Climate change and resource insecurity-related mental health stressors among young adolescents in Kenya: Qualitative multi-method insights

Julia Kagunda[1,2], Aryssa Hasham[3], Carmen Helen Logie[3,4,5,6] (ID), Humphres Evelia[7], Clara Gachoki[1], Beldine Omondi[7], Mercy Chege[1], Maryline Okuto[7], Sarah Van Borek[3], Irene Wu[3] and Lesley Gittings[8,9]

[1]Elim Trust, Kiambu, Kenya; [2]Daystar University, Nairobi, Kenya; [3]Factor-Inwentash Faculty of Social Work, University of Toronto, Toronto, ON, Canada; [4]United Nations University Institute for Water, Environment, and Health, Richmond Hill, ON, Canada; [5]Centre for Gender & Sexual Health Equity, Faculty of Medicine, University of British Columbia, Vancouver, BC, Canada; [6]Women's College Research Institute, Women's College Hospital, Toronto, ON, Canada; [7]Centre for the Study of Adolescence, Nairobi, Kenya; [8]School of Health Studies, Faculty of Health Sciences, Western University, London, ON, Canada and [9]Centre for Social Science Research, University of Cape Town, Cape Town, South Africa

Abstract

While the links between extreme weather events and mental health have received growing attention, little is known about how climate change impacts adolescent mental health in low- and middle-income climate-affected settings. To address this gap, we conducted a multi-method qualitative study exploring how young adolescents (YAs) aged 10–14 years experience climate-related stressors across six regions in Kenya. Guided by the resource insecurity framework, we thematically analyzed Elder focus groups, YA walk-along interviews and YA participatory mapping workshops. Our findings revealed that food, water and sanitation insecurity contribute to psychological distress, including symptoms of depression and suicidality, and heighten concerns of community violence (e.g., assault, fighting). Water insecurity, particularly the time and distance required for collection, disrupted school attendance, while resource borrowing generated feelings of shame. Food insecurity and larger contexts of poverty were associated with substance use as a coping mechanism, which in turn contributed to school dropout, crime and gang involvement. Poverty also led some youth to run away from home. These findings highlight the urgent need for climate-informed mental health interventions that address co-occurring resource insecurities. To advance adolescent mental health and well-being in climate-affected settings, policy responses must be targeted and multilevel, engaging families, communities and institutions.

Impact statement

Mental health challenges among adolescents have risen globally, with Sub-Saharan Africa (SSA) reporting particularly high rates of anxiety, depression, post-traumatic stress disorder and suicidal ideation. This is especially concerning as SSA is home to 20% of the world's adolescent population. This region is also among the global regions most vulnerable to climate change impacts. In Kenya, extreme weather events (EWEs) like droughts and floods are increasing in frequency and intensity, causing significant disruption and worsening resource insecurities such as food and water insecurity. These resource challenges exacerbate mental health stressors among adolescents, yet there remains a lack of understanding about associations between climate change-related EWEs, resource insecurities and mental health outcomes with young adolescents (YAs) aged 10–14 years in low- and middle-income climate-affected countries such as Kenya. This study addressed this critical gap by exploring the lived experiences of YAs in six climate-affected regions of Kenya. Using a multi-method qualitative approach, we investigated how climate change and related EWEs may contribute to mental health stressors for this vulnerable group. The findings from this research offer insights that can inform policies and interventions targeting mental health support for YAs in Kenya and other climate-impacted regions in SSA. Specifically, they highlight the need for integrated strategies addressing co-occurring food, water and sanitation insecurities, as well as larger contexts of poverty, to mitigate risks of psychological stress, depression, suicidality, as well as substance use-related coping. In turn, this may reduce community-level violence concerns and other social and well-being challenges, such as educational disruption and running away from home. This research underscores the urgency of addressing co-occurring resource insecurities when integrating YA mental health priorities into climate adaptation strategies in climate-affected Kenyan regions.

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Introduction

Climate change has multifold direct and indirect effects on child and adolescent health, including mental health (Helldén et al., 2021). A systematic review of 37 studies in Sub-Saharan Africa (SSA) published between 2008 and 2020 revealed prevalence rates of 29.8% for anxiety disorders, 26.9% for depression, 21.5% for post-traumatic stress disorder and 20.8% for suicidal ideation (Jörns-Presentati et al., 2021). Several factors may account for this widespread prevalence of mental health challenges, including chronic exposure to poverty, abuse and violence (Jörns-Presentati et al., 2021). These stressors are compounded by the rapid physical, emotional and social changes that characterize adolescence (Nyundo et al., 2020). In addition to these well-documented stressors, climate change and related climate anxiety may exacerbate mental health challenges among youth in SSA contexts, such as found among 18–23 year olds in Tanzania (Prencipe et al., 2023). Yet, a systematic review of extreme weather events (EWEs) and child and adolescent mental health in SSA identified only two articles, both on flooding and psychological distress, and reported "an alarming lack of research focusing specifically on the mental health of youth exposed to EWE in SSA, where EWE, especially extreme heat, flooding and droughts, continue to increase"(Rother et al., 2022, p. 100087).

