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"Heat is a danger to my health even though I said I am used to it": Qualitative insights of workplace heat among community health workers and health promoters in Kenya

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Abstract

Climate change is one of the most prominent environmental and health challenges of the 21st century. Variations in extreme temperature and weather events intensify occupational heat exposure and place workers at increasing risk of heat-related illness (HRIs) and injury. Healthcare workers, especially those in resource-limited, community-based, or mobile settings, face significant occupational risks from rising temperatures, yet these challenges remain largely overlooked and insufficiently studied. This qualitative study, based on semi-structured face-to-face interviews, explores the experiences of Community Health Workers (CHWs) and Community Health Promoters (CHPs) in Kenya, examining how extreme heat affects their personal health, livelihoods, and the delivery of community-based health services. We conducted 41 in-depth interviews with CHWs and CHPs (Mombasa County, n = 19; Tana River County, n = 22). Data was managed using NVivo 14 and analysed drawing on tenets of reflexive thematic analysis. We identified a pattern of intersecting vulnerabilities shaped by experiences of economic inequality, work conditions and pressures, HRIs, and challenges of accessing healthcare, effects of changing weather patterns on community health work and livelihoods, and gendered experiences of extreme weather and work challenges. Our findings show that these domains are not discrete but reinforcing, with overlapping effects that not only shape the daily experiences of CHWs and CHPs but also constrain their resilience and the effectiveness of community health service delivery. Our findings highlight the urgent need for climate-resilient health systems that not only improve the working conditions or protect CHWs and CHPs from extreme heat but also address the structural inequalities, such as economic disparities and the challenges of gendered burdens, that heighten their vulnerability.

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Introduction

Anthropogenic climate change is one of the most prominent environmental and health challenges of the 21st century [1]. Variations in extreme temperature and weather events intensify occupational heat exposure and place workers at increasing risk of heat-related illness (HRIs) and injury [2,3]. Outdoor workers, particularly those in tropical and subtropical regions, are especially vulnerable [3,4]. Evidence surrounding the heat-related impacts of outdoor work exists for occupations such as agriculture [5–7], construction [8,9], and surface mine workers [10,11], where heat exposure is more visibly recognised. However, beyond these specific examples, a great number of (healthcare) workers in resource-limited, community-based, or mobile settings face significant occupational risks from rising temperatures, yet these challenges remain largely overlooked and insufficiently studied. These risks are exacerbated in the Global South, where many healthcare workers operate in underserved communities, where infrastructure is not climate-adaptive, and where there are no heat-related protective measures or policies [12].

In Kenya, where approximately 70% of the population resides in rural areas with limited access to formal healthcare infrastructure, Community Healthcare Workers (CHWs) and Community Health Promoters (CHPs) are essential for delivering primary health services. They are estimated to provide up to 30–50% of all health services, particularly in underserved areas [13,14]. As formal healthcare facilities are often located far from rural communities, CHWs and CHPs help to mitigate this by providing healthcare services within communities [15]. CHWs and CHPs operate as intermediaries between the formal health sector and the community, offering various services, including health education, prevention of endemic diseases, family planning, maternal and child health care, and referrals [14]. As their work primarily involves moving outdoors from one household to another, CHWs and CHPs face heightened vulnerability to heat due to the physically demanding nature of their tasks, limited infrastructure, and a lack of heat adaptation measures. Yet, the ways in which heat and other environmental exposures affect their health and shape their ability to provide essential care remain underexplored. Although Kenya has contributed minimally to global greenhouse gas emissions, it faces disproportionate and escalating impacts of climate change [16]. Since the 1960s, the country has experienced a warming trend of approximately 1.0°C, increasing at a rate of 0.21°C per decade [17]. 2024 was reported as the hottest year on record in Kenya [18]. This warming, combined with more frequent and severe droughts and floods, is destabilising key sectors such as agriculture, water access, and public health [19]. Arid and semi-arid regions are particularly affected, with recurring droughts leading to acute food and water insecurity [20] while intensified rainfall events result in destructive flooding, displacing populations and straining infrastructure. These climate stresses are compounded by structural inequalities that limit Kenya's adaptive capacity, creating conditions of climate injustice for already vulnerable populations, including rural communities, women, and outdoor workers [3,21,22]. As the climate crisis

intensifies, it places mounting pressure on healthcare and healthcare providers, yet little is known about how CHWs and CHPs experience heat and how it affects the work they do.

Wet Bulb Globe Temperature (WBGT) measures heat stress by accounting for temperature, humidity, wind, sun angle, and cloud cover [23]. When WBGT exceeds 28°C, work capacity declines markedly, and the risk of adverse health outcomes such as heat exhaustion, muscle cramps, heat stroke, and, in extreme cases, death increases [24–26]. Outdoor workers are particularly vulnerable to extreme heat, due to prolonged periods outside in direct sunlight, increased physical exertion, and limited access to cooling measures [27,28]. A recent meta-analysis on occupational heat strain in outdoor workers showed that anthropogenic climate change is projected to highly impact the physical work capacity of outdoor workers [29], and projections show that fatalities due to occupational heat stress will likely occur every 14–24 minutes by 2030 due to increasing temperature trends [30]. These projections emphasise the urgent necessity to protect outdoor workers, particularly those who face compounding or intersecting risks such as gender [31,32], poverty [33,34], and informal employment [35,36].

