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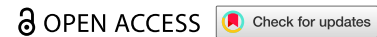


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RESEARCH ARTICLE



Through their lens: A photovoice study exploring pregnant and postpartum women's experiences, coping strategies and barriers to heat adaptation in an urban township in South Africa

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ABSTRACT

Rising global temperatures and heatwaves pose major health risks, particularly for pregnant women, infants and other vulnerable groups. Using Photovoice, we aimed to foreground how pregnant and postpartum women in an urban township in Tshwane, South Africa, experience and cope with heat stress. Fourteen women participated in two structured workshops held during the hot season (December 2023–January 2024). The first included reflective discussions on coping with heat and basic photography training. Over two weeks, participants captured over 300 images using disposable cameras or mobile phones. Selected images were reviewed and discussed in the second workshop. Thematic analysis of photographs and workshop transcripts identified three key themes: health impacts, coping strategies and structural challenges. Women preferred staying home on very hot days, where they had greater control over their environment. However, they struggled to soothe overheated infants, which they found distressing. They used simple cooling methods such as bathing or wet cloths but faced constraints including heat-trapping housing materials, inadequate ventilation, and limited access to water and electricity. These challenges led to a state of “*un-coping*”—where adaptation efforts are insufficient or counter-productive. Viewed through the women’s “lens”, these findings highlight the need for targeted adaptation strategies to improve climate resilience.

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Introduction

Extreme heat is increasingly recognised as a significant public health threat, particularly for vulnerable populations such as pregnant and postpartum women (Ebi et al., 2021). Climate change has brought rising global temperatures and more frequent and intense heatwaves, with important implications for maternal and child health (Lee et al., 2023). Sub-Saharan Africa bears a disproportionate burden of maternal and infant mortality, accounting for approximately 70% of global maternal deaths (World Health Organisation (WHO), United Nations Children’s Fund (UNICEF), United Nations Population Fund (UNFPA), World Bank Group, UNDESA/Population Division, 2023) and the highest under-five mortality rates globally (UNICEF, World Health Organisation, 2024). Extreme heat may further compound these burdens, making it critical to examine its impact on maternal and neonatal health in this region.

The heightened vulnerability of pregnant women to heat stress may be influenced by physiological changes that occur during pregnancy, including impaired thermoregulation and increased cardiovascular

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strain (Samuels et al., 2022). While the precise biological mechanisms linking heat exposure to adverse maternal and neonatal outcomes remain unclear (Bonell et al., 2024; Samuels et al., 2022), a recent systematic review of around 200 studies (Lakhoo et al., 2024) found that high ambient temperatures are consistently linked with an increased risk of obstetric complications, such as hypertensive disorders, preterm labour, and gestational diabetes. In the same review, heat exposure was also associated with adverse neonatal outcomes including low birth weight, stillbirth, congenital anomalies and increased neonatal intensive care unit admissions.

Beyond physiological susceptibility, social and environmental factors can further exacerbate pregnant women's heat exposure and ability to cope. Urban townships in Africa present unique challenges for heat adaptation due to rapid urbanisation, poor infrastructure, and high population density (Scovronick et al., 2015). Informal housing, often built with heat-retaining materials such as corrugated metal, can lead to indoor temperatures that significantly exceed outdoor conditions (Naicker et al., 2017; Weitz, 2024). Limited access to electricity and water, space cooling, and healthcare services further compounds these risks.

Despite growing evidence on the impacts of heat, little is known about how pregnant and postpartum women personally experience and cope with heat stress. A qualitative study in rural Kenya examined the experiences of pregnant women and found that local household gender dynamics and a normalisation of extreme heat limited women's capacity to avoid heat stress (Scorgie et al., 2023). An ethnographic study with post-partum women in urban and rural Burkina Faso highlighted the negative effects of heat on women's health and wellbeing (Kadio et al., 2024). Less is known about pregnant urban women in Africa, however, and there is a dearth of research from the Global South, reinforcing the urgent need for context-specific investigations, particularly in sub-Saharan Africa. To address this gap, we explored the experiences of pregnant and postpartum women in Mamelodi, a densely populated urban township in South Africa. We used Photovoice, a participatory research method that enables individuals to document and share their lived experiences through photography (Wang & Burris, 1997). The method has been widely used to examine community resilience to environmental stressors (Adams & Nyantakyi-Frimpong, 2021; Elum & Snijder, 2023), but not yet applied to the intersection of extreme heat, maternal health, and low-resourced urban settings. Designed to inform messaging for a heat early warning system, the Photovoice exercise in our study generated rich qualitative insights into the daily realities of heat exposure for women. By seeing the world through their "lens", this methodology helped to showcase and centre women's voices in an exploration of the lived experience of extreme heat. This "emic" perspective—insights grounded in participants' own experiences and perspectives, as opposed to those of 'outsiders'—is often absent in scholarship on extreme heat, climate change, and health (Scorgie et al., 2023), and is essential for developing feasible, context-specific interventions that enhance climate resilience and maternal health outcomes. The overall aim of the Photovoice activity within this project was to use a visual participatory method to document the day-to-day practices of pregnant and postpartum women in relation to extreme heat, with the broader purpose of co-developing relevant heat-health messaging. The specific objectives were: (i) to understand how heat events impact pregnant and postpartum women's lives; (ii) to learn how women cope with extreme heat during pregnancy and in the postpartum period; and (iii) to collectively develop heat-health messaging that is contextually relevant and appropriate. In this paper, we report on the first two objectives; another manuscript currently under development, reports separately on the messaging component.

Methods

Study setting

Mamelodi is a densely populated township in Tshwane district, approximately 20km from the Central Business District, with a mix of formal houses, backyard dwellings and informal settlements. Over the past two decades, there has been a sharp increase in the construction of backyard structures, which provide rental income to occupants of formal housing but further increase population density (Hamann et al., 2018; Hamann et al., 2020).