Stress arising from climate-induced resource insecurities has been linked to various psychosocial outcomes that underlie poor mental health. A scoping review of 15 studies in low- and middle-income countries (LMICs) highlighted four interrelated stressors related to inadequate access to safe water and sanitation: financial stressors, stressors related to lack of physical access, social stressors and stressors related to perceived inequities (Bisung and Elliott, 2017). For adolescents, food insecurity is also a significant contributor to poor mental health outcomes. Research from the United States has shown a strong association between food insecurity during adolescence and increased levels of emotional distress, anxiety, depression, substance use and suicidal ideation (Alaimo et al., 2001, 2002; McLaughlin et al., 2012; Heflin et al., 2019). A large study involving over 48,000 adolescents aged 12–15 years from 22 LMICs identified associations between food insecurity and increased odds of depressive symptoms (Smith et al., 2023). A Tanzanian study with school-going adolescents identified food insecurity as an independent predictor of suicidal ideation and attempts (Shayo and Lawala, 2019), and an Ethiopian study found a direct link between food insecurity and common mental disorders, characterized by symptoms such as sleeplessness, exhaustion, irritability, poor memory, difficulty concentrating and somatic complaints (Jebena et al., 2016).

Kenya is an important context to examine climate change and youth mental health. In Kenya, EWEs have increased in both frequency and severity as a direct consequence of climate change (Kogo et al., 2021; The World Bank Group, 2021). Further, persistent heavy rains and flooding, exacerbated by the El Niño climate pattern, caused widespread devastation – disrupting school attendance, damaging healthcare and sanitation infrastructure, contaminating water sources and destroying farmland (Kenya Red Cross, 2024; Onyango et al., 2024). EWEs, particularly drought and flooding, have intensified preexisting challenges related to food, water and sanitation insecurity. Of Kenya's 54 million inhabitants, 15 million lack access to clean drinking water (Water.org, 2024). Sanitation access is equally concerning, as nearly 37 million people, almost two-thirds of the population, do not have safe facilities (Water.org, 2024). Food insecurity

remains a major issue (NET, 2020), with over 9 million affected as of March 2024, including 1.9 million experiencing severe food crises or emergencies (Integrated Food Security Phase Classification [IPC] 2024).

Concurrent resource insecurities – spanning water, sanitation and food – may be exacerbated by climate change and heighten psychosocial distress among adolescents. Yet, critical knowledge gaps remain regarding how the lived experience of climate change and multiple resource insecurities shape mental health among YAs in climate-impacted regions. To address these knowledge gaps, we conducted a multi-method qualitative study with YAs aged 10–14 years in six climate-affected Kenyan regions to explore their experiences of climate change, resource insecurities and related mental health stressors.

Methods

Study sites

This study was conducted in six climate-affected regions in Kenya: (1) Mathare, an informal settlement in Nairobi characterized by densely packed tin housing and limited access to water, sanitation and hygiene (WASH) facilities (Scott et al., 2017; UN Habitat, 2020); (2) Kisumu and the surrounding fishing communities along the shores of Lake Victoria that face floods, extreme temperatures and drought (Global Center on Adaptation, 2024; MoALF, 2017); (3) Isiolo in semi-arid Northern Kenya, home to nomadic and pastoralist groups that face prolonged and recurrent droughts (Mohamed Sala et al., 2020); (4) Naivasha, located on Lake Naivasha in the Great Rift Valley, which is home to flower farm workers (Murage, 2020); (5) Kilifi, with coastal smallholder farms, where residents contend with evolving climate and weather patterns (MoALF, 2017; Ogega et al., 2020); and (6) Kalobeyei Refugee Settlement in Turkana County, northwestern Kenya, which faces cyclical drought, shifting climate conditions (Cohen et al., 2015) and food insecurity (UNHCR, 2024).

Study design

This multi-method qualitative study was conducted between 2022 and 2023; details have been described elsewhere (Logie et al., 2023). Three data collection methods were employed: Elder focus groups (EFGs), walk-along interviews (WAIs) with YAs and participatory mapping workshops (PMWs) with YAs. Integrating multiple qualitative methods reflects an *intra-paradigm* research design that can generate more comprehensive insights compared to a single method (O'Reilly et al., 2021). Although each data collection method aimed to achieve the same core objectives, specific guiding questions were tailored to the distinct insights and experiences of each group. Elders contributed ecological insights and intergenerational perspectives, while YAs shared immediate, firsthand accounts.

This study began with $n = 2$ EFGs ($n = 1$ woman and $n = 1$ man) per site, resulting in $N = 12$ EFGs overall. EFGs were anchored by the question: *How is climate change shaping young adolescents' health and well-being?* Including Elders provided an opportunity to learn from traditional ecological knowledge (Pearce et al., 2009) and intergenerational perspectives (Sanson et al., 2019; Zeinali et al., 2020; Kennedy and Gislason, 2022).

We then conducted WAIs with YAs (aged 10–14 years) ($n = 10$ WAI; $n = 5$ girls and $n = 5$ boys), totaling $N = 60$. Interviews were guided by the following question: *How do young adolescents*

encounter and manage challenges in accessing food, water and toilets? WAIs explored socio-environmental (Krieger, 2012) influences on YAs' well-being through visual recordings and oral narrations of spatial environments where youth access essential resources; walk-along methods generate data on participants' surroundings and daily life (Bartlett et al., 2023).

The final data collection method involved $n = 2$ PMWs per site ($n = 1$ girls and $n = 1$ boys), (total PMW: $N = 12$). The guiding prompt for the PMWs was: *What actions and changes do young adolescents see as most important to address climate- and resource-related challenges in their communities?*

Workshops engaged YAs in identifying their needs, priorities and solutions through a series of participatory activities. These included sharing WAI videos and photos; co-creating and annotating maps representing locations where food, water and sanitation are accessed (Logie et al., 2023) and applying emoji stickers (Halverson et al., 2023) to photos/maps to represent emotions, followed by verbal explanations of these emotional responses.

