, associate professor of paediatrics at Shaheed Suhrawardy Medical College, Dhaka

3.3.1 Coping action index

To examine these strategies together, we constructed a coping action index, scaled from 0 to 10, with higher scores indicating more active coping. Outdoor workers scored 5.6 and indoor workers scored 4.9 (see Figure 40). A higher score here reflects more self-reliance rather than better protection, since the actions it captures — drinking water, seeking shade and bathing after work — are individual responses to inadequate provision. Outdoor workers, being self-paced, can take more of these actions, while indoor workers, who are tied to the production line, often cannot. The lower indoor score therefore runs against the assumption that indoor work is easier to manage.

Figure 40. Coping action index, by work setting



Note: The coping action index is a composite of variables, namely drinking adequate water during work, covering the head with a cloth, resting in a shaded area, taking a cool bath after work and adjusting work schedules to early morning. It ranges from 0 to 10, with higher scores meaning better coping action to avoid heat impacts.

3.4 Indoor workers: no better off

Indoor work is often assumed to be safer because it is sheltered from direct sun. Much occupational heat research follows this assumption, focusing on outdoor workers and treating indoor work as a lesser problem. Our findings do not support this view. Across several measures, the indoor workers in this study are no better off than outdoor workers, and on some, they are worse off.

Their heat exposure is different. Indoor workers spend their day in enclosed, poorly ventilated garment units where heat builds up through the shift but because this heat does not come mainly from direct sun or open fire, standard exposure measures miss most of it. Indoor workers recorded almost no direct sun (0.1 hours a day) and little radiant heat (0.4 hours). Yet they rated the heat inside their homes at 4.3 out of 5 — almost the same as the 4.4 reported by outdoor workers — and they perceive summers becoming hotter and longer at least as strongly.

Indoor workers do have better facilities at work, which lifts their workplace facilities index above that of outdoor workers — to 5.0, against 3.1. But this reflects the fire and building safety required by global buyers after Rana Plaza (see Section 3.2.5), rather than protection from heat. On other measures, indoor workers are worse off. Their workplaces adapt less to extreme heat and do not apply midday work bans, schedule changes or job rotation in the hot season because production runs to fixed targets. Indoor workers' coping capacity is also lower, with a coping action index score of 5.0 against 5.6 for outdoor workers, since the production line leaves them with little room to rest, seek shade or drink water.

The disadvantage extends to their homes. Indoor worker households are more likely to live under heat-absorbing tin or asbestos roofs, at 66.0% against outdoor worker households' 54.1%, and to be overcrowded, with 92.9% below the adequate space standard, against 57.3%. A worker who spends the day in a hot factory returns to a home that is, if anything, hotter and more crowded than an outdoor worker's home. Indoor worker households are also more likely to have a female head (13.2% against 1.6%) and therefore to depend on a single, and typically lower, earner.

Indoor heat goes undercounted for reasons unrelated to its severity: it is enclosed rather than open, assumed to be controlled, and overlooked by exposure measures built around sun and radiant heat. Even factory safety rules enforced by buyers are aimed at fire and collapse, not heat. As a result, heat protection strategies, which usually focus on outdoor workers, tend to exclude this large and highly exposed part of the informal workforce.

3.5 The health impact: heat cramp, heat exhaustion and heatstroke

Heat-related illness typically follows a recognised progression, from heat cramp as an early warning, through heat exhaustion at a moderate stage, to heatstroke at the severe and potentially fatal end. For each condition, we recorded the symptoms workers reported, scored its prevalence on a 0 to 10 index and classified workers against clinical criteria validated by a panel of doctors.

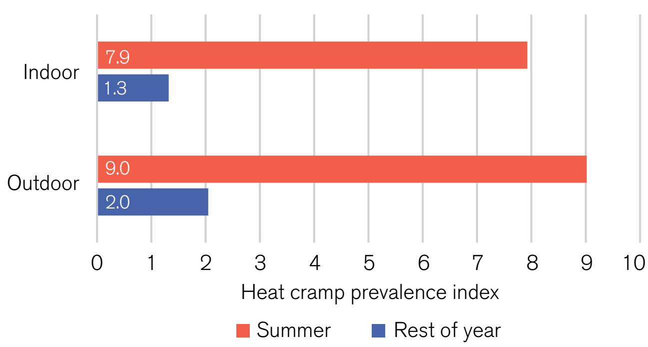
3.5.1 Heat cramp

Heat cramp is the earliest stage of heat-related illness, caused by the loss of water and salt through heavy sweating and marked by painful muscle cramps (NIOSH, 2016). On the 0 to 10 prevalence index, where higher values indicate a greater burden, heat cramp scored 9.0 among outdoor workers and 7.9 among indoor workers during the summer months (see Figure 41). Outside of summer, the index falls to 2.0 for outdoor and 1.3 for indoor workers.

The two defining symptoms are heavy sweating and muscle cramp (see Figure 42). During the hot season, 89.3% of outdoor and 77.4% of indoor workers reported heavy sweating, and 54.1% of outdoor and 39.6% of indoor workers reported muscle cramp. Both symptoms are far less common, but do not disappear, in the cooler months.

When classified against the clinical criteria, 90.2% of outdoor workers and 79.3% of indoor workers meet the threshold for heat cramp during the hot season (see Figure 43). In the cooler months, this falls to 20.5% and 13.2% respectively. For most workers, heat cramp is a routine feature, rather than an occasional symptom, of the hot season, reaching 4 in 5 indoor workers and 9 in 10 outdoor workers.

Figure 41. Heat cramp prevalence index, by work setting



Note: Heat cramp prevalence index measures the frequency and severity of heat cramps experienced by workers. It ranges on a scale from 0 to 10; a higher score indicates greater severity.

Figure 42. Prevalence of heat cramp symptoms, by work setting

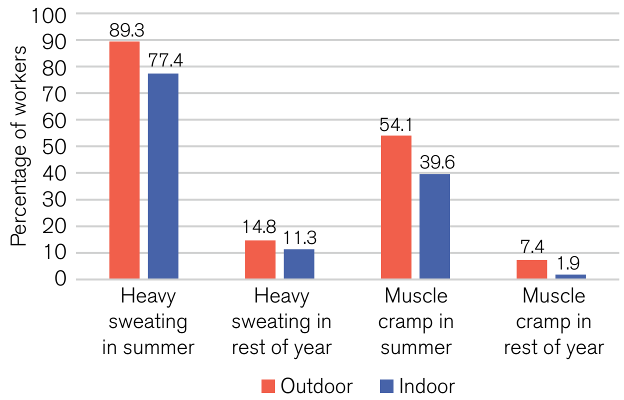
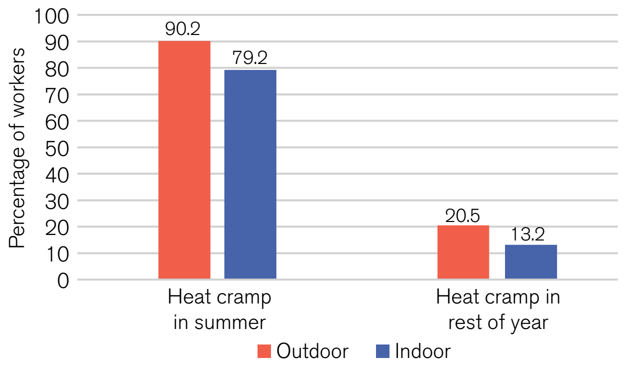


Figure 43. Heat cramp diagnosis, by work setting



3.5.2 Heat exhaustion

Heat exhaustion is the moderate stage of heat-related illness, occurring when the body loses water and salt faster than it can replace them. It presents through symptoms such as heavy sweating, weakness, headaches, dizziness, nausea and elevated body temperature (NIOSH, 2016). On the 0 to 10 prevalence index, heat exhaustion scored 6.6 among both outdoor and indoor workers during the hot season (see Figure 44). Outside summer, the index falls to 1.1 for outdoor and 0.2 for indoor workers.

Heat exhaustion presents through a wider range of symptoms than heat cramp (see Figure 45). Profuse sweating is the most common, affecting 81.1% of outdoor and 71.7% of indoor workers during the hot season. Fatigue and headaches each affect around half to two-thirds of workers in both groups, with 66.4% of outdoor and 50.9% of indoor workers reporting fatigue and 63.1% and 54.7%, respectively, reporting headaches. Outdoor workers reported somewhat higher rates of high body temperature, dizziness, nausea and diarrhoea. Most of these symptoms recede in the cooler months.

"The incidence of diarrhoea increases sharply during the summer months; and that puts a strain on our hospital, since we have to manage a surge of cases." Dr Sakina Sab Afroz, associate professor of paediatrics at Shaheed Suhrawardy Medical College, Dhaka

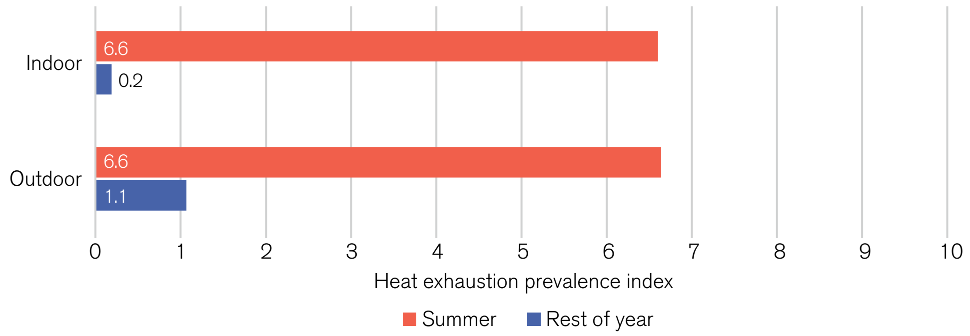
When classified against the clinical criteria, the two groups are almost indistinguishable. During the hot season, 66.4% of outdoor workers and 66.0% of indoor workers meet the threshold for heat exhaustion (see Figure 46). This is the clearest evidence in the study that indoor work offers no protection from heat. Despite being sheltered from direct sun, indoor workers reach heat exhaustion at essentially the same rate as workers labouring in the open. In the cooler months, the condition affects 10.7% of outdoor and 1.9% of indoor workers.

The lived experience behind these figures is stark for indoor workers. One garment worker described how heat exhaustion overtook her on the factory floor:

"I work beside a machine, and there's no fan nearby. I told the mechanic to fix the fan because the heat was becoming unbearable. The temperature kept rising, but nothing was done. I even reported it to the office director and requested a fan be installed. A few hours later, I started feeling extremely weak and dizzy, and lastly, I fainted. I had a severe headache, and three or four coworkers had to help me by giving me water. This is the kind of condition we work in." Participant in FGD with garment workers, Dhaka

Heat exhaustion is common across both settings; and for indoor workers, it arrives without the direct sun that is usually assumed to be its cause. Workplaces often have neither the means nor the flexibility to respond.

Figure 44. Heat exhaustion prevalence index, by work setting



Note: Heat exhaustion prevalence index measures the frequency and severity of heat exhaustion experienced by workers. It ranges on a scale from 0 to 10; a higher score indicates greater severity.