The study was conducted in the months of December and January to coincide with the hottest months of the year (December to February). During the study period, according to a local weather station in

Tshwane (The South African Air Quality Information System (SAAQIS), 2024), the average daily maximum, minimum and mean temperatures for December 2023 were 28.3 °C, 17 °C, 22.3 °C, respectively, with nearly 40% the days ($n = 12$) experiencing maximum temperatures of at least 30 °C. The hottest recorded temperature (35.5 °C) was on the 4th of December, the same day as our workshop. In January 2024 the corresponding values were 26 °C, 15.7 °C and 20.3 °C with most days ($n = 24$) reaching temperatures at or above 25 °C.

Participants were recruited from a local Community Health Centre (CHC) (2024), a primary healthcare facility that serves a population of around 260 000, providing antenatal care (ANC) to approximately 250 women and managing about 75 deliveries a month. Of the 1846 ANC visits in 2024, the majority of attendees 78.5% were aged 20–34 years with very few under 20 years (3.7%) (National Department of Health, 2025). Employment data and educational attainment are not systematically captured in health information systems. However, facility reports estimate an unemployment rate of approximately 73% amongst attendees (Health Facility Manager's Monthly Reports for, 2024), while Census 2022 data indicate that 62.4% of adults aged 25 years and older in the Tshwane district had completed secondary school or higher (Statistics South Africa, 2024).

Study participants

Pregnant women were recruited from the antenatal clinic and postpartum women from Well-Baby clinics at the CHC with a target of 24 women. This target was set based on previous experience within our team of conducting similar workshops, the anticipation of dropouts from the study, as well as the resources available to conduct and manage the study.

During the recruitment period, trained research assistants, fluent in the local languages and dialects (e.g. Isizulu, Sesotho), gave a brief presentation to women waiting to be seen at the clinic. Interested women were then directed to a private location to receive more information about the study. Purposive sampling was used to ensure a mix of ages and parity. Women were eligible if they were at least 18 years old, either in their 2nd or 3rd trimester of pregnancy, or had given birth to a live infant in the preceding three months. Participation required ability to provide documented informed consent for participation, including for audio-recording of workshop discussions. Women with serious complications of pregnancy requiring hospitalisation were excluded.

Photovoice methodology

Our Photovoice methodology included two workshops about a month apart, with the period in between used for photograph taking by the participants and assessment of these photographs by the research team. The workshops were led by two qualitative researchers with experience in Photovoice and expertise in community-based participatory methods. Additional researchers and research assistants supported workshop facilitation and provided translation where needed. Both workshops took place in a community centre located on the facility premises and lasted approximately four hours. The centre had diaper-changing facilities, and the research team provided cushions for the mothers and cots for the infants. Participants were also given meals and drinks, a gift voucher, and compensated for their time. The programmes for the two workshops are provided as a supplementary file (Appendix 1). Reporting of this study followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines (Tong et al., 2007), with the completed checklist included in the supplementary files (Appendix 2).

Workshop 1

The introductory workshop was held in December 2023, summertime in South Africa, and incidentally coincided with a declared heatwave. Participants were introduced to the study's objectives, the Photovoice method, and received training on basic photographic techniques.

We used two collaborative participatory exercises - community mapping (Stadler et al., 2013) and body mapping (Coetzee et al., 2017) - to encourage participants to reflect on their experiences with heat. For the community mapping exercise, women collaborated to map places in their neighbourhood that they regularly visit and describe navigation of these spaces during extreme heat. The body mapping exercise

Table 1. Body mapping questions.

Reflection questions for body mapping exercise

- Where do you feel heat on your body?
- How does heat affect your movement?
- How does the heat affect your emotions?
- How does heat affect your thinking?
- How does heat affect how you interact with your child?
- What is the different about your experience of heat as a pregnant woman?
- How does your child experience heat on their body?

involved participants outlining a general body image on a large sheet of paper and marking areas where they felt the effects of heat most acutely. To guide the body mapping, participants were given a set of questions to consider (Table 1). The women facilitated the discussions within their groups, while researchers attached to each group offered prompts when needed.

Participants then returned to the larger group to share insights and provide feedback. Together they examined examples from other Photovoice projects and discussed potential ethical concerns about photographing in their communities. Emphasis was placed on not taking photographs that could easily identify individuals (e.g. people's faces). Participants were taught some key basic photographic techniques including lighting, framing and perspective, and were shown how to use a disposable camera.

Discussions were held about the types of photographs appropriate for the study. Women were encouraged to capture images that reflected their own personal experiences and coping strategies, including how they felt, and the conditions they faced within their community—both supportive and challenging- in coping with heat. Women were asked to consider the following when taking pictures:

- What do you experience when it's hot?
- What do you do to cope when it's hot?
- What advice would you give to other women on how to cope with the heat?

Finally, participants were given an opportunity to practice taking and captioning photographs that reflected their experiences of the workshop. This was done using mobile phone cameras with captured images shared with the group for discussion and feedback.

Before departing from the workshop, each participant was provided with a disposable camera (Kodak FunSaver, 39 exposures) - although participants were told they could also use their phone camera if preferred—and a notebook to document thoughts and reflections during the Photovoice task. They were told they would have approximately two weeks to take photographs, with an expectation of 24–30 photographs each. WhatsApp was selected as the preferred platform for sharing images captured on phone cameras due to its accessibility, ease of use, and secure encryption. Participants were provided with mobile phone data to enable them to send their photographs to the research team by WhatsApp. Flyers describing the study in three local languages (English, IsiZulu and SeSotho) were provided to participants to help explain the study to community members if needed.

Photography in the community and selection of photographs

During the two-week period following the introductory workshop, the study team maintained regular contact with the participants, to provide support and address any challenges they encountered. All participants were contacted at least twice during this period, after which the disposable cameras were collected and photographs processed, and the photos sent on WhatsApp collated.