Participants

Two community-based organizations (CBOs) led study implementation in Kenya, overseeing participant recruitment through leveraging existing partnerships with schools, health institutions, environmental organizations and social service agencies to purposively sample participants using snowball sampling techniques. In each study site, a community researcher with expertise in youth programming was hired to support recruitment. Elders were eligible to participate if they self-identified as a community Elder, were recognized as such by the community researcher and/or were aged >55 years; spoke English, Swahili or Luo and provided informed consent. YAs were eligible to participate if they were aged 10–14 years; lived in the study sites; spoke English, Swahili or Luo and provided informed assent with parental/caregiver consent. All invited participants agreed to participate.

Data collection processes

Before data collection, researchers at collaborating CBOs pilot-tested and refined the interview guides for clarity, and worked with academic researchers to refine the PMW process. Two trained master's/doctoral-level gender-diverse researchers from collaborating CBOs, together with a community researcher with established relationships with the CBOs, co-facilitated the EFGs, WAIs and PMWs in either Swahili or Luo. Doctoral-level academic team members provided additional support. At the outset of each data collection activity, researchers outlined the study's objectives and disclosed personal experiences related to YA health with participants. The interviewers were trained Kenyans who spoke the local dialects, completed research ethics training and conducted extensive training on working in nonjudgmental and non-stigmatizing ways with diverse youth.

The EFGs, ~60–90 min in duration, were held at local CBO facilities and audio-recorded, transcribed verbatim, translated by an experienced translator and shared with the CBOs for verification. The EFG guide included open-ended questions focused on changes in weather, resource scarcity and connections to YA health. The data collection team made field notes after the EFGs, WAIs and PMWs to discuss in team meetings.

WAIs were led by a trained CBO researcher and a community researcher. Each began with the YA participant planning a 30–45 min walking route to community sites related to water, food and sanitation. Participants guided the research team to these sites, using either wearable technology (i.e., GoPro camera) or handheld devices (i.e., tablets) to record their journey. Upon arrival, they took photos and provided verbal descriptions of their experiences, which were audio-recorded alongside the video footage.

The two-day PMWs were facilitated by two trained CBO researchers and a community researcher at local CBO venues. Visual data (e.g., maps, photos and emoji stickers), audio recordings of YAs describing the visual data and audio recordings of participant-composed songs were collected. All audio recordings were transcribed verbatim, professionally translated and verified by the CBO teams.

Analysis

Transcriptions and video data were uploaded to Dedoose (Dedoose, 2016), a cloud-based platform designed for collaborative coding. Data were anonymized and coded by at least three trained researchers. We applied thematic analysis (Attride-Stirling, 2001; Braun and Clarke, 2006), a flexible approach that allows for both deductive and inductive analysis of data from all collection methods through an iterative, cross-method analytic process (O'Reilly et al., 2021). A predefined, structured codebook enabled systematic coding and analysis. We developed two parent themes relevant to our focus on mental health (mental health stressors and substance use coping), each with two to four child themes, resulting in the six child subthemes we discuss below. Deductive analysis was guided by the resource insecurity framework, which situates food/water insecurity within broader socio-ecological contexts shaped by factors such as poverty and climate change (Wutich and Brewis, 2014; Brewis et al., 2020). Inductive analysis allowed us to identify subthemes that emerged directly from participants' narratives. For example, while mental health stress was a preestablished parent theme, the specific ways it was discussed by participants led to the formation of complex, inductively derived child subthemes, shaped by patterns in the data rather than predefined categories (e.g., the child subtheme of water insecurity-related mental health stressors included dimensions such as feelings of shame from needing to borrow water from neighbors, as well as feelings of anger walking long distances for water collection).

We conducted a detailed review of the data, generated initial codes, identified thematic patterns supported by data excerpts, developed a thematic map, refined themes and subthemes further and constructed an overarching narrative with illustrative quotations (Attride-Stirling, 2001; Braun and Clarke, 2006). Coding discrepancies were reviewed by a fourth reviewer and resolved through team discussions and consensus-based recoding. Analyses continued until thematic saturation was achieved, with feedback on findings provided by CBOs. For this article, we present data on YA mental health outcomes.

Results

Participants ($N = 297$) included the following: Elders ($n = 119$; mean age: 60.6 years, standard deviation [SD]: 7.9; men: 48.7%, women: 51.3%), WAI participants ($n = 60$; mean age: 13.4 years, SD: 1.5; boys: 51.4%, girls: 48.6%) and PMW participants ($n = 118$; mean age: 12.1 years, SD: 1.33; boys: 50.8%, girls: 49.2%). Socio-demographic information is displayed in Table 1.

YA and Elder narratives revealed key mental health challenges related to climate change and related resource insecurities:

Table 1. (*Continued*)

Sociodemographic characteristics of participatory mapping workshop adolescent participants by location (*n* = 118)						
	Isiolo (*n* = 20)	Kalobeyei (*n* = 20)	Kilifi (*n* = 20)	Mathare (*n* = 20)	Naivasha (*n* = 20)	Kisumu (*n* = 18)
Gender						
Adolescent boy	10 (50%)	10 (50%)	10 (50%)	10 (50%)	10 (50%)	10 (55.6%)
Adolescent girl	10 (50%)	10 (50%)	10 (50%)	10 (50%)	10 (50%)	8 (44.4%)

Note: missing n, number of missing responses; SD, standard deviation.