Figure 45. Prevalence of heat exhaustion symptoms, by work setting

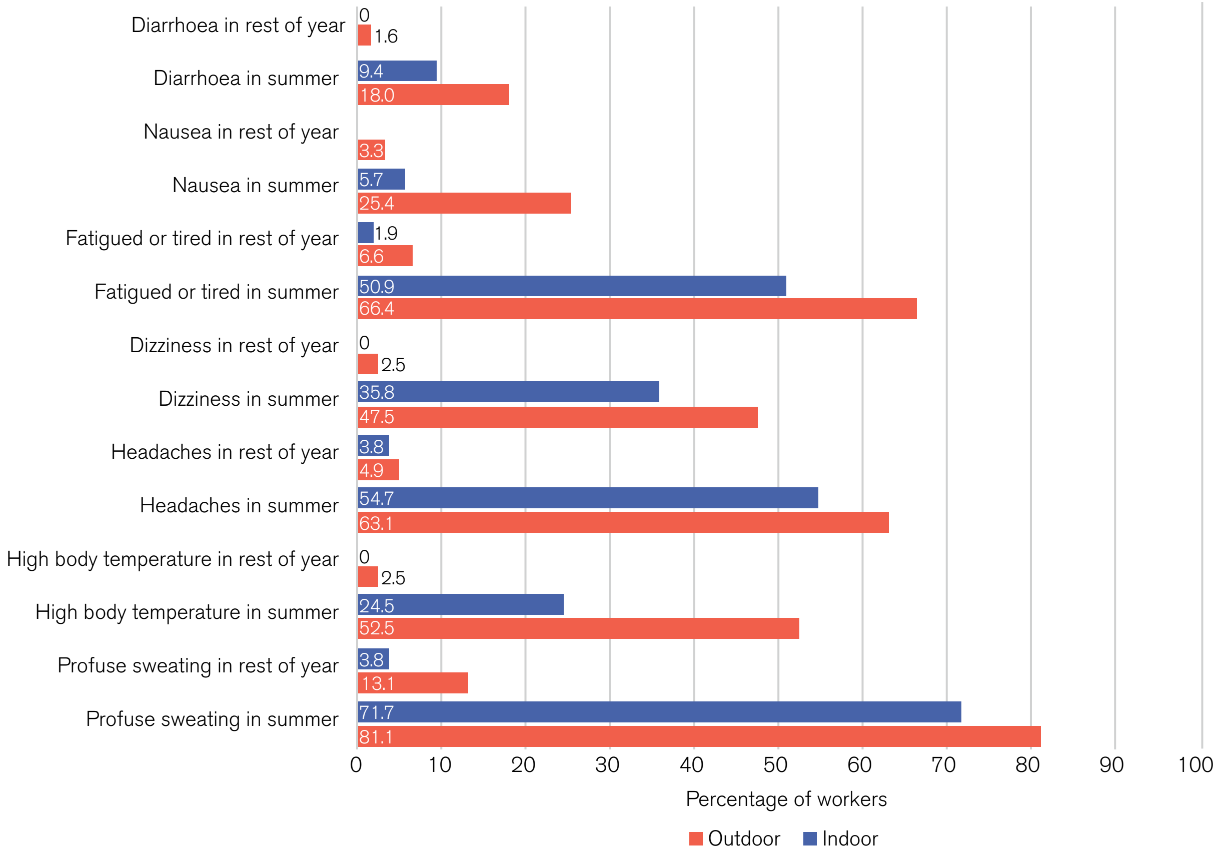
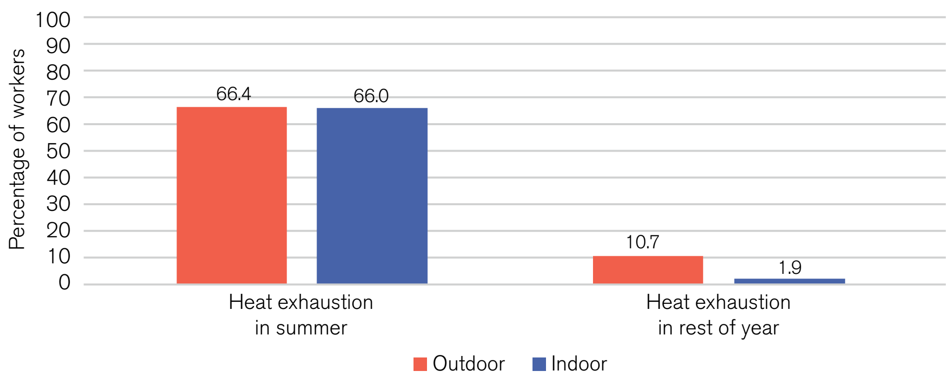


Figure 46. Heat exhaustion diagnosis, by work setting



3.5.3 Heatstroke

Heatstroke is the severe and potentially fatal stage of heat-related illness, occurring when the body can no longer regulate its temperature. It is marked by very high body temperature, hot and dry skin, a confused or clouded mental state, a rapid pulse and in serious cases, loss of consciousness (NIOSH, 2016). On the 0 to 10 prevalence index, heatstroke scored 3.6 among outdoor workers and 1.5 among indoor workers during the hot season (see Figure 47). Outside summer, it is close to zero for both groups.

The symptoms follow the same pattern (see Figure 48). During the hot season, 46.7% of outdoor and 30.2% of indoor workers reported very high body temperature, and 40.2% and 32.1%, respectively, a rapid and strong pulse. The more severe signs are less common but present: 30.3% of outdoor and 18.9% of indoor workers reported clouding of thoughts, and 13.9% of outdoor and 3.8% of indoor workers reported losing consciousness during extreme heat.

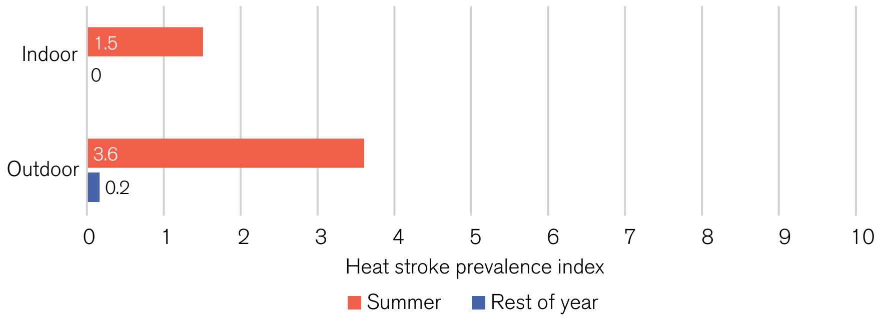
When classified against the clinical criteria, 36.1% of outdoor workers and 15.1% of indoor workers meet the threshold for heatstroke during the hot season (see Figure 49). Unlike heat exhaustion, where the two groups are almost identical, heatstroke is markedly more common among outdoor workers, who are directly exposed to the sun for much of the day. Even so, around 1 in 7 indoor workers reaching the threshold for a medical emergency is a serious finding, given that heatstroke can be fatal without rapid treatment, and most workplaces have no immediate medical response (see Section 3.2.2). In the cooler months, heatstroke is rare, affecting just 1.6% of outdoor workers and no indoor workers.

The scale of factory floor heatstroke is well known to those working with the sector, even if it goes unrecorded.

"Exhaustion is the main problem. A few coworkers have been hospitalised because of severe dehydration during heatwaves. During extreme heat, I have fainted twice and had to sit down for several minutes. I feel very tired and my body aches." Participant in FGD with garment workers, Dhaka

So, although heatstroke is concentrated among outdoor workers, it is not absent indoors. A meaningful share of garment workers reach a life-threatening stage of heat illness in workplaces without the means to treat it.

Figure 47. Heatstroke prevalence index, by work setting



Note: Heatstroke prevalence index measures the frequency and severity of heatstroke experienced by workers.
It ranges on a scale from 0 to 10; a higher score indicates greater severity.

Figure 48. Prevalence of heatstroke symptoms, by work setting

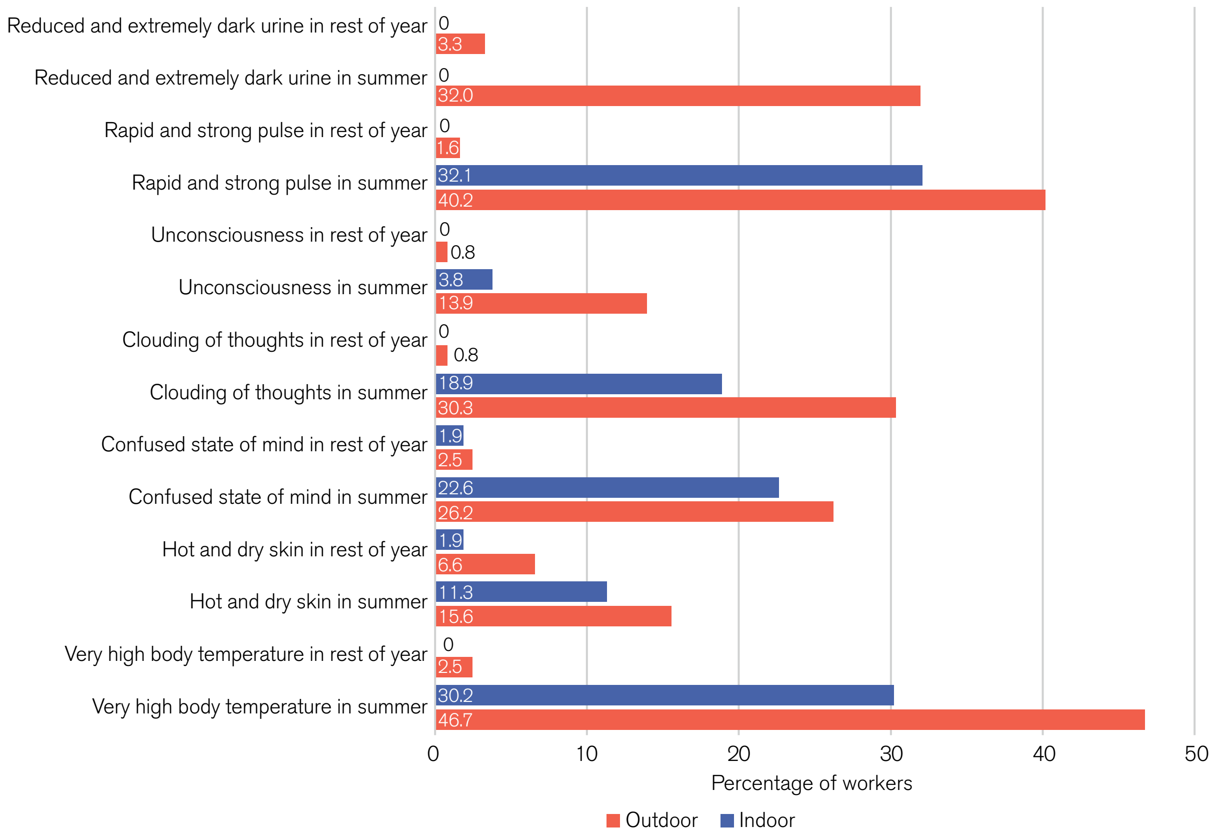
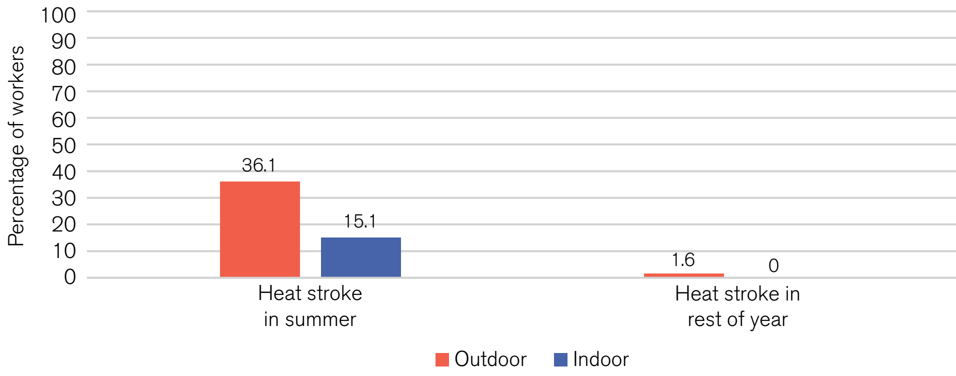


Figure 49. Heatstroke diagnosis, by work setting



3.5.4 Treatment sought and the gap in care

The high prevalence of heat-related illness is not matched by treatment seeking. Very few workers who experience heat-related symptoms seek medical care, even when those symptoms are severe.

Only 7.4% of outdoor and 1.9% of indoor workers who experienced heat cramp, 4.9% of outdoor and 3.8% of indoor workers who experienced heat exhaustion and 4.9% of outdoor and 3.8% of indoor workers who experienced heatstroke — a potentially fatal condition — sought medical care. This means that around 19 in 20 workers who experienced heatstroke received no treatment. Among the few who did seek care, most went to informal providers such as pharmacies and unqualified practitioners rather than formal health services, though the numbers seeking treatment are too small to draw firm conclusions about where they went. The reasons for not seeking care are practical rather than clinical. Health facilities are often distant, treatment costs fall directly on workers and seeking care usually means losing a day's wage. The most cited barrier is cost.