All photographs were then assessed by three members of the study team, which included three female researchers with post-graduate qualifications in public health (MPH), anthropology (PhD) and demography (PhD). They independently ranked each image using pre-determined criteria formulated to identify high quality images with the greatest relevance to the study (Table 2). Relevance refers to whether the images broadly depicted women's experiences of heat in daily life, particularly during pregnancy and early infancy. Some images were selected based on their uniqueness and the potential to have an underlying story worth exploring further. The highest-ranking images were curated into a final set for further discussion at the follow-up workshop. This curation was a pragmatic choice, setting aside photographs whose technical

Table 2. Criteria and ranking scale for assessing photographs.

Responsive to study objectives	Quality of photos	Narrative quality
1 = Not responsive (photograph has no apparent relevance to the study's focus on heat)	1 = Very poor (out of focus, over/under-exposed, poorly framed)	1 = Poor (little coherence; photos don't really tell a story)
3 = Moderately responsive (photograph shows some potential relevance to heat)	3 = Adequate	3 = Adequate (some coherence; potential for a story to emerge from images; something unusual or unique)
5 = Highly responsive (photograph is clearly relevant to heat in pregnancy in pregnancy, postpartum or for infants)	5 = Very good (clear pictures, in focus, good use of lighting, well-framed)	5 = Good (coherent and fluid; participant is really telling us something through the images; unusual or unique images worth exploring further)

quality was so poor that virtually nothing was communicated by them, or whose subject matter had no relevance to the study's central focus on heat in pregnancy or postpartum. Through this process, the set of photographs for discussion in the second workshop could be reduced to a manageable number, thereby allowing for the most efficient use of the participants' limited time in the study.

In this article, we present an analysis of only the curated sub-set of photographs used as a basis for discussion in the second workshop.

Workshop 2

The final workshop was held in late January 2024, where participants returned to reflect on the photographs selected. Each participant was given the opportunity to share one of their selected photos with the group as a way of opening discussion of experiences. They were invited to describe what the picture depicted, what they intended to convey through it, and the circumstances in which it was taken. Women could also share their experiences of taking the photos. Other participants were encouraged to ask questions or offer reflections in response to the photograph being discussed. The group then received guidance on developing impactful captions for each photograph, focusing on clarity, emotional expression, and key takeaways for other women in their communities.

Participants worked collaboratively in small groups (3–4 women) to develop messaging around advice or recommendations for coping with the heat, based on their individual photographs and captions. The workshop concluded with women providing feedback on their experiences of participating in the workshops and the overall Photovoice experience. Women also received a printed copy of their photos to take away with them.

Ethics

Study procedures were approved by the University of Witwatersrand Human Research Ethics Committee (Ethics number 230808), the District of Tshwane Health Research Committee and the health facility manager. All participants provided written informed consent prior to enrolment in the study.

Data analysis

Discussions during the workshops were recorded (including small group discussions and discussions during the mapping exercises) and transcribed by a professional transcription service. Transcripts were checked against the recordings by the first author [IS] and corrections made where needed. Transcripts and photograph captions were then open-coded following a thematic analysis approach as described by Braun and Clarke (2006). All data sources—Workshop 1 transcripts, Workshop 2 transcripts, and participant-generated photograph captions—were analysed together in one thematic process. Coding was initially done by the first author and a coding tree developed. One transcript from each workshop was independently coded by a second author [FS]. Both authors compared their coding and resolved any differences until consensus on the coding tree was achieved. The remaining transcripts were then coded by the first author. Qualitative data analysis software, MAXQDA24 (*Verbi software*), was used to manage and code the data.

Results

While 24 participants were enrolled (12 pregnant and 12 postpartum women), only 14 attended the first workshop (7 pregnant and 7 postpartum women). Seven of the women who withdrew from the study

before this workshop cited personal reasons, including having other commitments on the day ($n = 3$), caring for an unwell child ($n = 1$), unexpected relocation ($n = 1$), too hot to attend ($n = 1$), and loss of interest ($n = 1$). Two further women could not be contacted on the day, and one indicated she was on her way but never arrived. For the second workshop, 13 of the 14 women attended; the absent participant had travelled on the day of the workshop. Participants' socio-demographic details are provided in Table 3.

A total of 303 photographs were taken by the participating women. Almost half of these ($n = 141$; 46,5%) were taken with the participants' own camera phones and sent to the study team using the WhatsApp platform. The remaining photos ($n = 162$; 53,5%) were captured with disposable cameras (Table 4).

Participant discussions and photographs centred around three main themes: impact of extreme heat on health and wellbeing for themselves and their infants; coping strategies; and related environmental and structural challenges. Participant quotes and photograph captions are presented verbatim.

Impact of heat on health and wellbeing

Participants' descriptions and photographs indicated several signs of heat strain. During the body mapping exercise, women described feeling heat all over their bodies but particularly under their breasts and on their necks. Workshop participants noted that, *"As a pregnant woman we feel heat everywhere but sometimes you find your body wet, all of it."* (workshop 1). The heat felt during pregnancy was also described as being more severe than when not pregnant, with many women describing it as *"double"* and one woman exclaiming, *"I feel heat times 10!"* (Workshop 1 participant).

Table 3. Socio-demographic characteristics of 14 participants.

Age (years)	Median: 30; Range: 19–42 kMedian: 2; Range: 0–5	
Number of children	n	col%
Pregnancy status at enrolment		
Pregnant	7	50.0%
Post-partum	7	50.0%
Parity		
Primiparous	4	28.6%
Multiparous	10	71.4%
Education level		
Some high school	3	21.4%
Completed high school	8	57.1%
Some tertiary education	1	7.1%
Completed tertiary education	2	14.3%
Marital status		
In a stable relationship (but not married)	7	50.0%
Single (never married)	4	28.6%
Married common-law	3	21.4%
Employment		
Employed (full/part-time or self-employed)	4	28.6%
Not employed but looking for work	10	71.4%
Main source of income		
Income earned informally	6	42.9%
State grants	3	21.4%
Salary from formal employment	1	7.1%
No Income	2	14.3%
Other	2	14.3%
Monthly income (South African Rands)		
No income	2	14.3%
≤R1000	8	57.1%
R1001 – R2000	2	14.3%
R2001 – R3500	2	14.3%
Type of home		
House, brick or concrete structure on a separate stand	3	21.4%
House, flat or room separate from main dwelling in backyard	4	28.6%
Informal dwelling	7	50.0%
Home ownership		
Own their home	6	42.9%
Government subsidised housing	5	35.7%
Renting the property	3	21.4%
Access to mobile phone		
Yes	14	100%

Table 4. Image source and number of photographs selected.