(1) mental health stressors, with subthemes – water insecurity-related stressors, sanitation insecurity-related stressors and food insecurity-related stressors; (2) alcohol- and substance use-related coping, with subthemes – economic insecurity and poverty-related stressors and substance use-related violence concerns. Table 2 presents mental health-related findings across genders, locations and data collection methods. Water insecurity emerged as a universal concern for both men and women across all sites. In contrast, sanitation insecurity was predominantly reported by women, particularly in Mathare and Naivasha. Food insecurity-related stressors showed more variation, with men in Kilifi and Mathare identifying these challenges more frequently. Economic precarity was a common stressor in all locations, with discussions primarily occurring in EFGs. EFGs and WAIs provided gender-specific insights, revealing that men more frequently discussed alcohol and substance use as a response to economic insecurity, particularly in Isiolo and Mathare, while women, especially in Kalobeyei, highlighted concerns about substance use-related violence. While core stressors were consistently identified across methods, EFGs emphasized structural factors (e.g., economic insecurity and interpersonal violence), WAIs revealed experiences of everyday resource access and navigation and PMWs centered on youth-driven priorities and recommendations.

Mental health stressors

Water insecurity-related stressors

Limited or inconsistent access to clean water invoked anger and sadness among participants. For instance, a participant described: "Water gets disconnected a lot; sometimes even for 2 weeks. If after one week, water isn't back, it really upsets us because it means we have no drinking water." (PMW, Mathare, girls). Others expressed anger when being forced to walk long distances in difficult terrain to collect water; a participant described what they felt: "Angry: Too far to fetch water, legs get tired as we push the jerricans" (PMW, Isiolo, boys). Figure 1 illustrates how adolescent girls in Isiolo expressed similar anger with emoji stickers during a PMW.

Alongside anger, participants experienced shame from having to borrow water from their neighbors: "Here in Akadeli, we don't even have water. We borrow from our neighbours. The jerrican we

Table 2. Mental health findings by location, gender and data collection method

Theme	Subtheme	Method	Isiolo	Kalobeyei	Kilifi	Mathare	Naivasha	Kisumu
Mental health stressors	Water insecurity-related stressors	EFG	W, M	W, M	W	W, M	W, M	W, M
		WAI	W, M	W, M	M	W	W, M	W, M
		PMW	W, M	W, M	W, M	W, M	W, M	W, M
	Sanitation insecurity-related stressors	EFG	W, M	W, M		W	W	
		WAI	W, M	W, M	W, M	W, M	W, M	W
		PMW	W, M	W, M	W, M	W, M	W, M	W, M
	Food insecurity-related stressors	EFG	W, M	W, M	M	M	W, M	W, M
		WAI	W, M	W, M		W, M	W	W
		PMW	W, M	W, M	W, M	W, M	W, M	W, M
	Stressors related to larger contexts of economic precarity	EFG	W, M	W, M	W, M	W, M	W, M	W, M
		WAI	M			W		
		PMW					W, M	
Alcohol- and substance use-related coping	Economic insecurity and poverty-related stressors	EFG	M	W	W, M	W, M	W, M	W, M
		WAI		W, M		M		
		PMW		W		M	W, M	
	Substance use-related violence concerns	EFG	M	W		W, M	W, M	W
		WAI		W, M		W	M	W
		PM		W			W, M	

Note: Participant type: elder focus group (EFG), walk-along interview (WAI), participatory mapping workshop (PMW), women (W), and men (M). Color legend: Green, both men and women mentioned; orange, woman alone mentioned; and purple, men alone mentioned.
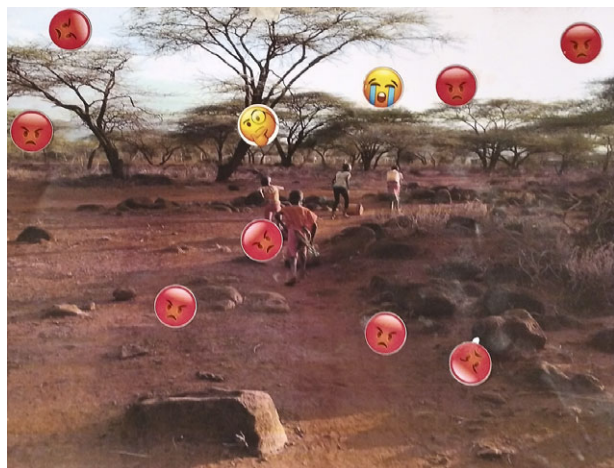
Figure 1. Photograph of children pushing jerricans in a rural landscape, with emoji stickers placed by adolescent girls during a participatory mapping workshop in Isiolo, Kenya.

borrow from the neighbour only lasts us two days, then we will go beg elsewhere, and they'll say there's none." (PMW, Isiolo, boys). Another participant shared that borrowing water made her feel bad "because sometimes when I have to do it, my friends laugh at me" (WAI, Mathare, girl, aged 11, ID#107).

Long queues at communal taps also contributed to educational disruptions as adolescents were expected to fetch water early in the morning before school and again after school. This often required waking up early, sometimes leading to being late for school or being unable to complete their homework in the evening, resulting in punishment. One participant shared:

This makes me feel sad because if there's no water and that has been the case for a while, then you find a line. If it's evening, for example, and you have homework, you'll queue for a very long time, not get to do your homework, then the next day at school the teacher will punish you. (PMW, Mathare, boys)

These narratives illustrate how emotional, educational and social consequences of water insecurity converge in adolescents' lives, amplifying stress across settings.