"How can we go to the hospital? It is very expensive. With the income we earn, we don't get the chance to go to the hospital. Even if we go, we mostly go to government hospitals to save money."

Participant in FGD with construction workers, Dhaka

"I don't go to the doctor every time because it is costly. Instead, I buy over-the-counter medicine or home remedies. Still, my medical expenses increase a little during summer."

Participant in FGD with garment workers, Dhaka

"In a government hospital, the cost of treating heat stroke is minimal. But informal workers — construction workers, rickshaw pullers or daily wagers, often cannot afford the same treatment in a private hospital." Dr Sakina Sab Afroz, associate professor of paediatrics at Shaheed Suhrawardy Medical College, Dhaka

The result is a large gap in care. Heat-related illness is widespread and often severe, yet most workers manage it themselves through rest, over-the-counter medicine or by continuing to work. This has direct consequences for their long-term health, as we examine in Section 3.6.

Case study 1. Anwar Hossain: the river took everything; Dhaka's heat took the rest

Anwar Hossain, 55, migrated to Dhaka from Gaibandha about three decades ago.

"We had a beautiful life — our own house, some land, a small shop. Mango trees, jackfruit trees all around. Life was peaceful and full."

The river flowing near the village was an integral part of their lives. The village depended on the river. Then, the river changed course.

"It just didn't flow anymore. It came like a monster."

Erosion began slowly. Then it intensified. Anwar's house and land collapsed into the water. His family lost their two cows, the assets that had supported their home, livelihood and future security.

"It felt as if the ground had been pulled out from under us."

Anwar, his wife and two young children fled to his in-laws' village with nothing; not even a change of clothes. He had been a farmer his whole life. Now he had no land. He came to Dhaka alone. After months pulling a rickshaw, he sent a letter asking his family to join him.

Today, Anwar and his wife, who works as a domestic worker in other people's homes, live in a poorly ventilated room with a tin roof that heats up during the day, making it extremely hot inside.

"Sometimes we go out of the room at night to escape the suffocation. But even outside, the air feels heavy and still."

They pay a monthly rent of 5,000 taka. Slightly better housing would cost 8,000–10,000 taka.

"Should I pay rent or feed my family? I just don't have a choice."

Anwar reports recurrent illness due to his strenuous work in Dhaka's peak temperatures. Last summer, he had a high fever and could not work for several days.

"The fever was so high I couldn't move."

After work, he would pour water over his head to cool down. A doctor told him to stop, warning that the sudden exposure to cold on an overheated body could be dangerous.

"Now I just sit and wait for my body to naturally cool down," he says.

The piped water turns warm by midday. The rice they cook in the morning goes bad and they cannot eat it in the evening. Sometimes they eat spoiled food and suffer diarrhoea.

"If the river hadn't taken our home, I wouldn't be in this city struggling like this."

He pauses.

"What I want most is to live with dignity and not to keep suffering like this."

A rickshaw puller in Dhaka pauses by the roadside to drink water before continuing his route. Photo: Md Riaz Uddin/OKUP

3.6 From dehydration to kidney damage

The acute conditions described in the previous section are not isolated episodes. Repeated exposure to heat, and the dehydration that comes with it, places a recurring strain on the kidneys. When the body loses fluid faster than it can replace it, blood flow to the kidneys falls and waste products become concentrated, raising the risk of AKI, a sudden and often reversible decline in kidney function. The risk is greatest for workers doing strenuous physical labour in hot conditions with limited access to water and rest, which is precisely the situation documented in this study. Research among construction and informal workers has found that heat exposure in the hot season increases the incidence of kidney injury, with dehydration a key risk factor (Al-Bouwarthan et al., 2020; Venugopal et al., 2025).

The concern is repeated injury over time. A single AKI episode may resolve, but recurring episodes can leave lasting damage and raise the likelihood of progression to CKD, an irreversible decline in kidney function (Veltkamp et al., 2025). For informal workers, CKD can mean rising healthcare costs, reduced productivity, lost workdays and, in severe cases, the loss of the ability to work altogether. The national scale of this long-term loss is estimated in Section 4.6.

"Workers exposed to extreme heat for long hours lose large amounts of fluid through sweat. When that fluid is not replaced, blood volume falls and blood flow to the kidneys drops. The kidneys are very sensitive to this, and each episode of severe dehydration can cause acute injury. Repeated over many summers, these injuries can build into chronic, irreversible kidney disease, often in young workers with no other illness. This is why heat poses a serious long-term health risk for manual workers, well beyond the discomfort of a hot day." Dr Akhilesh Sharma, president and CMO, Alkem Laboratories Ltd; and founding director and CEO, Alixer NexGen Therapeutics Ltd

In our survey, 23.1% of workers reported symptoms consistent with AKI. This means nearly 1 in 4 workers are already showing signs of the kidney damage that can precede CKD. The finding is consistent with the working and living conditions documented in this report, where dehydration is common and opportunities for recovery are limited. It applies to both indoor garment workers who restrict their water consumption on production lines with few toilet breaks and to outdoor workers labouring in the sun.

3.7 Psychological and other non-economic impacts

The impacts of heat reach beyond physical illness and lost income, affecting workers' mental wellbeing and bringing a range of non-economic losses that conventional assessments of heat-related harm rarely capture.

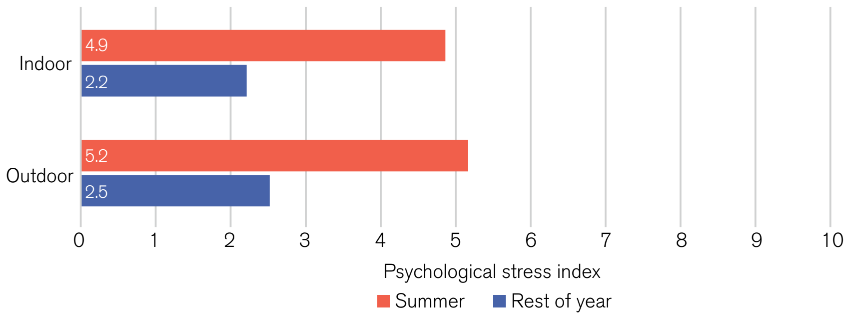
3.7.1 The psychological stress index

To assess the mental health impacts of heat, we constructed a psychological stress index based on nine indicators of mental strain, scaled from 0 to 10, with higher scores indicating greater stress. During the hot season, the index reached 5.2 for outdoor workers and 4.9 for indoor workers (see Figure 50). In the cooler months, it fell to 2.5 and 2.2, respectively, showing that psychological stress more than doubles during the hot season.

The high hot season scores for both groups reinforce a pattern seen throughout this study: the psychological burden of heat on indoor workers is nearly as high as on outdoor workers, despite the assumption that indoor work is easier to bear. Indoor garment workers described the same strain as outdoor workers.

"I notice that hot days make me anxious and unable to concentrate. I struggle more with fatigue and anger." Participant in FGD with garment workers, Dhaka

Figure 50. Psychological stress index, by work setting



Note: The psychological stress index is a composite of nine individual variables. It ranges from 0 to 10, with higher scores meaning more severe stress is experienced.

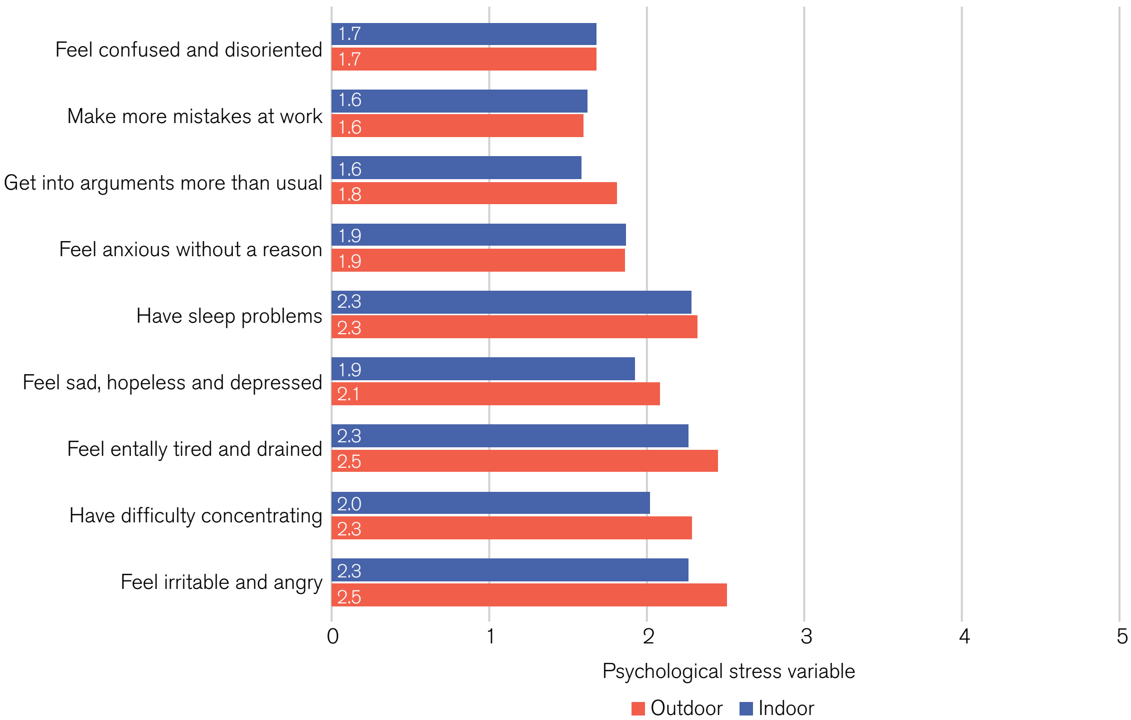
3.7.2 Dimensions of psychological stress

The psychological stress index is built from nine dimensions of strain, each scored on a 0 to 5 scale, where higher values indicate more frequent or more severe symptoms. During summer, 'irritability and anger' and 'mental tiredness and feeling drained' are the most prominent domains, both with scores of 2.5 for outdoor and 2.3 for indoor workers (see Figure 51). These are followed by sleep problems, with scores of 2.3 for both groups, and concentration difficulties, with scores of 2.3 for outdoor and 2.0 for indoor workers. The remaining dimensions — low mood, anxiety, arguments, mistakes at work and confusion — all with scores ranging from 1.6 to 2.1.

The two groups track each other closely across the dimensions. Sleep problems, anxiety, confusion and mistakes at work are identical for both groups, with scores of 2.3, 1.9, 1.7 and 1.6, respectively. Outdoor workers scored marginally higher on irritability, concentration and low mood. That sleep problems are the same for both groups reflects the hot, poorly ventilated housing that indoor and outdoor workers alike return to at night (see Section 2.2.4). The disturbed sleep documented here is a direct consequence of homes that offer no respite from the day's heat.