	Number of WhatsApp photos	Number of disposable camera photos	Total number of photos	Number of photos selected for workshop*
Total	141	162	303	96
Average number per participant	10.1	11.6	21.6	6.9
Range per participant	0–40	0–33	7–40	5–11

Note: *Main reasons for non-selection include duplicate or repetitive photos/shots, under/overexposed images, images not relating to heat or women's experiences of heat.



"On this picture I took a picture of my swollen feet after a long day, so I was sitting under the tree."

(Pregnant woman, primiparous, 34 years)

Figure 1. Swollen feet.

Women described physical effects on their health, including fatigue, severe sweating and dizziness. This affected their ability to perform routine chores, as noted by one participant who said, *"We become lazy to walk or do something in the house."* Cognitive ability was also perceived to be affected with women saying that they found it hard to concentrate with the heat. *"You can't think straight when it's hot."* They found the heat at night particularly troublesome, describing it as a *"problem"* that affected their sleep. One woman even attributed a nosebleed to the heat. While several women mentioned swollen legs or feet, some were not always certain if this was caused by heat or by pregnancy itself. Nevertheless, swollen feet featured in a few photographs (Figure 1).

Women also reported their infants being disturbed by the heat, as illustrated by their constant crying, restlessness and sleep disturbance. Breastfeeding was negatively affected, as described by this participant: *"[Breast]Feeding a baby in a tin house with heat. The baby does not enjoy the milk. Heat affects a lot."* (Workshop 2 participant) Infants also reportedly suffered from heat rash, which one mother found so distressing that she took her infant to be seen at a clinic in the middle of the night (Figure 2). The act of carrying or rocking infants only made both mother and infant hotter. These reactions to the heat as well as the feeling of helplessness also affected women's emotional states. They described feelings of frustration or sadness as they felt incapable of consoling their child.

"You feel frustration, even the baby, he or she doesn't feel good when it's hot, she or he feels like to cry only just because of the heat, you don't even know how to hold the baby...you don't know what to do because of this heat so you too become sad." (Workshop 1 participant)

"And then remember when your baby starts crying, when you start holding your baby, doing like this 'shushu baby' thing, you also getting hot. Your body temperature rises. You are holding a baby, the baby as well is getting hot, it's becoming like too much for both of you." (Workshop 1 participant reporting back on group discussion)



"Here, my baby had the rash, and it was very irritating on her, she was crying non-stop because it was very hot at 36 degrees on that day. She couldn't sleep at all..."

(Postpartum woman, multiparous, 39 years)

Figure 2. Baby rash.



"This picture on this day it was very hot. The temperature was 34 degrees [°C] and there was no one on the street the streets was empty everyone was indoor because of the heat."

(Pregnant woman, multiparous, 42 years)

Figure 3. Empty street.

Coping strategies

Women overwhelmingly preferred to stay at home on hot days, describing it as the most comfortable place to be because "...at least if you're at home you can do your own thing" (workshop 1 participant). Opting to stay at home meant the freedom to wear fewer items of clothing, or none at all, both for themselves and their infants. Swollen feet also made wearing shoes uncomfortable and being at home meant they could walk around barefoot. They found crowds and queues difficult to manage in the heat and a few women resorted to online shopping.

"And then when you are at home, it's the most convenient space that we all have, 'cos you can take off your clothes, walk around with your tights in the house, with your bra, you get more fresh air, you have a fan, you have a wet cloth, whether it's a towel or what, you can just wrap yourself with that. And then it's more convenient to be home than to be outside in the sun." (Workshop 1 participant reporting back on group discussion)

Several submitted pictures showed empty streets, to demonstrate how people chose to stay indoors during the hottest parts of the day (Figure 3).

Within the home, women used a combination of strategies to cope with high temperatures, which may be grouped into three main approaches: directly cooling the body; creating cooling spaces in the home;

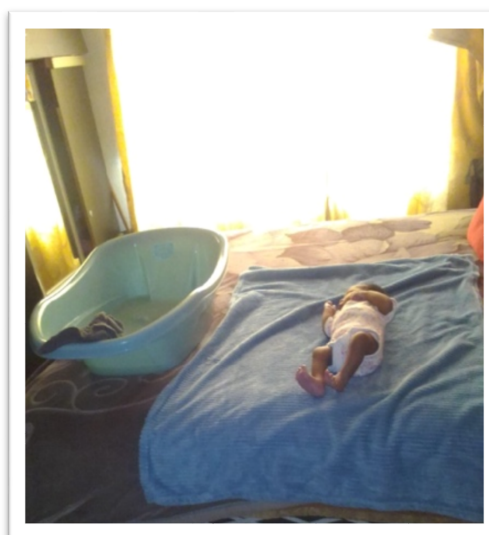
and adjusting their behaviour or routines to better manage the demands of caregiving and household responsibilities in the heat.

Bathing was the predominant method used for direct cooling, with many saying they took several baths a day. Most women also reported bathing their infants at least three times a day, finding this to be the most effective way to quickly soothe irritable babies (Figure 4). Other ways of directly cooling the body included wrapping themselves or their infants in a wet cloth or towel. For some women, soaking their feet in basins of cool water provided some relief (Figure 5) and one mentioned playing “water splash” games outside. Hydration was an important part of direct cooling: women drank water, particularly cold water if available, and breastfed infants to soothe them.