As consecutive failed rainy seasons have exacerbated existing water shortages, water disputes have risen. Participants expressed sadness and distress from witnessing fights at water taps "I put an angry face on the water point. I'm usually not happy when there's no water…most times people fight when there isn't water, because they don't want the water to run out on them." (PMW, Mathare, girls). Another participant shared a recent experience when at the taps:

Just recently I was here fetching water when a woman came and told me to remove my jerrican. My dad had gone to work. I told her that I am the one who arrived here first, but she still removed my jerrican and pushed it away. I let her fetch her water, I didn't want trouble. When I allowed her to do so, another one came; she was drunk. She also wanted to fetch water. I didn't feel good. I didn't even get water and so I just went back. (WAI, Kalobeyei, boy, aged 13, ID#502)

Sanitation insecurity-related stressors
While water insecurity contributed to routine disruptions and interpersonal conflict, sanitation concerns introduced another layer of distress marked by discomfort, fear and, in many cases, gendered vulnerabilities. Adolescents described experiencing hygiene-related stressors triggered by unclean and malodorous

toilets. As a participant stated, "The place gives me stress. There's a bad smell. (WAI, Kilifi, girl, aged 12, ID#302). Challenges with accessing toilets were another significant source of stress for adolescents. Despite being used communally, many toilets are privately owned and locked. This forces adolescents to endure discomfort, as expressed by one participant: "We have to ask for the key so this means you would have to hold it in till morning." (WAI, Mathare, girl, aged 14, ID#106). Another participant shared a similar sentiment: "For me, I feel sad because sometimes you might be really pressed, go to one toilet and find it locked, and then go the next and it's the same. Upon finding one that's open, you find it completely dirty with faeces all over, you cannot even go in" (PMW, Mathare, boys).

When toilets are inaccessible, some resort to open defecation or using "flying toilets," where human waste is collected in plastic bags and discarded in public areas, such as roadsides or roofs. A participant explained that this could lead to feelings of discomfort: "Sometimes we find the toilet locked because some people have not paid, so it becomes difficult to go to the toilet. This way, you find some people using flying toilets, and this can get to you" (PMW, Mathare, girls). Figure 2 below shows a photo used during participatory mapping workshops with a sticky note where young adolescents explained their emoji choices. Sad, worried and angry emojis were linked to a lack of privacy (no door), smell, spread of disease and lack of handwashing facilities.

The potential for harassment, kidnapping and rape when accessing sanitation and hygiene facilities arose as another stressor, impacting girls disproportionately. A participant explained, "… children shouldn't take trash to the river, because someone can kidnap them, especially girls." (PMW, Mathare, boys). Another participant recounted the rape of a young girl disposing garbage at the river, saying, "There was a case here where a child got raped and since then, I've been afraid to come here" (WAI, Mathare, girl, aged 14, ID#106).

Boys, in particular, expressed anger over the lack of privacy and security in public toilets and showers. One said: "I am angry because the toilet has no door and has no privacy because if you go outside and some people have to see you and some stranger can kill you. I am angry" (PMW, Naivasha, boys). Another shared: "I am angry
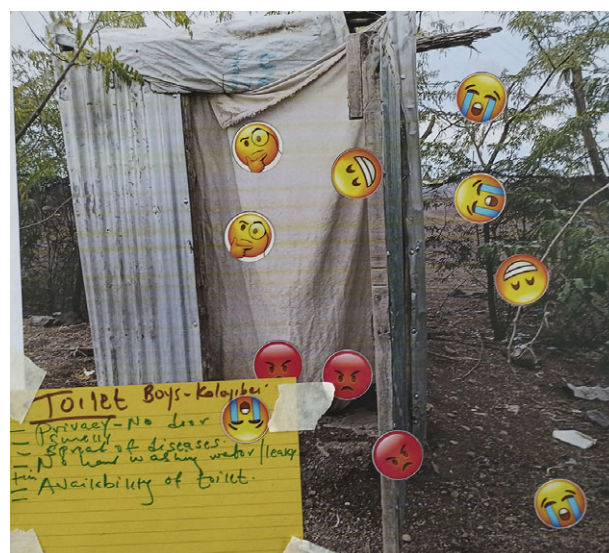

Figure 2. Photograph of a toilet with emoji stickers added by adolescent boys during a participatory mapping workshop in Kalobeyei Refugee Settlement, Kenya.

because it is near the toilet and the area is also the area is bushy and it is too dirty, I cannot come at night because there is no security and I may be 'stolen' at night" (PMW, Kisumu, boys). These accounts underscore how adolescents' emotional responses to inadequate sanitation, ranging from discomfort and sadness to fear and anger, are shaped not only by physical conditions but also by broader contexts of gendered violence and neglect.

Food insecurity-related stressors

Food insecurity elicited intense emotional responses of desperation and helplessness, rooted in feelings of abandonment and neglect. Across nearly all study sites, participants spoke of increasing desperation related to hunger. In songs written and performed by YAs, they called upon their community leaders and governments to alleviate their struggle. In Isiolo, they sang: "We are crying of hunger. We all would like food. Our president, we are asking that you bring us food. Leaders! Bring us food" (PMW, Isiolo, boys). In Mathare, boys sang: "Food is life to people and there are people who are struggling without meals. Mr. President, we are asking you to help. Give us jobs so that we can fend for food" (PMW, Mathare, boys). Adolescent girls in Naivasha expressed the same sentiment: "Our government, give us food, that we may have enough" (PMW, Naivasha, girls). These messages were reinforced visually during a PMW. In Figure 3, adolescent girls in Mathare used emoji stickers to express feelings of sadness and frustration in relation to a fish stall, a symbol of food scarcity and struggle that also caused distress due to a lack of perceived cleanliness.

