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Climate seasonality and the health and well-being of older adults in rural Busia and Kilifi Counties, Kenya: SENIORS study – protocol for a qualitative study

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ABSTRACT

Introduction Older adults are particularly vulnerable to climate-related stressors such as extreme heat, food and water insecurity and displacement, all of which can worsen existing health conditions. This is further compounded by age-related physiological changes, pre-existing health conditions and social factors like isolation and limited mobility. With a growing population of older adults in low-income and middle-income countries, their vulnerability to climate change becomes a critical global public health issue and yet is understudied and needs urgent and comprehensive action. This study aims to investigate how climate seasonality impacts the health, well-being and socioeconomic conditions of older adults in rural communities of Kenya.

Methods and analysis This formative qualitative study will use a combination of 40 in-depth interviews with older adults and key informant interviews with 20 health workers and 12 policy-makers to provide a comprehensive understanding of the impacts of climate seasonality on the health, well-being and socioeconomic conditions of older adults in rural communities of Busia and Kilifi Counties in Kenya. These counties were selected for the study due to their history of significant flooding and heat stress events. Study participants will be purposively selected for the interviews. A thematic approach will be employed in data analysis using NVivo V.14 software.

Ethics and dissemination This study received ethical approval from the Medical College of Wisconsin Institutional Review Board, Institutional Scientific Ethics Review Committee at Africa International University and National Commission for Science, Technology and Innovation, Kenya. The study outputs will reflect the views and experiences of older adults, health workers and policy-makers. The findings will be disseminated to the scientific community through conferences and peer-reviewed publications and to the older adults, health workers, communities and policy-makers through videos and dissemination meetings, and policy briefs. The findings will deepen understanding of how climate seasonality is experienced by older people and shape strategies for resilience and adaptation.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This qualitative study facilitates in-depth exploration of older adults' experiences of climate seasonality on their health and well-being in Kenya.
⇒ The study also triangulates the experiences of older adults with perspectives of health workers and policy makers, adding richness to the data.
⇒ The sampling of two distinct geographical areas of Kenya will capture a wide-ranging spectrum of older adults' experiences, thereby ensuring that the findings reflect the complexity of climate seasonality impacts that may be applicable to similar settings and highlight those that might be limited to certain contexts.
⇒ A key limitation is that, because this is a qualitative study, results may not be generalisable to the entire population of older adults in Kenya.

BACKGROUND

Globally, older adults aged 65 years and over are the fastest-growing population due to further advancements in technology and medicine.[1 2] The WHO estimates that by 2050, 80% of older adults will be living in low-income and middle-income countries (LMICs).[3] In Africa, this demographic shift coincides with the escalating impacts of climate change, creating complex and compounding risks for vulnerable populations.[4] Older adults are particularly vulnerable to climate-related stressors such as extreme heat, food and water insecurity and displacement, all of which can worsen existing health conditions.[5] Increased exposure to extreme temperatures, air pollution and infectious diseases is compounded by age-related physiological changes, pre-existing health conditions and social factors like isolation and limited mobility.[6] Prolonged periods of hot and cold weather make it difficult for older individuals to thermoregulate, leading to dehydration and cardiovascular strain,[7] while increasing air pollution worsens cardiovascular and respiratory health.[8] The growing number of extreme weather events, combined with water contamination, poses

additional threats to the physical and mental health of older adults, especially those with pre-existing health conditions.[6 9 10]

With a growing population of older adults in LMICs, their vulnerability to climate change becomes a critical global public health issue that creates multiple challenges and needs urgent and comprehensive action.[2 11–13] In North America, older adults are disproportionately affected by extreme weather events like hurricanes and wildfires due to mobility constraints, reduced social support networks and limited access to emergency services.[13] In Australia, older adults face challenges adapting to extreme heat due to limited health literacy, technological difficulties and isolation, exacerbating their vulnerability to climate impacts.[14] Furthermore, climate change has been linked to increased anxiety, depression and other psychological disorders in older adults, particularly in regions where healthcare services are limited.[15 16] In addition to impacting mental health, climate change also influences the social and environmental determinants of healthy ageing by limiting older adults' ability to travel, socialise and seek help, increasing their risk for negative health outcomes.[11]