This picture shows how hot [I was] and I was so frustrated on this day because of I'm undress and the baby too. I was trying to calm him down so that he can sleep. It took me about an hour and he finally sleep after 40 minutes, by breastfeeding him.

(Pregnant woman, multiparous, 42 years)



The baby feels the heat, the baby was crying because of the heat so I decided to bathe her to cool her off. After I have done bathing her, she stopped crying when she was inside the water.

(Postpartum woman, multiparous, 29 years)

Figure 4. Bathing and undressing.



“...it was a sunny day, and it was hot, the temperature was 27 degrees, I was also pregnant at the same time. My legs were swollen because of heat, the way it was hot. I had to come up with an idea of putting my legs in a bathtub, in that bathtub I had to put some ice and lemons just to reduce some swelling for a period of time.”

(Postpartum woman, multiparous, 30 years)

Figure 5. Feet in water.



"In this picture I came back home from the mall, and I've got my mother sitting under the shelter. And that day the sun was really hot, so I thought maybe how about I put some blanket on top of them and try to make another shelter from them. Because the sun was moving across the net and was moving on top [of] the child."
(Postpartum woman, primiparous, 19 years)

Figure 6. Grandmother and infant in the shade.

To cool their home environment, women used fans if they had them, closed curtains because *"it keeps the room cool"*, or opened windows and doors to increase ventilation. This strategy was partly dependent on outdoor versus indoor temperatures: One woman reported that she closed her doors because *"the heat that is inside will be the only heat that is inside. More heat won't come in."* (Workshop 2 participant).

They also tried to find innovative ways to keep their immediate environment cool by blocking the sun. One woman described how she hung extra blankets over her outdoor space to create shaded areas around the home in which to sit (Figure 6).

The third strategy for coping with the heat involved making changes to their daily schedules or adjusting behaviour. They would do heavier, more intense chores such as laundry either very early in the morning or late in the evening when it was cooler and avoid long distance travel on hot days. At home, they chose to sleep on the ground (both indoors and outside) or change their babies' diapers on the floor in order to move away from the tin roofs, which became too hot during the day. They specifically mentioned avoiding sitting on their beds because it was said to *"trap the heat"*.

"And then, again, avoid being like maybe on top of the bed. At least lay on the floor. Because a bed has heat. At least it's better on the floor." (Workshop 2 participant)

Coping strategies outside of the home environment were more limited. When walking in the sun, women used sun hats or umbrellas for protection. They sought out shade wherever possible, sitting under trees when outdoors. Several photographs were of people staying close to the side of buildings to make use of their shade. Some women spoke about going to the park or a community swimming pool to cool off. The only places with access to air conditioning mentioned were churches and shopping malls.

"With the park, we all know that if you go to the park, there is trees that you can sit under there, there's pools that you can swim just to cool off your body... While your kids are playing there, you can just sit under the tree or under the car ports because most of the parks there have the car ports. You can just sit there...it is much calmer, and you can also relax from there." (Workshop 1 participant)

"When you go to the mall, when it is hot, at least when you go inside the mall it is much calmer, it is cool, and then it just relaxes your body, and you become free." (Workshop 1 participant)

Constraints and challenges to coping

Participants identified a number of environmental and structural issues that exacerbated the effects of heat and limited their ability to cope with its effects.

Limited access to water

With water being essential for daily living and central to many of the coping strategies, access to water was one of the most significant features of the women's environment that impacted on their ability to cope with the heat. The community was facing severe water shortages at the time of the study, contributing to an already difficult situation. Women had to stand in long queues in the heat waiting for water tankers to deliver water and then carry heavy containers of water or wet laundry back to their homes (Figure 7). These heavy loads were carried on their heads or with wheelbarrows, when available, and older children were sometimes enlisted to help. Postpartum women carried babies on their backs to free up their hands, but this close contact made them both feel even hotter. Alternatively, women had to wait for their babies to sleep before going out to fetch water. There was an added layer of stress as some women described either not having anyone to babysit their infants or were worried about leaving their infants at home with others. Male partners were also sometimes not willing to help; as one participant put it, *"they'll tell you that it's a woman's job"*. Even without the acute water shortage, most women relied on outdoor taps - located within their yard or in a communal area - to collect water in buckets, a heavy task, particularly for pregnant women.

"We all know we're struggling with water lately in our community, so it's very hard to get water. You need to walk maybe a mile to go get water somewhere, you're having a baby from your back. That creates another problem for baby and mother with the heat. So, we just hope this issue with the water thing can be resolved quicker cause it is giving us problems as mothers because you need to go get water for during washing, you need to go get water for cleaning, for bathing. So, it is a 'must-have' thing that you need to go out and get [but] while you're having a small baby like this, walking in the sun with a bucket on your head, it's a problem." (Workshop 1 feedback to group)

"When that day I took the picture it was in the morning around 9 am and that time I was having a new born baby and no water in the house it took me two hours to get that water, waiting for the truck to come and the queue was long."

(Pregnant woman, multiparous, 36 years)



"We stand here for a long time, waiting for the truck to come and bring water. And then the heat is affecting us so much." (Workshop 1 participant)

Figure 7. Water challenges.

"... 'cos putting the baby at the back, you also sweat and then you are transferring your heat to the baby, plus the blanket that you are putting on the baby [to tie the baby onto their back], yo, it's a lot. The baby will definitely cry." (Workshop 1 participant)

Built environment constraints

Participants' discussions and photographs highlighted how the built environment exacerbated the challenges of coping with heat. Issues such as heat-trapping housing materials, proximity to dumping sites, and the scarcity of green or shaded spaces in their communities significantly limited their ability to find relief, both indoors and outdoors.