Stressors related to larger contexts of economic precarity

When compounded by economic precarity, the impacts of food, water and sanitation insecurity deepened into more acute mental health outcomes. Elders and adolescents alike expressed concerns regarding suicides among young people: "Children have killed themselves. They have hanged themselves due to their stress and there are many of them. Fifteen, fourteen-year-olds" (EFG, Kalobeyei, women). Adolescent participants disclosed past suicidal

Figure 3. Photograph of an omena (freshwater fish) stall, with emoji stickers placed by adolescent girls during a participatory mapping workshop in Mathare, Kenya.

thoughts. One participant said: "after the challenges I have gone through, sometimes I felt like killing myself" (PMW, Naivasha, girls). Reasons provided for suicidality included poverty, family stress and specifically food insecurity. Elders also noted that parents' stress exacerbated children's stress, including poverty and domestic disputes:

> "These children seem to absorb the stress of their parents. They are greatly affected by this. On top of poverty, there is domestic violence and disagreement in the homes. These children will definitely be very stressed. They will give up, be withdrawn and imitate life out there to distract them from what's going on." (EFG, Mathare, women)

Further, participants reported that parents, especially mothers, were driven to suicide out of desperation of seeing their children without food. Delay of "bamba chakula," money or food assistance vouchers given to refugees, meant the accumulation of debts: "I am currently five months in debt. What should I do?" asked a woman Elder in Kalobeyei Refugee Settlement. Describing the situation in the same area, a participant said:

> "Mothers are starting to hang themselves. On the fifth of this month, we have buried one. I have found (another) mother by rope. Do you see? I asked, 'my mother' (term used amongst women) what is the problem? She said, 'mother', my children have completed four days without eating." (EFG, Kalobeyei, women)

These accounts reflect the psychological toll that prolonged economic precarity can take, not only on individual adolescents but also across entire households and communities.

Alcohol and substance use-related coping

Economic insecurity and poverty-related stressors

Participants explained that widespread poverty, resource insecurity and unemployment drove adolescents to run away from home and drop out of school. As a participant shared: "…this area doesn't have factories and the jobs available… so that income, for someone who rents a house, is very little. So, most children cannot get education further…they become dropouts…" (EFG, Naivasha, men). In their efforts to meet their needs, adolescents were often led to environments where alcohol and drug use were prevalent. Elders in all but two study sites noted this trend:

> "… that means that he didn't seem to have eaten enough food and if he compares what is going to do at school, he doesn't seem impressed. So, he will decide and go weed (cultivate a garden) for someone for money. When he gets money, together with other people they were weeding with, they will then go as a group and drink alcohol. When he gets back his eyes are red." (EFG, Kisumu, women)

For some adolescents, the consequences of engaging in this behavior are tragic. One mother narrated her son's struggle:

> "My son completely refused to attend school. It was the type of environment he was constantly in … the people, the drugs they smoked. I buried him last year, January the 14th (2022). He started stealing in the house to get money to buy bhang [marijuana]. I'd be so saddened meeting him on the streets, asking him why he's chosen that life, he would just keep telling me that he's coming home. Eventually he never did. They brought him to me when he was sick, just the last hours before his death. So, I see poverty as a factor." (EFG, Mathare, women)

Participants also highlighted the increasing number of adolescent girls turning to alcohol and drug use to cope with the challenges of poverty. Elders pointed out that girls experience heightened stress due to taking on responsibilities such as sourcing food for families. In refugee settlements, Elders observed that adolescent girls often

assumed parental roles. A participant in Kalobeyei Settlement described: "Especially many girls have pressure due to stress. And there are those who don't have their fathers, their fathers died for our countries, they were killed. Children are here with other children" (EFG, Kalobeyei, women). Another participant stated: "…there are some who use the drugs because maybe I am the parent, and I don't have a job. So that causes even the young girls, because children are all children, to get involved in some things that are not right because of lack of income" (EFG, Kilifi, men). These narratives reveal how economic hardship and gendered expectations shape adolescents' trajectories, with girls bearing both emotional and material burdens that heighten their vulnerability.

Substance use-related crime concerns

Participants described how once adolescents began using alcohol and drugs, involvement with neighborhood gangs and crime often followed. As an Elder explained, "They know there's no food at home, their mother is probably at work and so another child will invite them to smoke bhang [marijuana] with them. They will want to smoke it again and so will start pickpocketing to get money to buy it" (EFG, Mathare, men). Petty crime could escalate to violence, especially among boys. This emerged as a significant issue in various communities:

> *"Let's talk about the boys. Once they feel mature, for example, if a boy's voice breaks making him feel just a little grown up… he goes out and begins engaging in theft. Give it just a few months, or at most a year, this child will be shot and killed. This is because eventually, he will get into hard core groups, and this will be his fate. There, they indulge in drugs, illicit brew, bhang, mugoka [similar to khat, a plant for chewing], etc"* (EFG, Mathare, women).

Elders explained that as crime rose, the community's sense of security declined. One participant recounted that "… just the other day, on Wednesday, I was robbed. I got back from my night shift and found my door open, and my house broken into. It's these same boys that we are talking about aged 10–14 years" (EFG, Mathare, men). Substance use and interconnected violence were described as causing community violence concerns: "This combination (drugs and crime) is lethal! That boy can knife you after indulging in all those. They will not even realize that it's an adult, a parent, someone they may know" (EFG, Mathare, women). These accounts highlight how adolescent distress, when left unaddressed, can ripple through communities and erode collective safety and social cohesion.