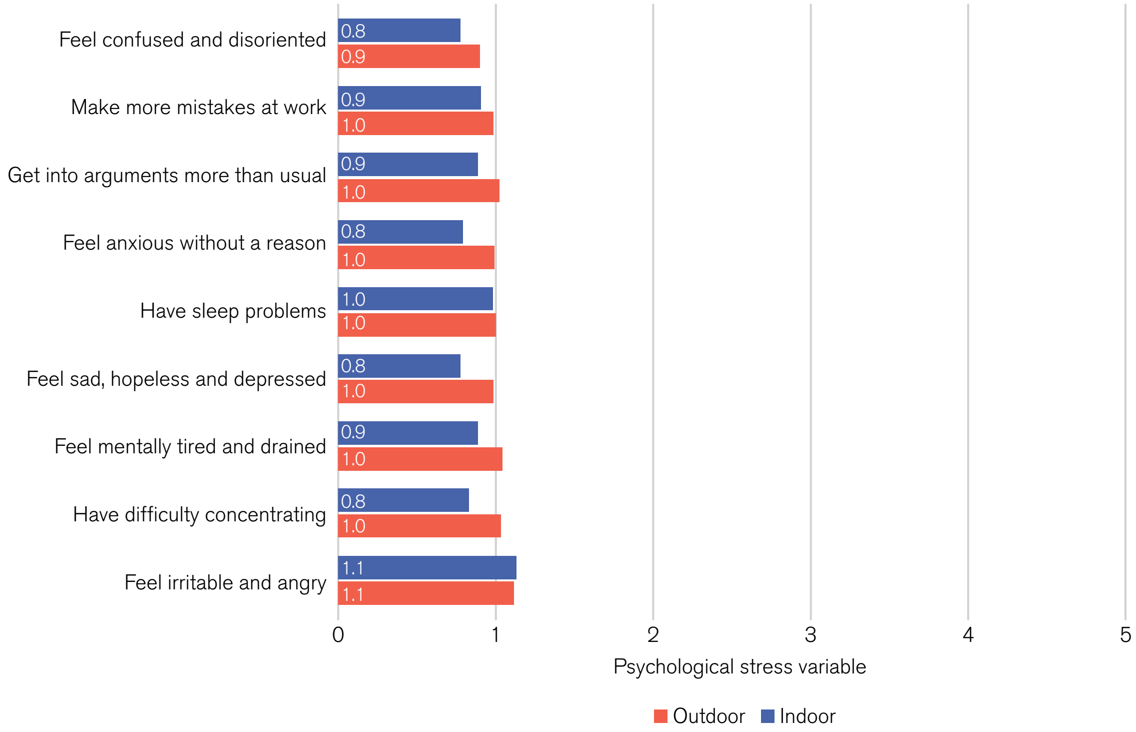
All dimensions decline sharply outside the hot season (see Figure 52), which shows that the heightened psychological strain is closely tied to periods of extreme heat.

Figure 51. Psychological stress variable scores in summer, by work setting



Note: The psychological stress variable scores represent individual indicators of mental strain reported by workers during summer. Each indicator is measured on a scale from 0 to 5, where higher score reflects greater severity or frequency of that specific stressor.

Figure 52. Psychological stress variable scores in the rest of the year, by work setting



Note: The psychological stress variable scores represent individual indicators of mental strain reported by workers during summer. Each indicator is measured on a scale from 0 to 5, where higher score reflects greater severity or frequency of that specific stressor.

3.7.3 Other non-economic impacts

The FGDs and KIIs revealed a range of non-economic impacts that go beyond illness itself. Workers described being unable to stop even as their bodies gave out, and a steady erosion of their capacity to work.

"The heat is very hard, and sometimes I feel faint, but there is no choice. I have to continue working. My speed drops, but I keep going." Participant in FGD with garment workers, Dhaka

Extreme heat also frays workers' mental state and their relationships with those around them. One worker described how it leaves people irritable, unable to concentrate and quick to take offence.

"When the weather gets very hot, it causes various mental problems, irritation or lack of concentration. People feel frustrated or anxious, the body gets very tired. If we talk a little, the other person thinks we're angry. Then the mood becomes restless. At that time, no one likes to listen to others." Participant in FGD with construction workers, Dhaka

The strain does not end with the working day. Instead, workers return to hot, crowded homes that offer little relief, and for many, the loss of rest is itself a significant harm. Power cuts during heatwaves make it worse.

"After a long day of work, I come home hoping to rest but do not get sleep. The intense heat becomes unbearable. To find some relief, I often have to sit outside my home."

Participant in FGD with garment workers, Dhaka

The burden extends across the household rather than falling on the worker alone. When illness strikes, families absorb the lost income and cost of treatment, often through borrowing. And because workers live in the same hot, overcrowded conditions as their families, women and children are also exposed to heat at home, with the disturbed sleep and health effects that follow.

Running through these accounts is a loss of dignity and control. Workers are expected to maintain output regardless of the temperature, and cannot slow down or stop without losing income or risking their job. The sense of having no choice, of working through faintness and illness because the alternative is losing a day's wage, recurs across both settings.

3.8 Determinants of heat-related illness

So far, this chapter has documented the scale of heat-related illness among informal workers. In this section, we examine what drives it.

3.8.1 The model

Heat-related illness is shaped by multiple influences operating at the same time, from the nature of work to conditions at home. To disentangle these effects, we used binomial logistic regression, which estimates how strongly each factor is associated with the likelihood of illness while holding the others constant. This allows us to assess, for example, whether physically demanding work increases the risk of heat-related illness independently of housing conditions or age.

We examined seven explanatory variables grouped into three categories. The first captures work-related exposure: whether a worker is employed outdoors or indoors, the temperature intensity of the area where they work and the physical intensity of their labour. The second captures protection: the availability of workplace facilities, the level of heat protection provided by housing and the use of coping strategies. The final variable is age, distinguishing workers above and below 45 years.

Estimating separate models for heat cramp, heat exhaustion and heatstroke, we present results as odds ratios, where values above 1 indicate higher odds of illness, values below 1 indicate lower odds, and values close to 1 indicate little effect (see Box 1).

Box 1. Identifying what drives heat-related illness

For this analysis, we drew on the records of surveyed workers, each classified by doctors as having or not having experienced heat cramp, heat exhaustion and heatstroke. Our purpose was to identify which conditions are most strongly associated with heat-related illness across the sample, rather than to predict whether a particular worker would fall ill, so that policy can act on the factors that matter most.

Using binomial logistic regression, a standard method for explaining a yes or no outcome, we estimated the same model three times — once for each illness — using an identical set of seven explanatory variables to ensure results stayed comparable across the three conditions.

The binomial logistic regression model

$\ln(p/1 - p) = \beta_0+\beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7$

X_1 = heat exposure (outdoor work = 1, indoor work = 0)

X_2 = regional temperature intensity (very high = 1, high = 0)

X_3 = physical labour intensity (high = 1, moderate/low = 0)

X_4 = safety measure facilities availability at workplace (always/often = 1, rarely/never = 0)

X_5 = heat protection housing facilities (poor = 1, good = 0)

X_6 = practice of coping actions (never/rarely = 1, always/often = 0)

X_7 = age (> 45 years = 1, ≤ 45 years = 0)

Y = prevalence of heat cramp/heat exhaustion/heatstroke

p = probability of the event (Y = 1)

p/1 – p = odds of the event

β_0 = intercept

β_i = coefficient for predictors X_i

The model reports an odds ratio for each factor. We assessed the statistical significance of each factor using standard tests, and checked the fit of each model with the Hosmer and Lemeshow goodness-of-fit test (Hosmer and Lemeshow, 1980).

See Appendix 1 for the full specification, coefficients and diagnostics for all three models.

3.8.2 Drivers of heat-related illness

The outcome of the three models (see Table 3) reveal three important patterns.

First, the work setting itself does not determine who falls ill. The variable distinguishing outdoor and indoor work was not a statistically significant predictor of heat cramp, heat exhaustion or heatstroke. Once we consider other factors, indoor workers face odds of illness that are similar to those faced by outdoor workers. This reinforces a consistent finding in this study that heat-related illness cannot be considered a problem that affects outdoor workers alone.

Second, the drivers of illness change as conditions become more severe. Heat cramp is primarily associated with physically demanding work and the absence of coping strategies. Workers engaged in high-intensity labour have 3.4 times the odds of heat cramp, while workers who rarely or never adopt coping actions are 1.9 times more likely to experience it. As illness progresses to heat exhaustion and heatstroke, structural factors become increasingly important. Living in a very hot temperature zone increases the odds of heat exhaustion threefold and of heatstroke by 2.8 times. Poor housing has the strongest effect, more than doubling the odds of heat exhaustion and increasing the odds of heatstroke more than fourfold. High physical labour intensity remains a significant contributor throughout.

Third, vulnerability increases with age. Although age has no significant effect on heat cramp, workers over 45 are 1.8 and 2.9 times more likely to experience heat exhaustion and heatstroke, respectively. The risk of the most severe forms of heat-related illness therefore rises sharply with age.

The protective factors included in the model have more limited effects. Workplace facilities significantly reduce the odds of heatstroke, lowering the risk by 41%, while coping strategies are significant only for heat cramp. Neither is enough to offset the influence of broader structural factors such as climate, housing and labour intensity.

One result stands out in particular. Housing conditions are as important as workplace conditions in explaining severe heat-related illness — and for heatstroke, they are more important. This shows that the ability to recover from heat at home plays a critical role in determining health outcomes, reinforcing a central finding of the study, that heat exposure does not end when the working day ends.

The overall analysis suggests that the most serious forms of heat-related illness are driven less by individual behaviour and more by the environments in which workers live and work. Many of the strongest predictors — including climate conditions, housing quality, labour intensity and age — lie largely beyond the reach of individual coping strategies.

Table 3. Determinants of heat-related illness: odds ratios from binomial logistic regression

Factor (coded condition)	Heat cramp	Heat exhaustion	Heatstroke
Heat exposure (outdoor)	1.33	1.42	1.07
Regional temperature intensity (very high)	1.03	**3.03*** **	**2.78*** **
Physical labour intensity (high)	**3.44*** **	**2.31*** **	**1.93** **
Workplace facilities (available)	1.16	0.65	**0.59** **
Housing heat protection (poor)	1.38	**2.15*** **	**4.09*** **
Coping actions (never or rarely)	**1.88* **	1.46	0.98
Age (over 45)	1.85	1.80*	**2.89*** **

Note: Significance: *** p<0.001, ** p<0.01, * p<0.05. Ratios shown in bold are statistically significant (p<0.05 or lower) and marked with asterisks; all others are not statistically significant. Ratios above 1 mean higher odds of experiencing the illness; those below 1 mean lower odds, each holding the other factors constant.

4

Quantifying the cost of heat-related loss and damage

Chapter 3 shows how heat exposure affects workers' health, livelihoods and wellbeing. Many of these impacts remain largely invisible in policy and planning because they are not routinely measured. Lost workdays, forgone wages, heat-related illness, long-term kidney damage and psychological stress are all real costs, yet most fall outside the systems used to assess economic damage. In this chapter, we use the C-CIQ framework to quantify these losses and damages and make visible the scale of the costs of heat exposure on informal workers and their households.

We begin by introducing the C-CIQ framework and the economic and non-economic dimensions of loss and damage that it captures. We then estimate workdays and wages lost during extreme heat events, assess the longer-term losses associated with heat-related kidney disease and examine how these losses deepen existing living wage deficits among worker households. Finally, we scale these impacts to the national level to estimate their implications for productivity, economic output and GDP.

4.1 Why it matters

Heat exposure imposes a wide range of losses on informal workers and their households. Some — such as workdays lost, wages forgone, healthcare expenditures and the loss of future earnings associated with long-term illness — are economic and can be measured directly. Others, including physical pain, psychological stress, loss of sleep, anxiety, strain on family relationships and the loss of dignity associated with working under unsafe conditions, are non-economic. Together, these impacts constitute the full burden of heat-related loss and damage.

Conventional assessments capture only a small part of this burden. Unlike floods or cyclones, heat rarely leaves visible physical destruction that we can count and value. Even where heatwaves appear in disaster databases such as EM-DAT, the impacts recorded are typically limited to deaths and immediate emergency losses. The cumulative effects experienced by workers — including reduced productivity, declining health, worsening mental wellbeing and lost income — are rarely measured. As a result, much of the damage caused by heat exposure remains invisible in policy and planning.

Quantifying such losses helps make them visible to the institutions responsible for planning and public investment. When we express heat-related losses in workdays, wages and national output, we can compare them with other economic risks and weigh them against the costs of interventions designed to reduce them. This shifts the view that heat exposure is solely a public health or welfare issue, recognising it as an economic challenge with implications for productivity, livelihoods and growth.

IIED developed the C-CIQ framework to address this gap by bringing economic and non-economic losses together within a single assessment framework. In doing so, the framework provides a more complete picture of what heat exposure takes from workers, who bears those losses and why they matter for policy and decision making.

4.2 Applying the C-CIQ framework to heat exposure

We adapted the C-CIQ framework to assess heat-related loss and damage among informal workers. The framework moves through three connected stages. First, it identifies the factors that shape vulnerability using the 3P framework presented in Chapter 2 (see Figure 2). Second, it categorises resulting losses and damages across four domains: tangible, intangible, intrinsic and functional. Third, it quantifies these losses using a combination of economic valuation, composite indices and qualitative evidence.