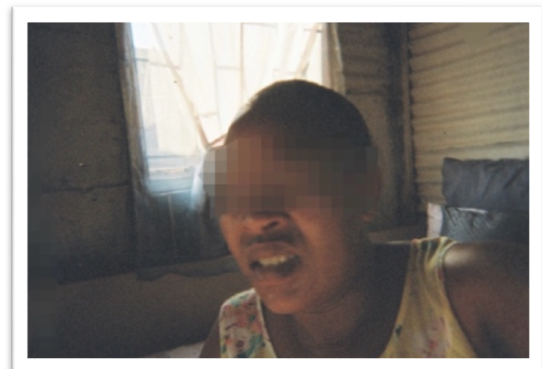
Housing. Some women lived in homes constructed from tin sheeting and other inadequate building materials. Participants described how their homes retained heat, making even basic activities inside uncomfortable, and even coping strategies such as opening windows were often ineffective. The two photographs in [Figure 8](#) highlight the unbearable heat women endured in their homes, one a self-portrait taken inside a tin house while the other depicts the tin ceiling and window of a shack. In addition, power outages reduced the dependability of fans. Cooking indoors was recognised as further intensifying the already stifling conditions inside their homes.

"...obviously heat plus corrugated sheets, plus stove. I tried to switch the fan on. Still, the fan did not help because it was blowing hot air." (Workshop 2 participant)

Proximity to dumping sites. Open dumping sites located close to houses in some communities posed an additional layer of difficulty for women ([Figure 9](#)). The smell from these sites as well as the flies they attracted often forced residents to keep their windows closed. This compounded effect was described by one participant as follows: *"Because they can't even open the windows as well. Imagine the heat inside the shack."* (Workshop 2 participant) and another, who stated: *"We also can't handle living in a place that smells like that, especially when it's so hot."* (Workshop 2 participant). Concerns about hygiene and the potential health risks for their infants, added to the challenges of living near these sites.

"I was sweating in my Tin house, I was about to cry because of the heat."

(Pregnant woman, multiparous, 30 years)



"The heat of the shack is too much"

(Pregnant woman, multiparous, 36 years)

Figure 8. Heat in shack.



“There is a dumping site behind the shack and the smell is not good, [it] is very affecting people in my community's health especially the newborn babies because they can't even open windows or doors. Imagine the heat inside the shack.”

(Pregnant woman, multiparous, 36 years)



Figure 9. Dumping sites.



“... most of [the] people who stay here struggle to stay outside and receive some fresh air because there's no shelter outside, so they must stay indoors even though it's hot. This place doesn't have a grass and doesn't even have some trees. It's a dry place. People struggle a lot.”

(Postpartum woman, primiparous, 19 years)

Figure 10. Tin house, lack of vegetation.

Green spaces. Lack of green or shaded spaces around homes and in some communities was also a problem. One photograph (Figure 10) taken by a participant vividly demonstrates how certain areas within the community had a severe lack of greenery around homes, with almost no provision of outdoor shading.

While women mentioned visiting parks as a way to cope with the heat, their photographs showed that even the park couldn't provide relief on days with intense heat, when sitting in the shade of trees did not provide the respite one would expect (Figure 11). On such days, the park was not an inviting place to be.

Institutional infrastructure. Attending clinics for antenatal care or baby-wellness cheques and collecting social grants from government facilities were described as significant challenges for participants. Women



“At the park, under the tree it’s hot. Waiting for the sun to cool up so the kids they can have their time to play just because the heat is affecting them to play.”

(Pregnant woman, multiparous, 19 years)

Figure 11. Hot park.

described having to endure long waits outside facilities with no proper shading or seating areas. They had to sit on the ground outside clinics and use their hands, clinic cards or other makeshift items to fan themselves in the heat. They found these conditions particularly challenging, contributing to their sense of physical exhaustion.

Participants mentioned the absence of diaper-changing facilities, which forced them to change their infants on the ground outside the clinic, regardless of the weather. These inadequate facilities made an already stressful experience even more difficult.

Discussion

Despite growing evidence of the impacts of heat on maternal and child health (Chersich et al., 2023; Lakhoo et al., 2024), there is limited attention in the literature on understanding this experience from the perspective of women themselves (Laue et al., 2022). Three previous studies, from Burkina Faso (Kadio et al., 2024), rural Kenya (Scorgie et al., 2023) and the Gambia (Spencer et al., 2022) explore this aspect to some extent. However, these studies are from contexts and populations very different to our urban site in South Africa.

In this study, pregnant and postpartum women from an urban township shared their experiences with navigating heat in their homes and communities. The use of Photovoice in our study provides a unique opportunity for women to craft the narrative of their experiences with heat on their own terms, and to depict their experience visually, rather than limiting themselves to the kinds of verbal accounts typically captured in interviewer-led interviews. Their photographs give expression to lived experiences that reveal not just the effects of extreme heat on the [pregnant or postpartum] body, but also how heat intersects with socio-economic and infrastructural inequities, with profoundly disabling consequences.

Impact on health and wellbeing

Women overwhelmingly reported feeling heat more intensely when pregnant compared to when not pregnant, echoing findings from a study with pregnant farmworkers (Spencer et al., 2022). In addition, a study investigating thermal comfort in pregnancy reported that thermal sensation increases with the progression of pregnancy (Peng et al., 2022). This increased sensitivity is due to the numerous physiological changes that occur during pregnancy including thermoregulatory capacity and increased metabolic rate (Samuels et al., 2022), and implies that pregnant women will be more vulnerable to heat stress than the general population.

Women in our study detailed how heat disrupted their ability to carry out routine tasks, care for their infants, and find rest. Symptoms such as fatigue, dizziness, and severe sweating were widely reported, alongside cognitive difficulties, as participants described their inability to “think straight” in extreme heat. These findings point to signs of heat exhaustion and are also similarly reported in other studies (Kadio et al., 2024; Scorgie et al., 2023; Spencer et al., 2022). Swollen feet were another symptom mentioned although

some women were uncertain whether this was due to heat as water retention is common in pregnancy (Parker et al., 2022).