Discussion

Our multi-method study with YAs in six climate-affected regions in Kenya indicates that climate change-related EWEs, including drought, heavy rains and flooding, negatively impact YA mental health by exacerbating resource insecurities that, in turn, produce multiple stressors. A conceptual framework showing these pathways from EWEs to resource insecurities to individual and community-level stressors among YAs in these climate-affected Kenyan regions is displayed in Figure 4. This framework illustrates the pathways our findings documented from climate change to food, water and sanitation insecurities, along with general economic precarity, that in turn led to intrapersonal stressors of shame, psychological distress and substance use-related coping. The consequences of resource insecurity and its intrapersonal stressors could include educational disruption for youth as well as perpetration and/or victimization from community violence. These findings can inform future YA-centered mental health programming that accounts for social-ecological (Baral et al., 2013) factors spanning ecological (e.g., weather), community (e.g., resource insecurity and violence concerns) and individual (e.g., shame and distress) levels.

Our findings provide insight into mental health stressors faced by YAs in diverse Kenyan regions when attempting to access
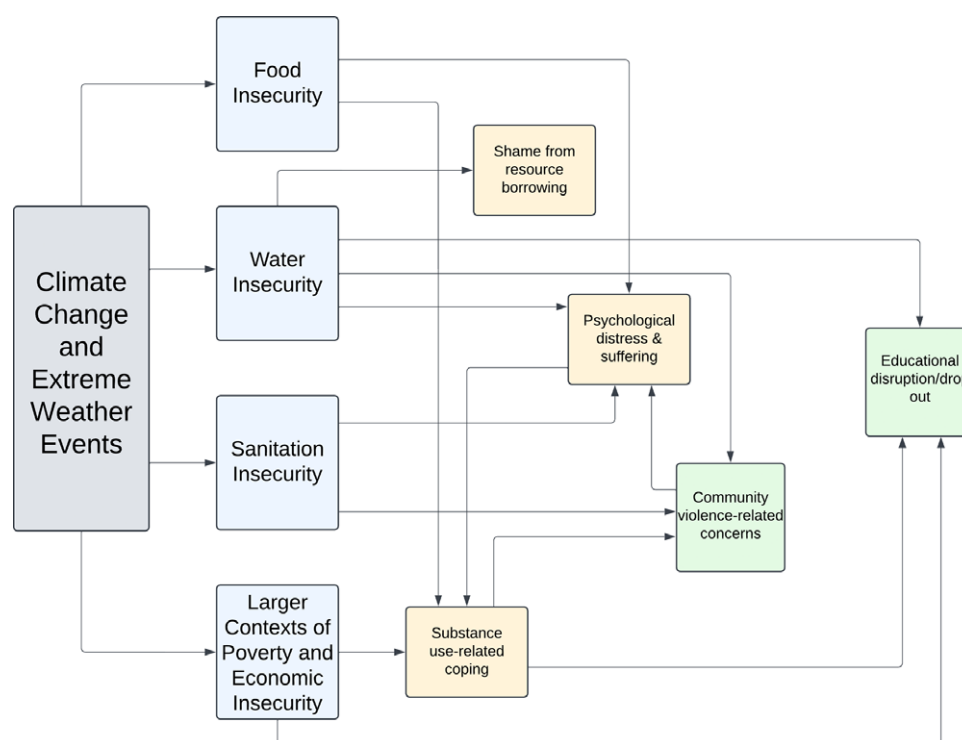

Figure 4. Conceptual framework of pathways from climate change and extreme weather events to psychosocial distress and suffering among young adolescents in Kenya.

essential resources, such as water, food and sanitation. Youths' emotional responses, including anger, shame, sadness and frustration, were triggered by challenges such as high costs, long travel distances, prolonged waiting times to access basic needs, stigma when borrowing resources, inability to meet hygiene needs and consequences such as disruptions to education. These findings align with previous research indicating that climate-induced resource insecurities exacerbate poor mental health outcomes through financial, physical and social stressors (Bisung and Elliott, 2016, 2017; Shayo and Lawala, 2019; Smith et al., 2023). Consistent with studies from Kenya, Tanzania and Ethiopia, our findings indicate that food insecurity is associated with increased emotional distress, depressive symptoms and suicidal ideation and attempts (Alaimo et al., 2001, 2002; McLaughlin et al., 2012; Heflin et al., 2019; Shayo and Lawala, 2019; Smith et al., 2023). Our study builds on this evidence by highlighting how resource-related conflicts linked with multiple co-occurring insecurities are experienced by youth, families and communities. Youth experience additional stress due to awareness of their parents' poverty-related stress. Our findings, thus, expand beyond a focus on stressors caused by individual experiences of resource insecurity, as youth described how family and community stressors increased their stress. Future research can further explore family dynamics through parent, teacher and local health worker perspectives to focus on identifying strategies for promoting multisystemic resilience (Ungar, 2021).