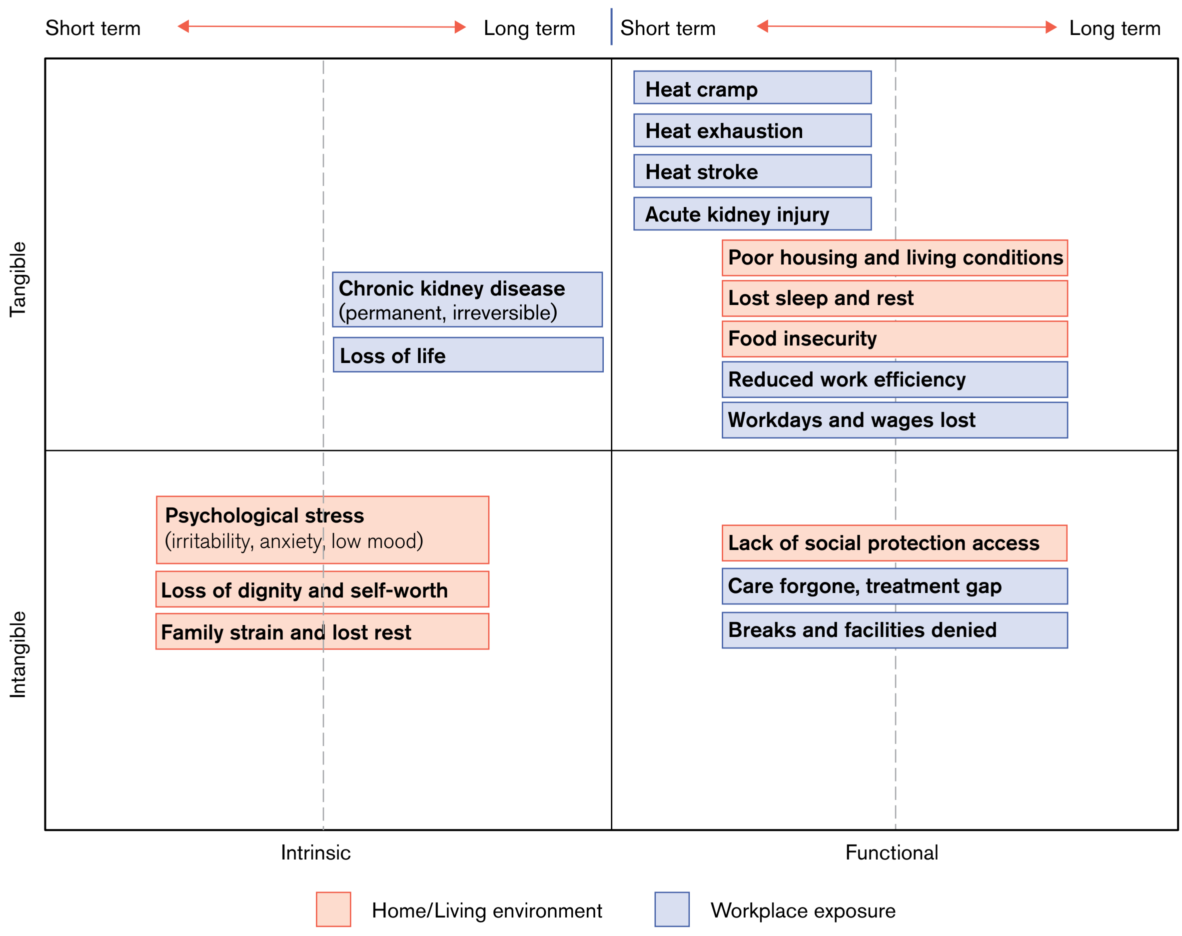
Tangible losses are those we can observe and measure directly, such as lost workdays, reduced earnings and healthcare costs. **Intangible losses** are more difficult to value economically, and include psychological stress, disrupted sleep and strain on family life. **Intrinsic losses** relate to health, wellbeing and human dignity, while **functional losses** concern people's and systems' ability to perform essential functions, such as working, earning an income or accessing services. Many impacts span multiple domains. CKD, for example, is an intrinsic loss, because it damages health; a functional loss, because it reduces the ability to work; and a tangible loss, because it results in lost earnings.

The framework also captures how losses unfold over time and across different settings. Some occur immediately during periods of extreme heat, while others accumulate over years and may become permanent. Likewise, heat exposure affects workers both at work and at home, recognising that many have little opportunity to recover from heat once the working day ends.

4.3 Heat-related loss and damage across the C-CIQ domains

Figure 53 presents the heat-adapted C-CIQ matrix. The matrix pairs the four domains of loss and damage and shows how the impacts identified in this study are distributed across them.

Figure 53. The heat-adapted C-CIQ matrix: heat-related loss and damage across the four domains



The tangible functional quadrant captures the immediate economic losses from heat exposure, including lost workdays, forgone wages, reduced productivity and household spending on treatment and medicines. These arise both at work and at home, and are the impacts we place monetary values on in this chapter.

The tangible intrinsic quadrant is dominated by long-term damage to health, particularly CKD. This loss is intrinsic because it affects health and wellbeing in their own right, and tangible because it can be measured through lost working years and reduced earnings. Mortality sits in this quadrant as the most severe consequence of heat exposure, though we have not quantified it in this study.

The intangible intrinsic quadrant captures losses that are hard to value economically but central to workers' wellbeing. These include psychological stress, irritability, anxiety and low mood, lost rest, strain on family relationships, and the loss of dignity described by workers in the FGDs, KIIs and case studies.

The intangible functional quadrant captures the erosion of workers' ability to cope with heat. In this study, it includes: workplace conditions that deny workers water, shade, rest breaks and sanitation; the near-absence of social protection for the urban informal workforce; and the need to keep working through illness. These are best understood as drivers of vulnerability rather than losses in themselves, because they limit workers' capacity to recover from heat exposure.

4.4 Non-economic dimensions of heat-related loss and damage

Under the C-CIQ framework, we assess losses that cannot readily be monetised through composite indices. This study uses the five indices introduced in chapters 2 and 3 to quantify different dimensions of vulnerability, exposure and impact. Two capture the conditions that shape vulnerability (housing heat exposure and workplace facilities) and the other three capture workers' responses and outcomes (coping actions, heat-related illness prevalence and psychological stress). Together, they provide a quantitative assessment of the non-economic dimensions of heat-related loss and damage (see Table 4).

Table 4. The five composite indices used in this study

Index	What it measures	Outdoor	Indoor
Housing heat exposure index	How far workers' homes add to their heat exposure through construction, ventilation and cooling Higher score means more exposure	6.0	5.0
Workplace facilities index	Provision of water, shade, rest, sanitation and medical support at work Higher score means better protection at work	3.1	5.0
Coping action index	Coping strategies workers use to manage heat exposure in the absence of formal provision Higher score means stronger coping capacity	5.6	5.0
Heat-related illness prevalence indices, summer	How widespread and severe heat cramp, heat exhaustion and heatstroke are Higher score means more prevalent	Cramp 9.0 Exhaustion 6.6 Stroke 3.6	Cramp 7.9 Exhaustion 6.6 Stroke 1.5
Psychological stress index, summer	Mental strain during the working season Higher score means more stress	5.2	4.9

Notes: The heat-related illness prevalence and psychological stress indices are shown for the hot season; scores for the rest of the year are lower, with the psychological stress index, for example, falling to 2.5 for outdoor and 2.2 for indoor workers.

4.5 Workdays and wages lost during extreme heat events

The most immediate economic loss from heat exposure is the workdays it takes from workers. We quantify this at the individual level, first as workdays lost over a year, then as the wages those days represent.

4.5.1 Workdays lost per worker per year

Heat exposure reduces work through three pathways, which were all measured in our survey:

- Illness, when workers are unable to work because of heat cramp, heat exhaustion or heatstroke
- Reduced capacity working, when workers remain at work but are unable to maintain normal productivity because of the heat, and
- Workplace closures, when operations halt because conditions become too hot to work safely.

For both groups, illness is the largest component. Outdoor workers lose 15.3 workdays a year to heat-related illness, 7.7 days to reduced capacity working and 0.7 days to workplace closure. Indoor workers lose 8.1 days to illness, 5.4 days to reduced capacity working and none to closure, since garment factories run to production targets and do not halt in the heat.

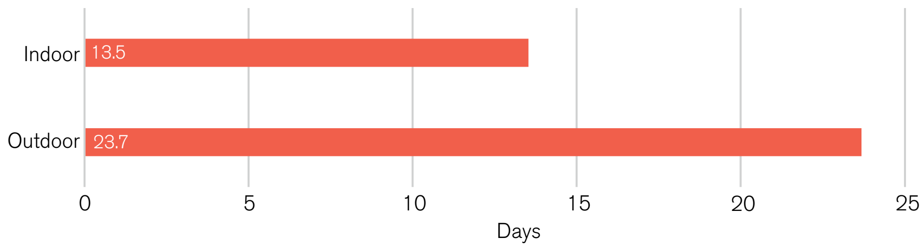
We estimated reduced capacity based on workers' reports of how many hours they were unable to work effectively during periods of excessive heat, together with a conservative assumption that only 25% of those inefficient hours translate into lost output (see Table 5). Workers reported being unable to work effectively for an average of 2.48 hours a day outdoors and 1.73 hours a day indoors during periods of excessive heat. Applied across an assumed 100 days of excessive heat a year, this gives 247.92 and 173.33 inefficient hours, respectively. Counting only a quarter of those hours as lost output yields 7.8 workdays lost a year for outdoor workers and 5.4 for indoor workers.

Taken together, the three pathways give an estimated loss of 23.7 workdays a year for outdoor workers and 13.5 for indoor workers (see Figure 54). Outdoor workers lose more days overall. For indoor workers, illness is the largest component, but reduced capacity working still accounts for 5.4 of the 13.5 days, a loss that leaves no formal trace because the worker remains present while producing less.

Table 5. Assumptions for estimating workdays lost to heat induced inefficiency, by work setting

Assumptions/variables	Outdoor	Indoor
Hours unable to work efficiently due to excessive heat (survey data)	2.48	1.73
Inefficient work hours per year (across an assumed 100 days of excessive heat per year)	247.92	173.33
Work hours lost per year (at 25% of the inefficient hours)	61.98	43.33
Workdays lost due to inefficient work in a year	7.75	5.42

Figure 54. Workdays lost to extreme heat per worker per year, by reason and work setting



4.5.2 Wages lost per worker per year

For a daily wage earner, a lost workday is a lost day's income. Valuing the workdays lost above at each worker's daily wage gives an estimated annual wage loss of US$148.86 for outdoor workers and US$89.10 for indoor workers (see Figure 55).

Figure 55. Wages lost due to excessive heat per worker per year, by work setting

For workers in some of the lowest-paid occupations, losses of this size are significant. With few savings to absorb the shock, households often cope by borrowing, cutting spending on food and other essentials, or delaying healthcare. The loss therefore reaches beyond income alone and can set off a wider set of economic pressures.

We have deliberately kept these estimates conservative. They capture only wages lost through missed work and reduced productivity during periods of extreme heat, and do not include the longer-term earning losses associated with CKD (see Section 4.6) or the treatment costs borne by workers and their households. The figures here provide a baseline estimate of wage loss, which we use in the household and national calculations that follow.

4.6 Long-term wage loss from heat-related kidney disease

The losses set out in Section 4.5 are seasonal. They come with the heat and, for most workers, ease once the hot season is over. The loss covered in this section is different, because it does not ease. Where repeated exposure to extreme heat damages the kidneys, the damage can become permanent, reducing a worker's capacity to earn for the rest of their working life. This long-term wage loss sits in the tangible and intrinsic part of the matrix: a loss of health that is also a loss of income.

4.6.1 From AKI to CKD: method and assumptions

Repeated dehydration places strain on the kidneys and can lead to AKI. A single episode may resolve, but repeated episodes raise the risk of progression to CKD, an irreversible decline in kidney function. This pathway is especially relevant for workers who face repeated heat exposure with limited opportunity for rest and rehydration.