Using an intersectionality framework [37], we aim to qualitatively describe CHWs' and CHPs' experiences of heat and the ways in which heat and other environmental stressors impact their well-being. These perspectives provide insights into how extreme heat impacts individual health, livelihoods, and community-based health service provision in Kenya and may inform future health service provision.

Methods

Ethics statement

Ethical approval for this study was granted by the Ethics Committee of the Medical Faculty of Heidelberg (ref. No.: S-305/2023) and the Pwani University Institutional Scientific and Ethics Review Committee (ref. no.: ISERC/PhD/003/2023). Research permits were obtained from the National Commission for Science, Technology, and Innovation (ref.no.: NACOSTI/P/23/27995), along with permissions from the Mombasa County and Tana River County offices. We obtained written informed consent from all participants before conducting the interviews. Additional information regarding the ethical, cultural, and scientific considerations specific to inclusivity in global research is included in the Supporting Information (S1 Checklist).

Study setting

Our study was conducted in four sub-counties within Mombasa and Tana River counties, along Kenya's coastline (Fig 1). Mombasa County is home to Kenya's second-largest city, Mombasa, and is an important East African port facilitating trade for the nation and its neighbouring countries. The County's rich cultural heritage reflects a unique blend of African, Arab, and Indian influences, highlighting its historical significance as a major trade and cultural exchange hub [38]. Mombasa County experiences a hot and humid tropical climate with average high temperatures of 33°C [39]. Tana River County, located in southeastern Kenya, is characterised by its arid and semi-arid climate, with the Tana River being the country's longest river, serving as a critical water source for agriculture, livestock, and local communities. The County has an average high temperature of 41°C [40]. Tana River is home to diverse ethnic groups, including the Pokomo, Orma, and Wardei, whose livelihoods depend on farming, pastoralism, and fishing [41]. The County faces significant challenges such as recurrent droughts, temperature fluctuations, flooding, and resource-based conflicts, which impact food security and socioeconomic stability [42]. In Mombasa, the CHW program is often centralised and benefits from higher infrastructure support, including closer health facilities. However, the urban environment presents unique challenges, such as overcrowding in informal settlements and limited shaded spaces where CHWs and CHPs carry out their work. In Tana River, a rural and sparsely populated county, CHWs and CHPs often work in remote areas with limited infrastructure, and long-distance travel increasing physical exertion and exposure to direct sunlight.