Our finding that resource insecurities contribute to alcohol and substance use-related coping aligns with prior studies that link resource scarcity and environmental stressors to increased youth substance use (Alaimo et al., 2001, 2002; McLaughlin et al., 2012; Heflin et al., 2019; Vergunst et al., 2023). In our study, three main pathways – widespread poverty, resource insecurity and unemployment – emerged as driving forces behind adolescents leaving home, dropping out of school and substance use-related coping. Our findings suggest that adolescent girls may also engage in substance use-related coping to manage stressors linked with burdens of gendered role expectations (e.g., sourcing food). While resource insecurity-related stressors may contribute to increased substance use coping among all youth, our findings suggest that it may specifically contribute to boys' involvement in violence. This highlights the importance of a gender-based analysis (Tannenbaum et al., 2016) that considers the differential impacts of resource insecurities on youth well-being among boys and girls that are shaped by gender roles, norms and expectations.

Additionally, sanitation insecurity produced psychosocial distress in multiple ways, including discomfort using unclean facilities, as well as girls' fears of sexual assault. These findings also underscore the importance of gender-based analyses (Tannenbaum et al., 2016) to identify stressors such as sexual and gender-based violence rooted in the devaluation of women and girls. For both adolescent boys and girls, the lack of adequate security and privacy in water and sanitation hygiene facilities exacerbated stress and worry. Our findings align with previous research that highlights the social stressors associated with inadequate or unsafe access to sanitation facilities (Bisung and Elliott, 2016, 2017), with Table 2 demonstrating how these experiences were ubiquitous across six diverse climate-affected regions in Kenya.

Our findings build on resource insecurity frameworks (Wutich and Brewis, 2014; Brewis et al., 2020) to highlight the complex pathways from multiple resource insecurities to mental health with YAs and how these were exacerbated by preexisting social inequities, including poverty and gender inequity. Our findings also align

with hypothesized mechanisms connecting water insecurity to mental health – such as worry of illness, shame, conflict, material deprivation and opportunity loss (e.g., school) (Wutich et al., 2020) – and reveals that these mechanisms are also relevant for understanding pathways from food and sanitation insecurity to YA mental health in Kenya, as illustrated in Figure 4.

Interventions targeting resource insecurities can concurrently enhance psychosocial well-being among adolescents (Wutich et al., 2020) and should be co-created with YAs to ensure gender, age, cultural and contextual relevance. Evidence supports the effectiveness of school-based mental health programs in reducing mental health concerns and improving well-being among youth (Grande et al., 2023; Cohen et al., 2024). Gender-sensitive WASH initiatives that involve women in the design and management of sanitation facilities have been shown to improve both health outcomes and gender equity (UNICEF, 2017; MacArthur et al., 2023). Moreover, youth-engaged climate adaptation projects empower adolescents to contribute to climate solutions, promoting a sense of agency and reducing climate change-related anxiety (Fund, 2022; Global Center on Adaptation, 2022). Additionally, child health-specific adaptation policies and measures have been documented elsewhere and could be explored for relevance in the study sites, including online programs, awareness raising and community engagement and outreach (Zangerl et al., 2024). However, addressing resource insecurities alone may be insufficient. Comprehensive strategies must also tackle broader social inequities – including poverty, gender inequities and the unique challenges faced by marginalized groups such as refugees and nomadic and pastoralist communities – to effectively promote mental health and well-being among adolescents.

Strengths and limitations

This study has several limitations. First, the group-based design of focus groups and participatory mapping may have discouraged participants from openly sharing personal experiences on sensitive topics. Second, as recruitment occurred through CBOs, our sample comprised adolescents already connected to social, educational or health services. As a result, the study may have excluded particularly marginalized or disconnected youth who lack access to these programs or networks, thereby limiting the perspectives of those most isolated from institutional support. Third, the nature of WAIs in public spaces limited opportunities for in-depth conversations. Fourth, while mental health stressors can influence physical health through multiple pathways, exploring these linkages was beyond the scope of the analysis. Fifth, several dimensions of mental health were not prominently reflected in participants' narratives and are, therefore, underexplored in this study. These include community-level resilience and protective factors (e.g., the roles of elders or local organizations), differences between externalizing and internalizing coping responses (e.g., substance use vs. social withdrawal) and the influence of intersecting identities, such as gender and refugee status, on climate-related vulnerabilities. Finally, because this study focused on sexual and reproductive health rather than mental health, participants did not engage in more in-depth discussions of mental health solutions. Despite these limitations, study strengths include a focus on YAs, a group often overlooked in climate change and mental health research and interventions, especially in LMICs (UNICEF Innocenti, 2022). The study captured diverse perspectives across genders, life stages and geographical regions, providing a view of shared and site-specific challenges. Moreover, the qualitative multi-method approach

enabled a more comprehensive examination of climate and resource insecurity impacts, and participatory visual methods facilitated self-expression and interaction with photos (D'Amico et al., 2016).

Conclusions

To date, limited research has explored how concurrent water, sanitation and food insecurity-related stressors affect the mental health and well-being of climate-affected YAs in Kenya. This study spotlights the pathways linking resource insecurities to mental health stressors, as well as distinct gendered experiences within this understudied age group. Future research should consider longitudinal designs to examine changes in risk and protective factors over time to inform intervention development, and to explore the bidirectional relationship between mental and physical health in the context of climate change and related resource insecurities. Further attention to the interplay between gender-related constructs (e.g., roles and relations), social identity-related stressors (e.g., refugee-related stigma), coping responses (e.g., substance use and withdrawal) and socio-cultural protective factors (e.g., social support) may generate deeper insight into how collective environments shape adolescent well-being. To meaningfully promote YA mental health in climate-affected settings, policy responses and interventions must address co-occurring resource insecurities, gender inequities, engage families, communities and institutional systems, and incorporate strategies that target broader social, environmental and structural inequities.

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