We estimated long-term wage losses in several stages. First, we identified the workers in the survey who reported symptoms consistent with AKI, giving the base population already showing signs of heat-related kidney damage. We then applied a progression rate of 25.8%, drawn from a systematic review and meta-analysis of long-term kidney outcomes following AKI (Veltkamp et al., 2025) to estimate the share expected to develop CKD. For those workers, we applied the 56% reduction in working time associated with end-stage kidney disease reported in the literature (Wang et al., 2024). We then valued the resulting loss of workdays using workers' daily wages. We applied the same approach to the national informal workforce, using Bangladesh Bureau of Statistics labour force data to generate national estimates.

As with wages lost per year, we have deliberately kept the estimate conservative. It captures only long-term wage losses associated with CKD among workers already reporting symptoms of AKI and excludes treatment costs such as dialysis, hospitalisation and medication, out-of-pocket household expenditure, premature mortality and wider social impacts. We therefore include mortality in the C-CIQ matrix as a loss but do not assign it a monetary value. The estimates presented here should be read as representing only part of the full burden of heat-related kidney disease.

4.6.2 Workers affected and workdays lost

In the survey, 23.1% of workers reported symptoms consistent with AKI. Applying the 25.8% progression rate, we expect an estimated 6.0% of all workers to develop CKD over time — equivalent to around 1 in 17 workers.

This risk is not confined to those working in direct sunlight. As we show in Chapter 3, dehydration is also common among indoor workers. On garment production lines, many restrict their water intake because toilet breaks are limited, leaving them dehydrated through the shift even where fans are running. And the dehydration does not end at the factory or the building site. Workers return to hot, poorly ventilated homes where they continue to lose fluid and sleep badly, so the strain on the body continues through the night.

"During peak summer, my house gets extremely hot at night, and it is very uncomfortable to sleep. Even with a fan, I often wake up sweating and thirsty, which sometimes makes me feel dehydrated. On average, I get only about four to five hours of sleep because the heat makes it hard to rest properly." Participant in FGD with construction workers, Dhaka

Scaled to the national informal workforce engaged in high physical labour, we estimate that around 3.56 million workers will develop CKD as a long-term consequence of heat exposure. Applying the 56% reduction in working time to this group gives a loss of approximately 0.61 billion workdays per year.

These figures point to a substantial reduction in the productive capacity of the informal workforce, one that builds gradually rather than appearing within a single season. Workers themselves often describe it as a slow decline in their ability to work and earn.

4.6.3 Wage loss from CKD

Valuing the workdays lost to CKD at workers' daily wages and aggregating to the national level gives an estimated long-term wage loss of US$2.12 billion per year, equal to 0.47% of GDP.

Unlike the seasonal wage losses associated with extreme heat events, this reflects a permanent reduction in earning capacity. It is additional to the immediate wage losses workers face during periods of extreme heat, and it continues as workers live with CKD. Section 4.8 presents these long-term losses alongside the seasonal losses to show the full economic burden of heat exposure.

Much of this loss stays invisible in conventional assessments. It does not appear in disaster damage estimates or heat action budgets, because it emerges gradually, across millions of workers, and often years after the heat exposure that contributed to it. It is one of the clearest examples of the long-term and unrecorded damage that extreme heat causes.

4.7 The living wage deficit and heat

The significance of wage losses becomes clearer when set against what households need for a basic standard of living. In this section, we measure the gap between household income and a living wage, and examine how heat exposure widens that gap.

4.7.1 The living wage benchmark

A living wage is the income needed to afford a basic but decent standard of living, covering food, housing, healthcare, education and a small margin for unexpected costs. For this study, we use the Anker living wage benchmark for Dhaka, estimated at BDT 30,459 per month, equivalent to US$2,997 per year (Guzmán Prudencio et al., 2025). We apply this benchmark to both outdoor and indoor worker households, since it reflects the cost of a decent standard of living rather than the type of work undertaken.

4.7.2 Household income and the deficit

Both groups fall well short of this benchmark. Outdoor worker households earn an average of US$1,756 per year and indoor worker households, US$1,985, against the living wage benchmark of US$2,997. This leaves a living wage deficit of US$1,241 for outdoor worker households and US$1,013 for indoor worker households, equivalent to 41.4% and 33.8% of a living wage, respectively.

Indoor worker households are somewhat better placed, earning more and carrying a smaller deficit than outdoor worker households, which is consistent with the steadier monthly wages of garment work set against the daily earnings of construction and rickshaw pulling. But both groups remain well below what a decent standard of living requires. And with no compensation, paid sick leave or insurance to fall back on, FGD participants described managing the gap by borrowing, reducing food consumption, postponing healthcare and cutting other essential spending.

4.7.3 How heat widens the deficit

Heat exposure widens an already substantial shortfall in living wage. When the wage losses associated with extreme heat (see Section 4.5.2) are deducted from household income, annual earnings fall to US$1,607 for outdoor worker households and US$1,896 for indoor worker households (see Figure 56).

The living wage deficit consequently rises to US$1,390 for outdoor worker households and US$1,102 for indoor worker households, equivalent to 46.4% and 36.8% of a living wage respectively, up from 41.4% and 33.8% before taking heat-related wage losses into account (see Figure 57).

The increase is larger for outdoor worker households, because they lose more work and income during extreme heat. But the impact reaches across both groups, deepening deficits that are already severe. For households already struggling to meet basic needs, losing income during the hottest months can mean further debt, reduced consumption or working through unsafe conditions.

For many households, the choice is not between safety and comfort. It is between protecting their health and protecting their income.

Figure 56. Household income per year, before and after wages lost to heat, by work setting

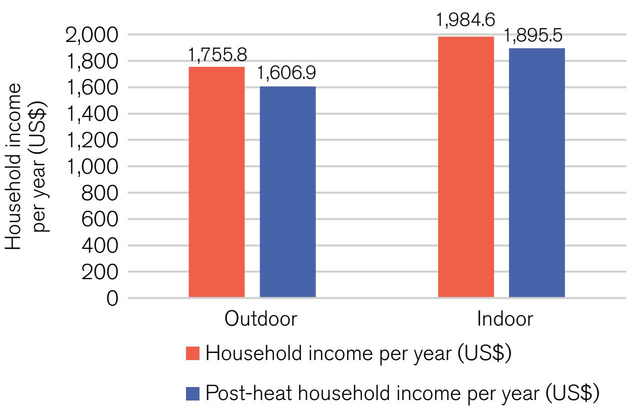
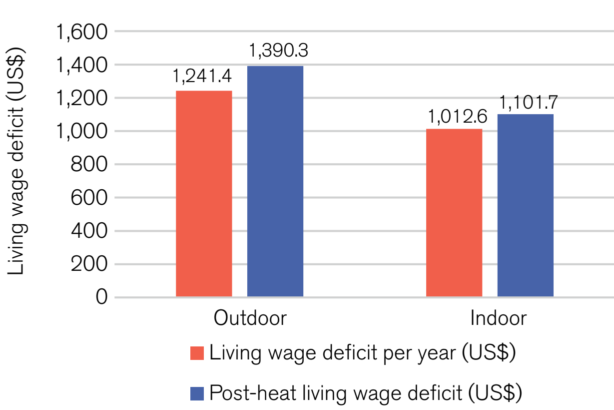


Figure 57. Living wage deficit, before and after wages lost to heat, by work setting



Case study 2. Dipok's story: the cyclone was one day; the heat is every day

Dipok, 40, grew up in Khulna district, where life was built around land, crops and family. That changed in 2009, when Cyclone Aila struck the region.

"We had cropland, and a small house. Back in my village, life was peaceful."

His house collapsed in the cyclone. When the storm passed, the land was flooded with saltwater. Nothing would grow there anymore. With no land to farm and no work in the village, Dipok migrated to Dhaka in search of work.

He found work in construction — carrying heavy materials, working under the open sky for long hours. The work is entirely weather dependent. And when rain stops work at the site, wages stop, too.

In peak summer, temperatures in Dhaka become punishing. Dipok works in direct sun on concrete surfaces. He often feels dizzy. His clothes are soaked with sweat within hours of starting work. He has watched colleagues faint on site and fears he may be next.

"Sometimes, I can't even breathe properly. The heat from the concrete feels like it's burning through my skin."

When he goes home at the end of the working day, the heat persists. His small rented room has a tin roof and the heat radiates back through the evening. He pours water over his body to cope, but the relief lasts only minutes.

"If I could get some financial support, I would start something small — a shop, maybe. I wouldn't have to run around in the sun and rain anymore. I could work with dignity."

Without social protection, that dignity stays out of reach. Seventeen years after Cyclone Aila, Dipok is still dealing with its consequences. What he faces in Dhaka is slower; but no less relentless.

Construction workers at a building site in Dhaka, Bangladesh. Photo: OKUP

4.8 National wage loss and its share of GDP

We used household-level loss to analyse what losses would look like at country level, including GDP losses.

Using the methodology outlined in Box 2, we estimate the immediate loss during extreme heat events at 1.18 billion workdays a year at national level. This is equal to 6.4% of the exposed workforce's total workdays and a wage loss of US$4.10 billion, or 0.91% of GDP. The long-term loss from heat-related kidney disease adds another 0.61 billion workdays and US$2.12 billion, or 0.47% of GDP. Together, heat exposure costs the Bangladeshi informal workforce 1.79 billion workdays and US$6.22 billion in lost wages each year, close to 1.4% of GDP (see Table 6).

These losses are substantial for two reasons. First, they fall disproportionately on low-income informal workers whose livelihoods depend directly on daily labour. For many households, lost workdays mean immediate cuts to income, consumption and savings, with little capacity to absorb the shock. Second, the workers bearing them are concentrated in sectors that underpin economic activity, such as construction, manufacturing and transport, so the impacts extend beyond individual workers and households to productivity across the wider economy.

The estimate is also conservative. It captures only wage losses among informal workers engaged in physically demanding work, and excludes losses among formal workers, disruptions to supply chains and production, healthcare costs and other indirect effects. The true economic burden of heat exposure is therefore likely to be higher.

Expressing these losses as a share of GDP helps illustrate their macroeconomic significance, but the burden is first experienced at household level. For families with little or no financial reserve, each lost workday means lower earnings and less opportunity to meet daily costs, save against future shocks or invest in health and education, eroding both their wellbeing and their resilience.

Box 2. Estimating national wage loss

We built the national estimate from the division-level calculations. We first identified the workforce in each of Bangladesh's eight administrative divisions that are exposed to heat: the informal workers in high physical labour sectors such as construction, manufacturing and transport, where heat directly affects the ability to work, based on the worker-population ratio and population from the Bangladesh Labour Force Survey; and the share of workers in high physical labour industries (BBS, 2023). Because heat is not uniform across the country, we gave each division a heat intensity weight based on its climate zone, drawn from the World Bank Climate Change Knowledge Portal (World Bank, no date). Hotter divisions, such as Rajshahi, carry a higher weight and cooler or coastal divisions, a lower one, so the estimate reflects the heat burden in each division.

We then scaled workdays lost at division level and summed these to get the national figure:

Workdays lost (division) = workdays lost per worker × number of exposed workers × heat intensity weight

Workdays lost per worker is the combined outdoor and indoor average of 20.61 days, the sample-weighted average of the per worker figures from our calculation.

Wage loss (division) = workdays lost (division) × average daily wage (division)

We then expressed the national wage loss as a share of GDP for 2024 in current US dollars (World Bank, 2025) and scaled the long-term wage loss from kidney disease in the same way.

Table 6. Estimated national wage loss from heat per year, Bangladesh: immediate and long-term losses

Loss	Workdays lost per year (billions)	Wage loss per year (US$, billions)	Share of GDP
Immediate (during extreme heat events)	1.18	4.10	0.91%
Long-term (heat-related kidney disease)	0.61	2.12	0.47%
Total	**1.79**	**6.22**	**1.38%**

Yet in conventional economic accounting, much of this loss remains invisible. Unlike damage to infrastructure or crops, earnings lost to reduced work capacity are rarely measured or compensated. Instead, workers and their households quietly absorb the costs as forgone income, depleted savings, debt and reduced consumption. This is uncompensated loss and damage, borne directly by vulnerable households rather than reflected in any formal assessment or support mechanism. Aggregated to the national level, what looks like individual hardship is a significant and recurring economic cost, carried across millions of households and showing up as lower national output.