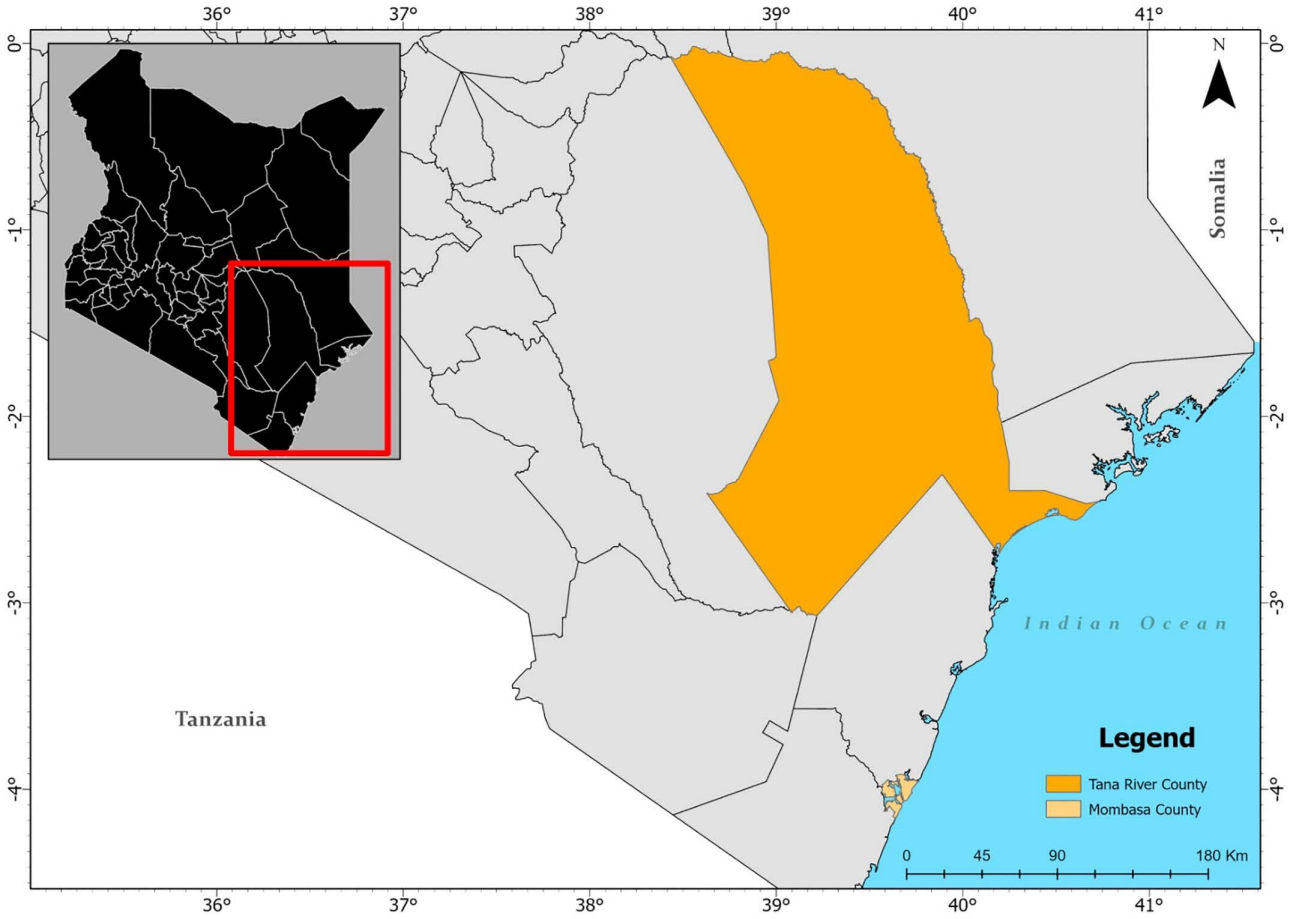

Fig 1. Map of Mombasa and tana river counties. Base map and data from Kenya Counties Shapefile (Open Africa). Available from, https://open.africa/dataset/kenya-counties-shapefile.

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Study design

We employed an exploratory qualitative design using semi-structured in-depth interviews (IDIs) [43,44]. We followed the reporting guidelines of the Consolidated Criteria for Reporting Qualitative Research (COREQ) (S2 Checklist) [45].

Sampling and recruitment

After obtaining ethical clearance, we presented the study in the respective counties to build trust and secure institutional support—afterward, interested CHWs and CHPs registered to participate in the study. In our study, the term "CHWs" refers to cadres with formal training and contracts, including Community Health Assistants (CHAs), Community Health Extension Workers (CHEWs), and Public Health Officers (PHOs). The term, Community Health Promoters (CHPs) refers to those without formal contracts or professional training, previously known as Community Health Volunteers (CHVs). We specifically included CHAs, CHEWs, and PHOs in the CHW category because they also work directly in communities and are therefore similarly exposed to environmental conditions, including extreme heat. We then purposefully selected CHWs and CHPs from the list to ensure maximum variation in terms of work experience, time in current employment, and age. CHWs and CHPs received oral and written explanations about the study. They could choose Swahili or English

information sheets and consent forms. We contacted CHWs and CHPs by phone from November to December 2023 to invite them to participate, and all individuals agreed to be involved in the study.

Data collection

We conducted IDIs using a semi-structured guide at locations convenient for CHWs and CHPs, including their workplaces within the community, their link facility, and occasionally their homes. Two female interviewers (TWM and ABR) conducted the interviews. The interviewers had no prior contact with the study participants. Researchers TWM, ABR, and KB designed data collection tools, including a demographic data cover sheet, an information sheet, an informed consent form, and an interview guide. Before data collection, the researchers tested the interview guide (S1 Text) by conducting interviews and adjusting it to enhance clarity and relevance. The researchers used the cover sheet to record reflexive and observational notes. We designed the interview guide to explore CHWs and CHPs' perception of their daily routine work, risks associated with heat, and experiences of HRIs. Based on CHWs and CHPs' preferences, we conducted the interviews one-on-one in either English or Swahili, with each session audio recorded. Each interview lasted between 22 and 81 minutes. After completing each interview, we conducted a debriefing session with KB, the last author, to reflect on the interview process and assess data saturation. We used notes taken during debriefing and interview notes as source materials for triangulation [46]. There were no repeat interviews conducted.

Data analysis

We transcribed the interviews in English and checked them all for data quality and accuracy. None of the transcripts were returned to the CHWs and CHPs. NVivo 14 was used to store, organise, and visualise the data. We followed the six stages of Reflexive Thematic Analysis (RTA) [47,48]. Researchers TWM, CW, ABR, and KB independently read and re-read the transcripts to familiarise themselves with the data. TWM and CW conducted an inductive analysis of the transcripts in sets of five, comparing and reviewing codes to identify similarities and differences. They repeated this process until they completed the coding. The research team met weekly to discuss recurring codes and refine themes. After developing a codebook, they created a thematic framework, refined and named the themes, and finalised them for interpretation and writing.

Ensuring rigor

We followed the "Eight Big-Tent Criteria" for excellent qualitative research by Tracy [49]. The topic, qualitative insights of heat among CHWs and CHPs in Kenya, is timely and socially significant, addressing occupational health and climate justice. Sincerity was ensured through continuous reflexivity, including weekly team discussions to acknowledge researchers' positionality and potential bias. Credibility was strengthened by prolonged engagement, detailed description, triangulation, member reflections with CHWs, CHPs who participated in the study, and community stakeholders. Resonance was achieved by inclusion of rich, evocative narratives from CHWs and CHPs, capturing their lived experiences in their own voices.

Reflexivity statement

Our team included researchers with expertise in qualitative, quantitative, and mixed-method approaches. Specifically, it comprised a doctoral student (with expertise in mixed methods (TWM)), a research assistant (CW), a postdoctoral researcher (with expertise in qualitative methods (ABR)), two senior researchers (one specialising in qualitative (KB) and the other in quantitative methods (TJ)), and a professor (with mixed methods expertise (TB)). By continuously acknowledging the influence of our social positions, identities, and values on how we collected and interpreted the data, we ensured the research process was reflexive from study design to data interpretation and write-up.