Infants were also shown to be affected by the heat, leading to crying, restlessness, sleep disturbances, and heat rashes. Irritability in infants had a huge emotional effect on mothers, as they expressed feelings of frustration and sadness at being unable to console their children. Finding ways to soothe infants was a struggle as both breastfeeding or carrying and rocking babies—routine, well-established soothing methods—made both mother and infant hotter. Heat-affected breastfeeding has been similarly reported elsewhere (Kadio et al., 2024; Lusambili et al., 2024; Spencer et al., 2022) and in a prospective study in Burkina Faso (Part et al., 2022) examining breastfeeding behaviour, the authors reported a negative association between temperature and breastfeeding duration, with on average 25 minutes less spent on breastfeeding on hotter days than cooler days.

Home is where the heat is

In terms of coping strategies, staying at home was identified as a key strategy, as this was where women felt they had the most control over their environment and how they dressed. Many of women's domestic cooling strategies involved the use of water. Frequent bathing was seen as highly effective, particularly for infants, and women cited strategies such as drinking cold water, wrapping themselves in wet cloths or soaking their feet in tubs of water. Using water to cool down has been highly recommended as a low-cost method for self-cooling (Jay et al., 2021)—yet accessing water was a daily struggle in this setting and one of the biggest challenges for women. With urban water scarcity projected to intensify due to the combined pressures of urban growth and climate change (He et al., 2021), it is essential that local government structures prioritise equitable water access as part of heat adaptation strategies.

Methods for cooling their environment were limited to relying on natural ventilation, mostly keeping windows or doors open or using fans, if available. But some women experienced fans as ineffective, likely because they do not reduce air temperature but merely circulate the air (Jay et al., 2021) and may therefore provide little or no relief in an already hot house. In addition, fan use is discouraged in very hot weather as they have the potential to increase core body temperature (Meade et al., 2024).

Natural ventilation methods may also be more challenging in houses built with materials such as corrugated iron, which absorb and trap heat. A study by Hugo et al measuring indoor temperatures in typical informal dwellings recorded temperatures of above 48 °C in the hottest month (January) (Hugo, 2023). Studies have shown that such houses are often several degrees warmer indoors compared to outdoor temperatures (Hugo, 2023; Radebe et al., 2024)—by as much as 4–5 °C (Naicker et al., 2017). Preliminary analysis from another study conducted by our team found that factors such as roof insulation, building type and surrounding vegetation affected indoor temperature (unpublished data from the HAPI study (Radebe et al., 2024).

These findings are an important consideration for the kind of messaging communicated in extreme heat alerts. Conventional advice during heatwaves often includes recommendations such as staying indoors or closing windows during the day to prevent hot air from entering the home (Global Heat Health Information Network, 2025). However, for those living in the type of heat-trapping housing described above, this advice may not be practical or effective considering how much hotter it could be indoors than outside. This highlights the importance of developing context-specific messaging that reflects lived realities. Our participants' photographs offer valuable insights that can inform the development of such tailored public health communication, which was the overarching aim of the project.

Suggestions have been made for using reflective white paint on roofs as a way to reduce temperatures within informal dwellings (Hugo, 2023; Nutkiewicz et al., 2022). "Cool roofs" work by reflecting sunlight back into the air reducing the amount of thermal energy stored (Elnabawi et al., 2022). The study by Hugo et al (Hugo, 2023) showed that cool roofs can reduce exposure to heat stress by between 42–63% in low-income housing. Other studies suggest reductions in indoor temperatures by several degrees, though reductions vary considerably (Synnefa et al., 2007; Vellingiri et al., 2020). More larger-scale studies are needed to assess the feasibility, acceptability, longevity, and unintended consequences of cool roofs within these communities (Bunker et al., 2024).

Dumping sites also pose a further challenge to ventilation within hotter homes. By not being able to open windows due to prevailing odours and flies, they impede the already limited coping options available to women. Addressing the issue of dumping sites is both necessary and critical as they affect health not only from a hygiene/public health perspective but also from a climate resilience angle.

Public spaces and institutional responsibility

Outdoor cooling spaces were limited, and public spaces played a mixed role in heat relief. For some, the park was a potential cooling space, but not on days of extreme heat. Public spaces with air conditioning—such as churches and shopping centres—offered some respite, but navigating crowds in these spaces sometimes made them unappealing. Healthcare clinics and payout-points for government welfare grants were places where women spent much time, by necessity, but these spaces lacked seating, shaded areas or diaper-changing facilities. Fineman's vulnerability theory (Fineman, 2008) argues that while vulnerability is a universal and inherent condition of human existence, social institutions—such as the state—play a critical role in either mitigating or exacerbating these vulnerabilities. In this setting, public sector facilities, which largely serve a population that is already vulnerable, would appear to further exacerbate this vulnerability for women. While women may have little control over the built environment in the communities where they live, public sector facilities such as these can and should become places where some level of respite can be achieved.

The importance of green spaces and other nature-based solutions in urban environments has been highlighted in several studies (Di Leo et al., 2016; Kiribou et al., 2024; Ngulani & Shackleton, 2020; Yang et al., 2017). According to Singh et al (Singh et al., 2020), greening is often rated as feasible but is also highly dependent on context. For example, in a densely packed, semi-formal settlement, growing trees may not be feasible. Developing community cooling spaces has been recommended as a solution for areas such as these (Hugo & Sonnendecker, 2024) and could perhaps give women more options for spaces where they can seek relief from the heat.