The longer-term burden does not lift when the heat does. Heat-related kidney disease can permanently reduce a worker's earning capacity, with effects that persist long after a heat event has passed. For affected households, this can mean years of reduced income alongside rising healthcare costs. At national level, it is a continuing loss of productive labour and a further drag on economic performance.

These estimates reflect current levels of heat exposure. As temperatures continue to rise and heatwaves become more frequent and intense, both productivity losses and heat-related illness are likely to increase. The costs identified here are therefore a measure of present day damage and an early indication of what a warming climate will add. Protecting workers from heat exposure should be seen as an investment in productivity, livelihoods and growth, rather than a welfare cost. These estimated costs also provide a benchmark for assessing the costs and benefits of worker protection.

Box 3. The costs of heat exposure for informal workers and their households

Table 7 brings together the costs of heat exposure to show the overall burden borne by informal workers and their households. Heat reduces working time and earnings, widens existing income deficits relative to a living wage and can lead to permanent health impacts through CKD.

Table 7. Annual household-level costs of heat exposure identified in this study

Indicator	Outdoor worker households	Indoor worker households
Workdays lost to heat per year (per worker)	23.68	13.53
Wages lost to heat per year (US$ per worker)	148.86	89.10
Annual household income (US$ per household)	1,755.76	1,984.59
Living wage deficit before heat (% below living wage)	41.4	33.8
Living wage deficit after heat (% below living wage)	46.4	36.8
Expected risk of CKD from heat exposure	Approximately 1 in 17 workers	Approximately 1 in 17 workers

The economic losses shown in Table 7 capture only part of the burden. Workers also experience a range of non-economic losses, including psychological stress, disrupted sleep, reduced wellbeing, strain on family life and a loss of dignity associated with inadequate access to water, shade and sanitation at work. And these losses do not stop at the factory gate or building site, as at the end of the day, workers return to hot, overcrowded homes with poor ventilation, unreliable water and frequent power cuts, which offer little chance to recover before the next day. Together, these findings show that heat exposure imposes a layered form of loss and damage on informal worker households: recurring income losses, deepening poverty, long-term health impacts for some workers and substantial non-economic costs that are rarely recognised or compensated.

5 Recommendations

Chapter 4 quantified what heat exposure takes from informal workers. At national level, these losses come to close to 1.4% of GDP each year. For workers and their households, this means lost workdays, forgone wages, declining health and a living wage deficit that was already substantial before the heat. And exposure does not end when the working day ends. Many workers return from hot workplaces to homes that stay hot through the evening and night, with poor ventilation, unreliable water and frequent power cuts, leaving little chance to recover before the next day's work. This chapter sets out practical measures to reduce these losses and protect the workers least able to absorb them.

Much of the response can build on systems that already exist. Bangladesh can draw on its mobile money payment infrastructure, NID system and track record of forecast-based anticipatory cash transfers. But coverage for the urban informal workforce is thin and no health scheme reaches these workers, so the task is partly to activate and extend what exists and partly to fill the gaps. We therefore recommend three actions: strengthening social assistance; making heat protection at work a binding requirement; and adopting the most cost-effective financing model for income protection. The common principle across all three is that acting early through existing systems costs far less than letting losses accumulate.

5.1 A living wage-based model: strengthening social assistance

Heat removes income from workers who are already earning well below a living wage. These losses are concentrated in the three divisions that the study's weighting places at or above full heat intensity — Dhaka, Rajshahi and Rangpur — where 32.16 million workers engaged in heat-exposed physical labour lose an estimated US$2.34 billion in wages each year due to heat. The challenge is twofold: to reduce exposure at work and at home, and to protect incomes when extreme heat disrupts work.

We recommend three complementary measures, set out below: a heat-triggered cash transfer to compensate workers when heat prevents them from working; interim health support to meet the cost of heat-related illness, given the absence of any health protection scheme for these workers; and improved access to existing food programmes so they can get food support when their incomes fall. Together, these measures directly protect household income while also reducing the indirect losses associated with healthcare costs and food insecurity.

The cost of providing this support is modest relative to the losses it can help prevent. Depending on the severity of the heat season, the estimated annual cost ranges from US$69.9 million in a normal year to US$132.4 million in a record year. This is 3.0–5.7% of the US$2.34 billion in annual wage losses in the three highest-exposure divisions.

Evidence from anticipatory social protection shows that acting early is substantially more cost-effective than responding after losses have occurred. Analysis across eight countries, including Bangladesh, found that every US$1 invested in anticipatory action generates US$2.06–5.17 in avoided losses and development gains (Bharadwaj et al., 2025).

All three measures are designed to build on existing systems. The cash transfer can be delivered through bKash and Nagad, the mobile money platforms that Bangladesh already uses for government-to-person payments, targeted through the NID system and activated using Bangladesh Meteorological Department heat alerts. The country also has direct experience of forecast-based anticipatory cash transfers, which gives a working foundation for a heat-triggered scheme. The health and food measures build on existing government programmes, though as the following sections set out, their reach among the urban informal workforce is limited.

5.1.1 A heat-triggered cash transfer

Income protection is the most immediate need for workers affected by extreme heat, yet no existing programme compensates workers when heat prevents them from working. But Bangladesh is well placed to provide it: through bKash and Nagad, it has a mature mobile money infrastructure that is already used for government-to-person payments; it also has direct experience of forecast-based anticipatory cash transfers. Ahead of the 2020 monsoon floods, it used forecast triggers to deliver anticipatory cash to more than 23,000 vulnerable households through mobile money before the flood peak (Pople et al., 2021) and the Bangladesh Red Crescent forecast-based financing programme has since piloted early cash actions for floods, cyclones and heatwaves (Anticipation Hub, 2023). A heat-triggered transfer would therefore extend a mechanism that Bangladesh has already built and tested, rather than create a new one.

We propose a transfer delivered through bKash or Nagad, targeted using the NID system and activated by Bangladesh Meteorological Department heat alerts. Workers would be paid a daily amount of US$1.62, in line with the wage paid under the Employment Generation Programme for the Poorest, the government's main public works safety net (World Bank, 2019).

The total budget would depend on the intensity of the heat season. We provide estimates for three levels of severity, following the heat alert record: a normal year at 6 paid days, a hot year at 12 and a record year at 18. Targeted at the poorest 10% of the 32.16 million heat-exposed workers in the three highest-exposure divisions (some 3.22 million workers) and with a daily floor of US$1.62, we estimate the transfer will cost US$31.3 million in a normal year, US$62.5 million in a hot year and US$93.8 million in a record year (see Table 8).

Because payment would follow the heat alert trigger, the cost would rise in worse years. We therefore recommend that financing is designed with a layered approach, so that the pressure of the peak year does not land as a shock on the government budget. Government funds could cover the normal and hot year payments, and insurance could cover the additional payments needed in rare record years (see Section 5.3).

Table 8. Annual cost of heat-triggered cash transfer, by season severity

Season severity	Paid days	Cost (US$ billion)	Share of the US$2.34 billion wage loss
Normal year	6	31.3	1.3%
Hot year	12	62.5	2.7%
Record year	18	93.8	4.0%

5.1.2 Interim health support

Bangladesh has no health protection scheme for urban informal workforce. Its social health protection scheme, SSK, remains a pilot for households below the poverty line in three rural sub-districts of Tangail, covering around 100,000 households; and although it is intended to expand nationally, it does not currently reach urban informal workers (Chowdhury et al., 2021). With no scheme to fall back on, workers meet the cost of heat-related illness themselves and out-of-pocket payments make up around two-thirds of all health spending in the country (MOHFW, 2023). The task, therefore, is to provide interim support while the country builds a national scheme, ensuring heat-exposed workers are not left to absorb these costs alone in the meantime.

We propose two interim measures, alongside a recommendation that heat-exposed urban informal workers be prioritised as the SSK and wider universal health coverage agenda scale up. The first is seasonal mobile health camps to provide screening, oral rehydration, basic treatment and referral near workplaces and labour settlements during the hot season. The second is a treatment top-up to meet the out-of-pocket cost of heat-related illness for workers who fall ill despite the cash transfer.

The logic of the treatment top-up follows from the cash transfer. When workers receive income support during extreme heat, fewer are forced to work through the worst conditions, so acute heat illness in the hot months falls. But the need for treatment does not disappear. Some workers carry long-term conditions from earlier years, above all CKD, which require treatment regardless of whether they are working. Others remain exposed to heat at home, in poorly ventilated and overcrowded housing, even on the days they do not work. We therefore assume that half of the workers who would otherwise experience heat cramp will still require treatment coverage. Applied to the 3.22 million poorest workers in the three highest-exposure divisions at the hot season heat cramp prevalence of 90.2%, this comes to around 1.45 million workers. Valuing their treatment at one month of average urban out-of-pocket health spending — BDT 1,605.36 or about US$13.00 (Khan et al., 2025) — gives a treatment top-up of US$18.9 million.

Seasonal mobile camps that reach an estimated 1.43 million workers near workplaces and settlements at BDT 260 each, add US$3.0 million. Together, the interim health support totals US$21.9 million (see Table 9).

Table 9. Cost of interim health support

Support type	Cost (BDT, millions)	Cost (US$, millions)
Seasonal mobile health camps and outreach	931	10.71
Treatment top-up for heat-related illness	3,724	42.83
Total	**2,702.0**	**21.9**

5.1.3 Food programme access

Although Bangladesh runs several food assistance programmes, these rarely reach the urban informal workforce. The four main programmes — Vulnerable Group Feeding, Vulnerable Group Development, the Food Friendly Programme and Open Market Sales — were designed largely around rural poverty and disaster relief, and enrolment among the workers in this study is very low, at less than 1 in 10 (see Section 2.4.2). Open Market Sales operates in urban areas, but coverage is limited and awareness among informal workers is weak. The entitlement to subsidised food exists in principle, but these workers sit largely outside it.

The task is to extend food assistance access to heat-exposed urban informal workers, so that food support is available when heat reduces their earnings. We propose five measures: awareness and information campaigns; facilitation desks in 50 upazilas (administrative subdistricts) across the highest-exposure divisions; strengthening 2,000 fair price and Open Market Sales outlets in these areas; grievance and access support for workers registered in their home districts; and monitoring and evaluation (see Table 10).

Table 10. Cost of extending food programme access

Support type	Cost (BDT, millions)	Cost (US$, millions)
Awareness and information	28.5	0.23
Facilitation desks (50 *upazilas*)	130	1.05
Fair price and Open Market Sales outlet strengthening (2,000 outlets)	1,300	10.53
Grievance and access support	325	2.63
Monitoring and evaluation	260	2.11
Total	**2,043.5**	**16.55**

At US$16.55 million, the budget is 1.8% of the national food subsidy allocation of US$0.93 billion and 0.7% of the annual wage losses experienced by heat-exposed workers in the three highest-exposure divisions. Most of the spending goes to strengthening outlets and access systems in destination areas, rather than additional grain.

5.1.4 The full package

The total package required to support heat-exposed workers through cash, health and food would cost approximately US$69.8 million in a normal year, US$101 million in a hot year and US$132.3 million in a record year (see Table 11). The health and food components are largely fixed in cost, at US$21.9 million and US$16.6 million respectively, so the overall cost rises only as heat-related losses increase, and support expands when workers need it most.

Table 11. Overall cost of the proposed package, by season severity

Support (cost in US$, billions)	Normal year	Hot year	Record year
Heat-triggered cash transfer	31.3	62.5	93.8
Interim health support	21.9	21.9	21.9
Food programme access	16.6	16.6	16.6
Total package	**69.8**	**101.0**	**132.3**
Share of the US$2.34 billion wage loss	**3.0%**	**4.3%**	**5.7%**

5.2 Workplace protections and enforcement

The legal framework governing workplace safety sets no standard for heat, at a time when protection is becoming more necessary. The Bangladesh Labour Act 2006 and the Bangladesh Labour Rules 2015 require employers to provide wholesome drinking water, adequate ventilation, a tolerable workroom temperature, rest areas and first aid (Government of Bangladesh, 2006; 2015). But none of these provisions sets a temperature threshold above which work is considered unsafe and heat is treated as a matter for advisory warning rather than enforceable duty. The Bangladesh Meteorological Department issues heat alerts during heatwaves, but these place no obligation on employers to act.