Theoretical framework

Informed by the lived experiences of CHWs and CHPs and intersectionality theory [37], we developed a framework of intersecting vulnerabilities (Fig 2) to describe the overlapping social, environmental, and occupational factors shaping their exposure to heat stress. Intersectionality, articulated initially by Crenshaw [50] and further developed by Collins and Bilge [51], emphasises that social positions and structures interact to create forms of disadvantage that cannot be understood by examining categories in isolation. This framework allows us to provide an analysis of individual vulnerabilities to show how overlapping systems of inequality intersect to impact the everyday lives of CHWs and CHPs. These include experiences of economic inequality, work conditions and pressures, experiences of HRIs and challenges of accessing healthcare, effects of changing weather patterns on community health work (CHW) and livelihoods, and gendered experiences of extreme weather and work challenges. For example, economic inequality is central to shaping heat experiences as many CHWs and CHPs receive little to no wages, limiting their ability to access cooling resources against heat exposure. The financial precarity intersects with the experiences of HRIs since limited incomes constrain CHWs' and CHPs' access to healthcare. At the same time, pre-existing conditions like diabetes and asthma exacerbate risks during episodes of extreme heat. Work conditions and pressures further compound these vulnerabilities as CHWs and CHPs are often expected to work long hours or in poorly ventilated spaces, even during periods of extreme heat. Changing weather patterns, including extreme heat, drought, and flooding, intensify these vulnerabilities, disrupting CHWs' and CHPs' ability to perform their roles effectively while also undermining their own livelihoods. Finally, these experiences are also profoundly gendered, as most CHWs and CHPs are primarily women. Their unpaid or underpaid demanding professional responsibilities intersect with heavy caregiving burdens within the household, reinforcing patterns of disadvantage across both work and domestic spheres. This dual burden can generate conflict and further constrain women's capacity to adapt to climate stressors.

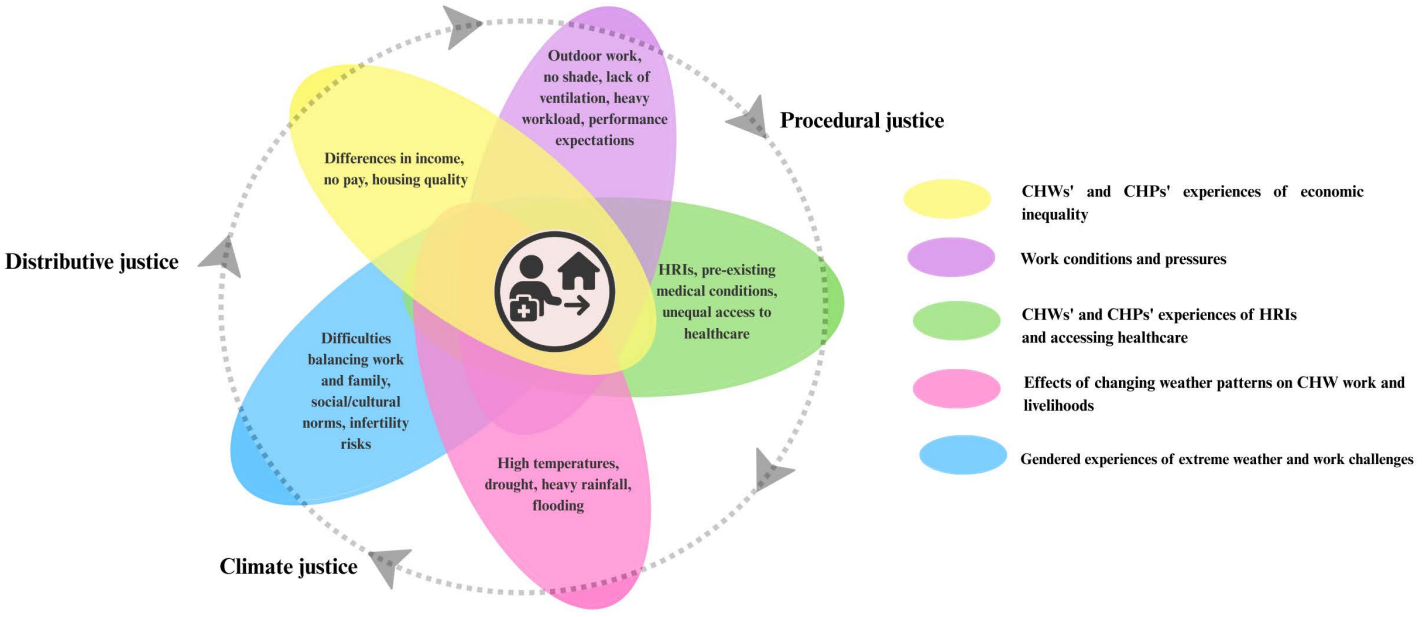

Fig 2. Intersectionality framework for understanding dimensions of vulnerability in CHWs' and CHPs' heat experiences.

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Results

We present findings from 17 CHWs and 24 CHPs (Table 1), organised into five major overlapping themes. The themes presented below reflect common experiences across both Mombasa and Tana River counties, as they were similar in both settings. The first theme of CHWs' and CHPs' experiences of economic inequality highlights financial struggles and how these challenges hinder access to protective resources, increase their exposure to heat, and limit their ability to adapt to changing climates. The second theme highlights precarious work conditions and pressures, which exacerbate the challenges they face in their daily duties. The third theme examines CHWs' and CHPs' experiences of HRIs and difficulties in accessing healthcare. The fourth theme explores how changing weather patterns, including prolonged droughts and heavy rains, disrupted how they provided health services, income-generating activities, and daily routines, which further deepened their financial struggles. The fifth theme addresses the diverse gendered challenges faced by both female and male CHWs and CHPs, from balancing caregiving and work responsibilities to the risks of infertility caused by heat exposure. Several quotes we present overlap across multiple themes, but we have assigned them to the theme with the most relevance. The following sections explore how each theme contributes to challenges CHWs and CHPs face.