"Un-Coping": The disconnect between effort and effectiveness

While women demonstrated their resilience through the various ways they tried to cope, one of the major insights provided in this study is a concept we term "un-coping". We use this term to describe how structural and environmental barriers either diminished the effectiveness of coping strategies or in some cases, even made them counterproductive. It captures the tensions women navigated as they attempted to manage the heat, as so eloquently demonstrated in their own words and images. The tensions between individual agency and external/structural constraints. Women had multiple uses for water to cool down but struggled to access it; opening windows was desirable but not always feasible due to bad smells, flies, and mosquitoes; the choice between going out and staying in was not an easy one as it was hot either way; and irritable babies needed to be soothed by breastfeeding and rocking, but in both methods, skin-to-skin contact produced more heat. In short, many of the women's coping strategies were so constrained by the conditions of their environment that they were effectively undone, while some even backfired. Un-coping connects to other established concepts in adaptation literature, including coping ranges, adaptation limits, and adaptive capacity. These concepts or frameworks typically operate at the system level, framing how societies, sectors, or regions can withstand or adapt to climatic stressors. The coping range, for instance, represents the set of climatic conditions within which established practices continue to function, and outside of which those practices fail (Smit & Wandel, 2006). Similarly, discussions of adaptive capacity often emphasise the structural resources, institutions, and skills that determine whether coping ranges can be maintained or extended (Intergovernmental Panel on Climate Change (IPCC), 2023; Smit & Wandel, 2006). Un-coping complements these broader perspectives by drawing attention to the micro-level or individual face of adaptation limits. It highlights how structural, environmental, or social constraints can narrow the effective coping range, preventing individuals from realising their adaptive capacity in practice—even when conditions remain within the effective coping range. In this sense, un-coping shows how the limits and capacities described in theory are actually experienced in everyday life.

These challenges are not unique to this population; several studies have highlighted how underserved and low-income communities are particularly vulnerable to the effects of heat. A recent review on heat stress in African informal settlements highlighted how poor housing and limited adaptation options meant that low-income residents were disproportionately exposed (Laue et al., 2022). Women in this study demonstrate how this experience is further compounded for both pregnant women and mothers with infants.

“Un-coping” highlights the urgent need for systemic interventions that address both environmental and structural drivers of vulnerability in our quest to build truly resilient communities in an increasingly warmer world. Such interventions—and the broader architecture of mitigation and heat adaptation planning in the Global South—must be context-specific and tailored to respond to the unique vulnerabilities experienced by women in these low-resource settings (Li et al., 2024). In practice, for example, this could take the form of passive cooling interventions such as increased urban greenery and community cooling zones that overlap with the spaces usually occupied by women and the routes they take as they go about their daily household chores. In addition, improving access to reliable water sources at community level would provide valuable co-benefits from a heat-health perspective, and should be a priority for local governments in these settings.

There are several limitations to our study. Pre-selection of images by researchers for discussion in the follow-up workshop, owing to resource and time constraints, meant that some relevant images may have been missed in the process. To preserve their agency, women were given the opportunity to discuss any pictures in their collection, regardless of if they had been pre-selected or not. Similarly, the researchers’ rejection of under- or over-exposed photographs may have excluded additional relevant images. As the analysed transcripts are based on workshop discussions, we could not always attribute quotes to specific individuals, which restricted participant level differentiation. Individual identifiers are however included with each photograph. Upon reflection, and if time had allowed, it may have been beneficial to extend the duration of the first workshop to two days, to allow participants more practice and reflection on the assigned task. However, we believe that our ongoing engagement with participants throughout the photo-taking period provided opportunities for helping to maintain focus on the project’s central themes.

We feel it is important to acknowledge the influence of researcher background and positionality on the interpretation of findings. While workshop facilitation was led by a diverse team including local language speakers, the two main authors responsible for study design and data analysis were a black woman with a public health background, not of South African descent but residing in South Africa for over 14 years (IS), and a white South African woman who is an anthropologist with extensive experience in qualitative research in local settings (FS). Both authors recognise their relative outsider status in relation to the women who participated in the study. We acknowledge that our positionalities—shaped by geographical location, academic training, and social privilege—inevitably influenced the research process. Our interpretive frameworks may well have been shaped by the asymmetries of power that arise when research is done with populations less affluent, educated, or influential than the researchers themselves. For example, our lack of direct experience of living in a shack in an informal settlement meant that in the workshop discussions but also in our interpretation of them, we may have overlooked more subtle coping strategies that could not readily fit into neat analytical categories within climate change adaptation research. To mitigate these dynamics, we have sought to centre participants’ voices in the presentation of findings, using their own words wherever possible and limiting the researchers’ over-interpretation of their photographs and narratives.

Conclusion

Through their narratives, photographs and associated captions, pregnant and postpartum women in this Photovoice study highlight the multiple challenges they face in coping with extreme heat in an urban environment in South Africa. Their experiences reveal not only the physical and emotional impact of heat exposure but also the structural and environmental barriers that limit adaptation. The concept of “un-coping” illustrates how at the individual level, existing coping strategies are often constrained or rendered ineffective by infrastructural inadequacies, socio-economic limitations, and environmental conditions. These findings underscore the urgent need for systemic interventions that go beyond individual adaptation and address the broader social determinants of heat vulnerability. They also provide a valuable foundation

for developing context-specific heat-health messaging. In the context of a warming climate, targeted policies and infrastructural improvements—such as heat-resilient housing, equitable access to cooling resources, and the integration of heat adaptation into public health and urban planning—are essential for protecting maternal and child health and building climate resilience in vulnerable communities.

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Author contributions

IS: Conceptualisation, Data Curation, Formal Analysis, Methodology, Project Administration, Resources, Supervision, Validation, Visualisation, Writing—Original Draft Preparation, Writing—Review & Editing; **FS:** Conceptualisation, Data Curation, Formal Analysis, Methodology, Project Administration, Validation, Writing—Review & Editing; **RRL:** Investigation, Project Administration, Resources, Supervision, Writing—Review & Editing; **CM:** Investigation, Project Administration, Resources, Supervision, Writing—Review & Editing; **ILL:** Conceptualisation, Methodology, Writing—Review & Editing; **PM:** Writing—Review & Editing; **SS:** Writing—Review & Editing; **MFC:** Conceptualisation, Funding Acquisition, Methodology, Writing—Review & Editing; **GM:** Project Administration, Resources, Supervision, Writing—Review & Editing.

Members of the HIGH Horizons Study Group are listed in the Supplementary files (Appendix 3).

Disclosure statement

IS, FS, MFC, SS and GM hold investments in the fossil fuel industry through their pension funds. All other authors declare no competing interests.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, IS, upon reasonable request.

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