Coverage is also limited. Most of the Labour Act's welfare provisions apply only to establishments above set worker count thresholds, so small units, outdoor workplaces and informal workplaces fall outside them. The provision allowing group accident insurance applies only where at least ten workers are employed, and even there it is not mandatory (Government of Bangladesh, 2006). The workers who are most exposed to heat — in construction, rickshaw pulling and day labour — are largely those the law does not reach.

There is another gap around compensation. The Third Schedule of the Labour Act lists the diseases that qualify for occupational disease compensation, and these do not include heatstroke, kidney disease or other heat-related illnesses. The Employment Injury Scheme piloted in the ready-made garment sector since 2022 covers work-related and commuting accidents, but occupational diseases remain outside its scope (ILO, 2024c). Workers therefore have no occupational claim for lost wages or treatment when they fall ill because of heat.

The following changes would address these gaps, and require little additional spending because they rely on regulation and enforcement rather than new expenditure:

- **Introducing a heat threshold into the labour rules:** a wet bulb globe temperature trigger should make a defined set of protections mandatory once crossed. These include drinking water, electrolytes, shaded rest areas and adjusted working hours, with outdoor work suspended at higher thresholds. Linking this trigger to Bangladesh Meteorological Department heat alerts would align workplace protection with the heat-triggered income support proposed in Section 5.1.1.
- **Replacing the worker count thresholds with a hazard-based approach:** the duty to protect workers from heat should depend on exposure rather than size of establishment. Any worker exposed to hazardous heat should be covered, whether the work is indoor or outdoor, and regardless of workplace size.
- **Recognising heat-related illnesses as occupational diseases:** heatstroke, heat exhaustion and heat-related kidney disease should be added to the Third Schedule of the Labour Act, brought within the scope of the Employment Injury Scheme and enforced by the Department of Inspection for Factories and Establishments, making heat protection enforceable rather than advisory.

These measures would protect workers while they are working. Combined with the income, health and food support set out in Section 5.1, they would provide a comprehensive safety net for the periods when extreme heat disrupts work.

5.3 Direct cash support versus insurance

Heat income support can be delivered in two main ways: as a direct cash transfer paid when a heat trigger is met or as an insurance payout. This section considers which is better suited to the needs of heat-exposed informal workers in Bangladesh.

The country's experience points towards direct transfers. It already delivers forecast-based anticipatory cash transfers through mobile money, reaching vulnerable households before a shock arrives, and has piloted early cash actions for heatwaves (Pople et al., 2021; Anticipation Hub, 2023). This provides a working foundation for a heat-triggered transfer that can be delivered quickly and at low cost through existing systems.

For insurance, the most developed real-world example in the region is the index-based scheme run by the Self Employed Women's Association (SEWA) in India, which offers some useful lessons. The scheme pays automatically when local temperature crosses a specified threshold, with no claim required. Piloted with 21,000 women in Gujarat in 2023, it covered around 50,000 women in 2024 and scaled to 250,000 in 2025 (WEF, 2025; IGC, 2025). Members in Ahmedabad receive US$8.78 when daytime temperature exceeds 43.6°C for two consecutive days and US$14.63 when it exceeds 44.1°C, against an annual premium of about US$8 (Thakur, 2025).

The scheme shows both the promise and the limits of insurance for heat. Three challenges stand out.

The first is basis risk — that is, the gap between the temperature index and the loss workers experience. In 2023, the threshold was set so high that some extremely hot days generated no payout (Thakur, 2025). Lowering the threshold would reduce missed losses but raise premiums, so calibrating that line is the central difficulty of parametric heat cover.

The second is timeliness. Early rounds paid after the heat event, with several days' delay before the money arrived; but workers need income when the day's wages are lost (Desai, 2023). Later rounds moved towards faster, forecast-linked automatic payments, which narrowed but did not remove this gap.

The third is adequacy. In 2024, the scheme paid US$350,859 to around 46,000 women, close to US$8 per worker for the season (WEF, 2025). Set against the heat-related income loss estimated in this study of US$89.10–148.90 per worker per year, a payout of that size would replace only around 5–9% of the loss, functioning as a supplement rather than a replacement.

SEWA's own design response is useful in this context. From 2024, the programme added a direct cash layer, paying a day's wage when temperatures reach 40°C, alongside the insurance payout reserved for higher thresholds (Climate Resilience for All, 2024). In practice, the model became a hybrid: direct cash for frequent, lower-threshold heat days and insurance for more extreme events.

The economics support that layering. Insurance has to cover administration, insurer margins and reinsurance costs, so it returns less to workers than it takes in. For a risk that is frequent, predictable and worsening, direct transfers are better suited, because nearly every taka funded reaches the worker and there is no basis risk. Insurance still has a role in rare, extreme years, when losses are large and concentrated and pooling can spread the fiscal cost.

We therefore recommend direct transfer (see Section 5.1.1) covering frequent heat days, which account for most income loss, with parametric insurance covering exceptional years when the fiscal cost spikes.

Table 12. Direct transfer versus parametric insurance for heat income support

Feature	Direct transfer	Parametric insurance (SEWA model)
Reach per dollar	Nearly all reaches the worker	Less; the balance is premium loading
Basis risk	None; pays on the district heatwave declaration	Real; the 2023 threshold missed extreme days
Timeliness	Same-season transfer based on the trigger	Pilot paid days late; has improved since
Income replaced (per worker)	US$9.72–29.16	About US$8, or 5–9% of the loss
Best-suited layer	Frequent, predictable heat days	Rare, extreme heatwave years

6
Next steps

The recommendations in this report are designed to link existing programmes and systems to heat and activate them before losses occur. The steps outlined here set out a practical sequence for moving from recommendation to implementation.

1. **Establish a common heat trigger.** The first step is to define the signal that activates both income support and workplace protections. Bangladesh Meteorological Department heat alerts already provide a basis. Adding a wet bulb globe temperature threshold for workplace measures and a higher threshold at which outdoor work should be suspended would create a single trigger that activates both workplace protections and cash support.
2. **Pilot the heat-triggered cash transfer.** The next step is to test the trigger, targeting and payment systems before wider scale-up. To do this, the government can pilot the proposed transfer in Dhaka, Rajshahi and Rangpur, targeting the poorest heat-exposed workers through the NID system, paying through the bKash and Nagad government-to-person platforms. Building directly on Bangladesh's existing forecast-based anticipatory cash transfer experience, the Ministry of Disaster Management and Relief is well placed to convene such a pilot, drawing on its role in anticipatory action and the Employment Generation Programme for the Poorest. The Department of Disaster Management, Ministry of Labour and Employment and city authorities would be well placed to implement the pilot.
3. **Strengthen the legal framework for heat protection.** This means amending the Bangladesh Labour Rules 2015 to include enforceable heat thresholds and associated workplace protections, with coverage based on heat exposure rather than establishment size and recognising heatstroke, heat exhaustion and heat-related kidney disease as occupational diseases under the Third Schedule of the Labour Act and Employment Injury Scheme. Responsibility for enforcement should sit with the Department of Inspection for Factories and Establishments.
4. **Invest in access to health and food entitlements.** Seasonal mobile health camps, facilitation desks and strengthened service delivery should be concentrated in the high-exposure divisions and informal settlements where heat-exposed workers live and work. Heat-exposed informal urban workers should be prioritised as the SSK and wider universal health coverage agenda scale-up. These investments are modest in cost and build on existing programmes.
5. **Agree the financing model.** A layered approach, with direct public funding for the recurring losses of normal and severe heat seasons and parametric insurance for exceptional years when costs spike, would combine the efficiency of direct transfers with the risk-sharing benefits of insurance. Bangladesh's experience with forecast-based financing could provide a foundation for this.
6. **Extend protection beyond the workplace.** Our findings show that heat exposure does not end with the working day. As such, future heat responses should extend beyond the workplace to include investment in cooling, water, sanitation and housing in the informal settlements where heat-exposed workers live. Cooler homes with adequate water and sanitation would allow workers to rest and recover from the heat they face at work.

7

Conclusion

This study has shown that heat exposure imposes substantial costs on workers, their households and the wider economy of Bangladesh. Across the highest-exposure divisions, workers lose billions in wages each year, while millions face worsening health, rising debt and a widening gap between what they earn and what they need to live with dignity. Yet much of what is needed to reduce these losses already exists. The NID system is in place. The bKash and Nagad payment platforms are in use for government transfers. Forecast-based anticipatory cash transfers have already been tested. The food programmes are funded and the weather information needed to trigger action is already produced. The only exception is health, where no scheme covers the urban informal workforce, so the task here is to build, rather than connect, protection.

Outside of health, however, the challenge is not one of initiating something new, but of coordination. Connecting the existing systems to heat, activating them before losses occur and extending protection from the workplace into the home would transform heat response from a reactive exercise into a form of anticipatory social protection. The costs to provide this support are modest compared with the losses already being borne by workers. Acting early through existing systems is an economic investment in protecting livelihoods, health and productivity in a warming Bangladesh.

Appendix 1. Study design and methodology

Site and sample

The study took place in Dhaka, Bangladesh's capital and largest city, selected for its high exposure to extreme heat, its large informal workforce and the presence of grassroots organisations able to reach workers who are hard to survey. We surveyed 175 informal worker households: 122 in outdoor sectors (construction, road work and rickshaw pulling) and 53 in indoor garment manufacturing. All selected households had an equal chance of inclusion and were grouped by workplace setting to allow direct comparison between the two samples. The Dhaka sample forms part of a wider study of more than 700 workers across India and Bangladesh.

Data collection

The household survey was the core instrument. Capturing demographics, income, housing, food security, water and sanitation access, work patterns, physical and mental health symptoms linked to heat, healthcare spending, productivity loss and access to employer or government support, it was supported by:

- Time motion studies, which tracked exertion, work and rest cycles, and changes in productivity during periods of extreme heat
- Self-reported health risk scoring tools, which recorded symptoms of heat-related illness, dehydration, fatigue and anxiety
- FGDs with men, women and young workers, which drew out subjective experiences, coping strategies and perceptions of fairness
- KIIs with employers, doctors, union leaders and government officials, which examined barriers to and opportunities for institutional action
- In-depth family case studies, which documented how the effects of heat accumulate across a season for a household, affecting income stability, children's schooling and health.

Our partner Ovibashi Karmi Unnayan Program (OKUP), a grassroots migrant workers' organisation, undertook the fieldwork in Dhaka. The trust it had already established with workers allowed candid responses, reflected in the quality of the data collected via the survey, FGDs and case studies.

Clinical input

A panel of three doctors advised on the survey tools, questions asked and analysis, and reviewed our findings. Local health professionals in Dhaka took part in KIIs and helped validate the symptoms workers reported, strengthening the health risk scoring. Their clinical perspective on the recurring health effects of heat, patterns of diagnosis and the difficulty of providing care to informal workers also informed the recommendations.

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Knowledge Products

Research Report

August 2026

Climate change; Policy and planning

Keywords:
Loss and damage, climate resilience, health, food security, climate finance

Extreme heat has become one of the world's most widespread occupational hazards, with Bangladesh among the countries most exposed. For Bangladesh's informal workers, rising temperatures are reducing productivity, eroding incomes, worsening health and deepening poverty. Yet most of this burden goes unaccounted for, because conventional assessments rarely capture it. This report measures that burden and sets out what it would take to reduce it. Using the Comprehensive Climate Impact Quantification (C-CIQ) toolkit and a survey of 175 informal worker households in Bangladesh's capital and largest city, Dhaka, we examine how heat affects workers both at work and at home, quantify the resulting economic and non-economic loss and damage, and assess the policy responses needed to protect those most exposed.

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