Table 1. Participants demographic characteristics n = 41.

	Mean (SD)	n (%)
Age, years	40.86 (11.43)	
Age classes		
26-35		14 (34)
36-45		10 (24)
46-55		11 (27)
56-65		6 (15)
Gender		
Male		14 (34)
Female		27 (66)
Religion		
Christian		33 (80)
Muslim		8 (20)
Education level		
Tertiary level		17 (42)
Vocational training		2 (5)
High school level		11 (26)
Primary level		7 (17)
None		4 (10)
Cadre		
CHP		24 (59
CHW		17 (41)
Setting		
Mombasa County		19 (46)
Tana River County		22 (54)
Availability of insurance		
With insurance		24 (59)
No insurance		17 (41)

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CHWs' and CHPs' experiences of economic inequality

Our findings highlight that CHWs and CHPs faced significant financial challenges, receiving no salary in some cases, inadequate pay in others, or paid late for the activities they performed. Some CHWs disclosed that they earned substantially less than their colleagues with formal contracts with the county government, highlighting wage disparities within the system.

Volunteer CHWs and CHPs took on additional jobs, such as security work and farming, while others ran small-scale businesses alongside their health service delivery duties to make ends meet. Despite these extra efforts, many still reported low earnings and struggled to balance their multiple responsibilities:

> *...my salary is only Ksh.15,000 per month from the work I do in security, and I have four children in secondary school and two in class eight who are about to join secondary school. Some are in grade four, while others are in grade six. So, you find that the cost of living spikes, but the salary remains the same, so I have to stop doing other things and focus on providing food and shelter. (43-year-old CHP)*

Volunteer CHWs and CHPs shared that they depend on sporadic, short-term paid activities, such as national health campaigns sponsored by the government or health initiatives funded by NGOs, which offered only temporary financial relief. A female CHW stated:

> *We are not given anything. So, as a volunteer, you have to depend on activities. Maybe if there is an activity like mass drug distribution or net distribution in the community, or maybe you're called to a certain training, that's when you can get some stipend for survival to pay rent and buy food, but we are not paid anything. (26-year-old CHW)*

Even when compensated for short-term activities they engaged in, CHWs and CHPs found that the funds were insufficient to cover essential expenses, such as transportation, lunch, water, and procure protective gears like umbrellas, sunscreen, and proper footwear, which were critical for carrying out their duties in extreme heat. As a result, many had to cover the financial shortfall from their pockets when expenses during field activities exceeded their allocated funds.

Some CHWs and CHPs reported living in temporary or semi-permanent housing, either rented or owned. These houses often had cramped and poorly ventilated spaces. A 37-year-old CHW recounted, "*I live in a rented house near my workplace, and I cannot modify it so that there is enough fresh air coming into the house. The landlord would never agree, so I struggle with the heat..."* The housing conditions thus added to their discomfort during extreme heat. Some CHPs also shared that their homes were highly vulnerable to damage from harsh environmental elements, such as heavy rains. "*The rain has swept houses away, including mine" (32-year-old CHP).* Additionally, she described the ongoing difficulty of maintaining the deteriorating home. "*It has happened at a time when I don't have a single cent in my pocket. Some sections of the house have collapsed and are open, but we still have to press on."* The determination to weather the climatic challenges was echoed by a male CHP who described how they maneuver their living space when it rains. "*You know that it is hard to tell whether you have a good roof or not when it is not raining. The roof of our house leaks, so when it rains, we have to move the bed to get a better spot that does not leak..." (54-year-old CHP)*

Work conditions and pressures

CHWs and CHPs revealed that they worked primarily outdoors for long hours, often in places without adequate shade. When they worked indoors, they were in small, shared offices that lacked proper ventilation.

> *In our case, we do not have a fan and are expected to provide services to clients here. There is no ceiling to insulate the heat that comes from the roof, so our office does not meet the adequate standards to deal with global warming issues. (31-year-old CHW)*

CHWs and CHPs also reported that they had a broad scope of responsibilities ranging from inspectorate and supervision duties to health education and referral activities. Their work required consistent coordination, mobility, and engagement with different environments, demonstrating how CHWs and CHPs operate across varying settings.

The CHWs and CHPs revealed that they were sometimes assigned additional responsibilities due to staffing gaps without support or compensation. These new tasks, which sometimes required them to work outside their villages, exacerbated their experiences of heat stress.

> *My original area of jurisdiction was Tarasaa, but the CHV in Golbanti applied to work outside their area, so they didn't have a CHV, and I was appointed to work there. I get exhausted and sweaty when I walk all the way there, and yet there is nothing I benefit from there. (42-year-old CHP)*

Additionally, CHWs and CHPs also faced demanding performance expectations often set without considering local realities or the difficulty of achieving the set targets. This demand pushed them to keep working even when the conditions posed a risk to them.

> *I was expected to visit several community members residing in the households I oversee...It was a very hot day, and I had to walk a lot. While working, my dispensary bosses kept calling, asking why few people were showing up... I went up and down the hill so many times. The more I walked, the more heated my body became, so I started having a headache. By the time I was done in the evening, I had a severe headache and was so exhausted that I could not do anything else. (43-year-old CHP)*

CHWs and CHPs consistently reported that extreme heat hindered their ability to perform their duties effectively. Many described how rising temperatures physically and mentally restricted their capacity to work, particularly when covering long distances. One 37-year-old CHW explained, *"I can't work when it's too hot because my areas are far away."* The heat not only limited physical mobility but also impacted motivation. The same CHW added, *"The heat makes it difficult for me to work the long hours I am supposed to, and the thought of going out to work when it is hot is demoralising."*

Similar sentiments were expressed by other CHWs and CHPs, who noted that excessive heat often resulted in shorter working hours. One CHW remarked, *"It slows my work down and reduces my work hours in the field. I have become used to the heat affecting my work." (42-year-old CHW)*. Beyond reduced hours, some CHWs reported that extreme heat affected their ability to arrive on time. One CHP noted, *"If you told the client that you would be there by 8 am, by 6 am or 7 am, the sun is already hot. The heat makes it hard for you to be punctual, so it affects your work."*

Ultimately, some CHWs and CHPs linked heat exposure to diminished productivity and effectiveness in community outreach. As a CHW reflected, *"It affects you since you will not be that productive in the community. Mostly, you would be perspiring in that you will be unable to go to the community and address the multitude." (26-year-old CHW)*

CHWs' and CHPs' experiences of HRIs and accessing healthcare

CHWs and CHPs described experiencing HRIs during field visits, especially when walking long distances (over 4 km) across sloped or flooded terrain and performing intense physical activity in high temperatures. Some were unaware that these HRIs were caused by heat. They reported symptoms such as headaches, nausea, dizziness, excessive sweating, heat rashes, sunburn, extreme thirst, difficulty concentrating, anxiety, and fatigue.

> *Heat is a danger to my health even though I said I am used to it...when in the field working, you start to get something like a skin disease because you have wandered for too long. For example, previously, we had an activity on toilets, so we were going around a lot with our CHA. It affected me personally because I had so many rashes on my body. (46-year-old CHP)*

CHWs and CHPs with pre-existing health conditions, such as hypertension, diabetes, and asthma, reported worsening symptoms of their chronic conditions when experiencing HRIs simultaneously. They [the CHPs] perceived that the combination of these conditions and extreme heat led to more severe health complications.

Your health status deteriorates when you sweat too much and don't drink enough water. Those of us with high blood pressure and diabetes don't feel well when it gets too hot. We feel weak and uncomfortable, but we can't know where the problem is. (37-year-old CHW)

CHWs and CHPs said they had limited sleep during episodes of extreme heat, which contributed to significant fatigue and heightened anxiety the following day. The lack of adequate rest impaired their physical recovery and made it challenging to maintain focus and perform their duties.

In this weather, we are really affected, and we can't sleep because it is too hot. Even when you put the fan on, you still cannot sleep. We are supposed to sleep eight hours, but we are always awake because of the weather. (30-years-old CHW)

Beyond the physical effects, some CHWs expressed that they were worried about the long-term health risks of prolonged heat exposure. A female CHW voiced concerns about skin damage, stating:

I worry a lot, especially me, who is working in the Ministry of Health. We hear about cancers of the skin, and you know your color changes; it is not the one you were born with. When we go to areas where there is not much heat, at least we become brown, but in this place, the majority of us are black not because we are black or dark, but because of the heat. (56-year-old CHW)

CHWs and CHPs said that they faced barriers in accessing medical care, citing financial constraints and limited availability of healthcare services as the main issues, especially in remote areas. When they sought medical attention, they often found essential medicines unavailable in public hospitals they visited, forcing them to purchase them in private-owned pharmacies. As a result, many CHWs and CHPs turned to traditional remedies and self-prescribed painkillers to manage their health.

Here, we just self-prescribe. We take local medicine that is available to cure our heat diseases. The hospital in Ngao is far, and one needs transport money to get there, Ksh. 150 to go and a similar amount to get back home. That is Ksh. 300. If you do not have that amount of money, you take the easy way out and purchase diclofenac or Panadol, take them, and go on with your work the following day. (32-year-old CHP)

Effects of changing weather patterns on CHW work and livelihoods

CHWs and CHPs highlighted how the effects of climate variability, like heavy rains and flooding, affected their work. Their schedules were often disrupted, and conducting community visits became challenging due to the lack of protective gear such as gumboots, raincoats, and umbrellas. Many of their villages experienced flooding, with roads becoming impassable and some villages, particularly those in hilly regions, becoming completely inaccessible. In certain cases, families were displaced by the rains, making it harder to locate and reach them.

It has affected my work because I cannot find people in their homes. While some are working, others have moved to campsites, so one cannot be successful with their work, and that becomes a problem in the work I do. (53-year-old CHP)

CHWs and CHPs described how climate variability disrupts their livelihoods by negatively impacting agricultural activities, leading to food insecurity and exacerbating financial struggles. Extreme heat, prolonged droughts, and unpredictable rainfall reduced crop yields, making farming increasingly unsustainable. As a result, many were forced to rely on costly irrigation methods. A 47-year old male CHP highlighted, *"A significant percentage of the money my family would have used goes to buying fuel for irrigation. Without the drought, I would have used that money for something else for my family."*

CHWs and CHPs said that erratic weather patterns contributed to shrinking water sources, affecting access to potable water. Additionally, these changing weather patterns disrupted fishing and small businesses, leading to a loss of income. A male CHP described the drastic shift in local ecosystems, saying:

> *...heat has affected us economically because previously, we could fish to get food and sell some to get money. The ecosystem of the river used to sustain us. Now, because of the heat, that is no longer possible. Previously, we used to have consistent rain; we could plant and then harvest, but now you need irrigation for that. With irrigation, you need resources like money. As a farmer, you are left stranded. So, heat has affected us in food production and business, and poverty continues to increase. (38-year-old CHP)*

Rising food prices and declining agricultural productivity put immense strain on household finances, severely limiting access to essential goods and services, including food, healthcare, and necessities like school fees. With the increasing cost of living and the diminishing returns from farming, many households struggled to meet their daily needs, forcing them to make difficult choices between essential expenses. The financial pressure deepened as income from farming, the primary livelihood for many CHWs and CHPs, became more unreliable. A male CHP explained the challenges, saying:

> *Climate change has brought food insecurity to our homes. Now, we don't know how the children will go to school because we expected to farm and sell the produce to get money for school fees, but that is not possible. (53-year-old CHP)*

Gendered experiences of extreme weather and work challenges

Female CHWs and CHPs with children highlighted difficulties in reconciling the dual demands of intensive professional roles and domestic obligations, especially caregiving. This continuous multitasking was thought to lead to pronounced physical fatigue, which heightened their susceptibility to heat stress when combined with long hours spent in high temperatures.

> *When it comes to my work and family life, it is hard to strike a balance. When you walk around from household to household in the evening, you find yourself always exhausted, but again, you have a family, and you must start from where you stopped in the morning. (27-year-old CHP)*

The financial insecurity of unpaid or low-paying health work intensified social and economic pressures, with some CHWs and CHPs feeling frustrated, as they volunteered without bringing any pay home for their families, leading to conflicts with partners over their decision to volunteer instead of pursuing income-generating activities. A woman serving as a CHP described the tension at home, highlighting:

> You have *children, you leave them at home, you go to do voluntary work, and at the end of the day, you have nothing. You have nothing to take home to cook for your children. Yes, it is indeed voluntary work, but you also have your household, children, and responsibilities, and you need to eat. This even brings disagreement at home with your spouse. My husband complains that instead of going to the farm where I can get something, I just wander around and come back empty-handed. (53-year-old CHP)*

Pregnant CHWs and CHPs also faced difficulties, as extreme heat intensified their discomfort, exhaustion, and health risks. The physical demands of their roles and the added strain of pregnancy made it increasingly difficult to cope with prolonged exposure to high temperatures. The heat exacerbated issues such as dehydration, dizziness, and fatigue, all of which posed additional risks to both the health of the CHWs and CHPs and their unborn children. A female CHP recalled the challenges she endured while heavily pregnant, saying:

After finishing work, when I stood up, I felt tired and thirsty, and it was scorching hot. On top of that, I had to walk home. I was nine months pregnant at the time. My legs were numb, so we started stretching with the other CHVs because some of them were older than me. The other ladies held me up as we walked home because I didn't have money to take a motorbike. When I got home, I couldn't even do the housework… I really suffered. (32-year-old, CHP)

Gendered expectations placed an unequal burden on women. Male CHPs often relied on female colleagues to handle culturally sensitive health issues, like reproductive and maternal care, which they could not address directly. Additionally, some noted that men had increasingly withdrawn from household responsibilities, shifting the burden of family care onto women. A male CHP emphasised the growing pressure on women, stating:

Around here, women have a lot to do. Homes have become matriarchal because men no longer want to do anything. There is a song they sing here. If you hear it, you will understand how roles have changed. That is also why women get a lot of diseases because they are doing too much… they're holding up the whole nation, so they get affected by the heat. (49-year-old CHP)

Some participants explained that prolonged exposure to high temperatures, combined with sweating and inadequate access to hygiene resources, created conditions that made women more susceptible to infections like vaginal candidiasis.

Even wearing a bra and underwear in this heat is challenging because it burns (points to her breasts and thighs). Most women around here don't wear panties because of the heat. This heat can cause other infections like candidiasis. In a month, I get at least two episodes, especially during the hot months... (*42-year-old CHW)*

Moreover, there was concern among male CHWs regarding the potential risks of infertility linked to prolonged exposure to extreme heat. A male CHW explained his anxiety about the lasting impact of heat on male reproductive health, saying.

I have to wear baggy innerwear and ensure that I don't have tight clothes so I can prevent maybe itching, and because I am a man, I have to prevent infertility in the future... According to science and research, our male reproductive organs, especially the testicles, need to have adequate air circulation. We need to prevent their exposure to high temperatures above normal body temperatures. (31-year-old CHW)

Discussion

We use an intersectionality framework to highlight the realities of CHWs and CHPs, showing how economic inequality, working conditions, HRIs, and healthcare access challenges, changing weather patterns, and gendered dynamics not only shape their experiences individually but also intersect to amplify one another in practice. Our findings describe how these domains are not discrete but reinforcing, with overlapping effects that compound the risks and burdens CHWs and CHPs face.

For example, low and unstable pay combined with inadequate institutional support left CHWs without protective equipment such as hats, tents, or drinking water, which increases their exposure and vulnerability to extreme heat [52–55].

We consider this an economic vulnerability that does not occur in isolation: it is intensified by changing weather patterns, which disrupted subsistence farming livelihoods and deepened financial instability [56,57]. The overlap of precarious income, climate shocks, and occupational demands magnified stress, as workers were forced to balance health service delivery with the struggle to maintain food security for their families. Furthermore, CHWs and CHPs described their health disparities with conditions such as high blood pressure, diabetes, and asthma worsening with extreme heat, making them more vulnerable to HRIs [58–61]. Yet, the same workers were expected to meet high-performance targets set despite staff shortages, long-distance travel, and other environmental factors, which created poor working conditions. These pre-existing health inequities, workplace pressures, and climate stressors converged to multiply risks, forcing CHWs and CHPs to continue working under hazardous conditions even when their own health was compromised [62].

The role of gender is evident across all of these dimensions. Female CHWs, who make up the majority of the workforce, reported the combined burden of community health responsibilities, caregiving roles at home, and agricultural labour under conditions of extreme heat [63]. This intersection of gendered expectations with economic insecurity and climate disruption left women especially vulnerable to exhaustion and burnout. Male CHWs described different but related challenges, including concerns about infertility linked to heat exposure and cultural restrictions on their participation in certain tasks. When viewing these intersections between economic inequality, precarious working conditions, underlying health vulnerabilities, climate shocks, and gender inequities together, we see a myriad of disadvantages that magnify the impact of heat stress on CHWs and CHPs. These overlapping vulnerabilities illustrate the dynamics of climate injustice [64] where those with the least power, protection, and resources are mostly exposed to risk, while lacking meaningful influence over the systems that structure their work and lives. The exclusion of CHWs and CHPs from decision-making further reflects failures of procedural and recognition justice, as their knowledge and lived experiences remain undervalued in policy debates. The knock-on effect of these intersecting injustices affects those even more vulnerable than the health workers themselves: the communities they are trying to support.

When framing our findings in a climate justice lens, we see distributive, procedural, and recognition injustices. From a distributive justice perspective [65], CHWs and CHPs face disproportionate risks because they work outdoors, travel long distances on foot, and lack protective infrastructure, yet they receive little institutional support to mitigate these burdens. In terms of procedural justice [66], CHWs and CHPs are rarely included in decision-making processes on climate adaptation and health planning, despite their central role in frontline service delivery and community engagement [67]. Their participation is often limited to program implementation rather than shaping priorities or designing policies, which prevents their on-the-ground insights about local needs and climate impacts from being integrated into adaptation planning [68]. This exclusion limits their opportunities to influence policies directly affecting their working conditions. There are further injustices around recognition, as the knowledge and lived experiences of CHWs and CHPs are often undervalued compared to biomedical or technical perspectives [69], even though they offer insights into the realities of climate vulnerability at the community level. This recognition is further exacerbated by their senior colleagues, who they felt dismissed the workloads and distances covered, and refused to acknowledge feedback that could be constructive.

Our findings highlight the need for climate and gender-responsive health system policies that address these overlapping inequities simultaneously, rather than in isolation. While Kenya's recent introduction of stipends for CHPs represents a step toward distributive justice [70], uneven implementation illustrates ongoing challenges of sustainability and fairness. Comparative evidence from India and Bangladesh demonstrates that integrating CHWs and CHPs into climate adaptation strategies, providing practical protections, and adjusting work routines can mitigate overlapping risks and enhance resilience [71,72]. Applying these climate-sensitive adjustments is likely to benefit CHWs and CHPs, while enhancing the sustainability and reach of a service that delivers healthcare to over 13.5 million people [73]. The overlapping nature of these vulnerabilities demands multisectoral, intersectional approaches that place CHWs' and CHPs' at the centre of adaptation planning, ensuring that those most affected by climate change are protected and recognised as agents of resilience and justice [74,75].

Limitations

Our study only included participants who had registered to participate, which may introduce a potential selection bias. However, this approach was necessary to prioritise participants who were motivated and willing to engage, as active reporting is critical to accurately capturing workplace heat experiences. Also, our study relied on self-reported experiences, which may introduce recall or response biases, particularly regarding health impacts. While our analysis identified experiences of economic inequality, work conditions and pressures, experiences of HRIs and accessing healthcare, effects of changing weather patterns on CHW work and livelihood, and gendered experiences of HRIs and work challenges as key factors contributing to CHWs' and CHPs' vulnerability to climate stress, other intersecting identities, such as age and disability, were less represented in the narratives. This limitation suggests that our study may not fully capture the breadth of factors shaping how individuals experience and respond to climate-driven challenges, which points to further research to explore these dimensions more comprehensively. Lastly, our study did not include any perspectives from supervisors or policymakers due to resource and time constraints. Exploring this angle might have provided a deeper understanding of how institutions respond to the everyday health challenges of climate-related working conditions.

Conclusion

This study reveals how intersecting factors, such as experiences of economic inequality, work conditions and pressures, HRIs and challenges of accessing healthcare, effects of changing weather patterns on CHW and livelihoods, and gendered experiences of extreme weather and work challenges, shape the lived realities of CHWs and CHPs in Kenya, with extreme heat emerging as a central challenge affecting their ability to work, their well-being, and their livelihoods. Our findings highlight the urgent need for climate-resilient health systems that not only improve the working conditions or protect CHWs and CHPs from extreme heat but also address the structural inequalities, such as economic disparities and the challenges of gendered burdens that heighten their vulnerability.

Supporting information

S1 Checklist. Inclusivity in global research checklist.
(PDF)

S2 Checklist. Consolidated Criteria for Reporting Qualitative Research (COREQ).
(PDF)

S1 Text. Interview guide.
(PDF)

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