Despite these global insights, there is a paucity of evidence on the link between climate change and health among older adults in LMICs. There needs to be more region-specific research on the health impacts of climate change on older adults in sub-Saharan Africa (SSA). It is worth noting that along with other countries in the SSA region, Kenya is experiencing significant and observable effects of climate change, including rising temperatures, prolonged droughts and extreme weather events like floods.[17 18] These climatic changes have devastating effects on agriculture, water resources and socioeconomic livelihoods, especially in rural areas. Moreover, rising incidences of infectious diseases such as cholera, malaria and tuberculosis have been linked to changing temperature and rainfall patterns.[19] A study conducted among the general populations aged 6–83 years found a significant correlation between high temperatures and physical activity levels in rural Kenya, suggesting decreased activity in hotter conditions.[20] However, the population of older adults in the sample was small and was classified together in the category 45 years and above. Other research on seasonality in Kilifi, Kenya, has focused on maternal and neonatal health, revealing how high temperatures affected postpartum women and neonates.[21] While there is a growing extensive body of work on climate change and maternal and child health, there are significant gaps in research on climate change and ageing in Kenya and in SSA in general. Older adults remain understudied, and the lack of research underscores the need for targeted studies investigating how climate seasonality affects this population in the Kenyan context and similar settings.

The global evidence suggests that older individuals are especially vulnerable to the effects of climate change. In Kenya, where climate change affects various subgroups, including women and farming communities, the vulnerability of older adults remains a critical but understudied issue.[22] Considering these vulnerabilities, particularly in rural Kenya, older adults with existing health concerns are more likely to experience poorer health outcomes and quality of life. To address these gaps, targeted research that specifically investigates the health impacts of climate change on older adults in rural Kenya is needed. This includes identifying key exposure pathways, such as heat stress, food insecurity and infectious diseases, and evaluating local adaptation strategies that leverage community-based support networks and indigenous knowledge systems. The climate seasonality and the health and well-being of older adults in rural Busia and Kilifi Counties, Kenya: SENIORS study will bridge this gap by exploring how seasonal variations associated with climate change impact their health, well-being and socioeconomic conditions in rural communities.

Research questions

RQ1: How does climate seasonality impact the health and well-being of older adults in Kenya?

RQ2: What coping strategies and adaptation mechanisms do older adults employ to manage the impacts of climate seasonality?

RQ3: How can local communities and policy interventions support older adults in enhancing their resilience to climate seasonality?

METHODS AND ANALYSIS

Study design

This formative qualitative study will use a combination of in-depth interviews and key informant interviews to provide a comprehensive understanding of the impacts of climate seasonality on the health, well-being and socioeconomic conditions of older adults in rural communities of Busia and Kilifi Counties in Kenya. The study commenced in August 2025 and analyses and dissemination are planned to be completed by the end of June 2026. The guiding theoretical framework of the SENIORS study first phase is the Climate Change and Health Vulnerability Adaptation Framework.[23] The framework was developed and used in conducting an extreme heat and health vulnerability assessment in Durham Region, Ontario, Canada. The framework posits that health impacts are influenced by three main factors: exposure, sensitivity and adaptive capacity. The first factor, exposure, is the degree to which an individual or community is exposed to extreme heat. It is influenced by underlying social and economic conditions that result in some individuals or communities experiencing more exposure to extreme heat than others. For instance, a person working outdoors may have greater heat exposure, for instance. In our study, we are focusing on rural environments and will look at older adults' reported exposure to extreme heat or floods. The second factor, sensitivity to heat, is the degree to which an individual is affected by extreme heat. This can be influenced by factors such as age, genetics, health

status or community health disparities. For instance, older adults may be more sensitive to heat due to a decreased ability to regulate body temperature. In our study, we will explore this sensitivity through the older adults' narratives exploring age, health and disability status including pre-existing conditions and community health disparities. The third factor, adaptive capacity, is the ability of an individual or community to respond to and protect against the health impacts of extreme heat. This capacity may include access to informational, social, financial and institutional support. Overall, vulnerability to seasonality is also influenced by the social and environmental determinants of health including broader structural factors, living conditions, income, access to health and healthcare and living in a supportive community. Our SENIORS study will identify actual experiences of climate hazards or seasonality, explore the perceptions of health impacts, drivers of seasonality changes and drivers of vulnerability, social and ecological determinants of health and community and health system responses.

Study setting

Busia and Kilifi Counties were purposefully selected from among Kenya's 47 counties, as the SENIORS study sites due to their history of significant flooding and heat stress events, which have had substantial impacts on the local populations. Their distinct climatic and socioeconomic variations, provide a valuable opportunity to explore the diverse impacts of climate change on older adults in different settings. Busia County in the western region experiences a wide range of climate extremes, including heavy rainfall, frequent flooding, periods of cold weather and episodes of extreme heat. These fluctuations expose the population to multiple climate-related risks, such as displacement, waterborne diseases and disruptions to agriculture and livelihoods. In contrast, Kilifi County on the east coast is characterised by sustained high temperatures, consistently averaging between 23–50°C throughout the year. The county faces prolonged dry spells and increasing heat stress, contributing to chronic water scarcity, reduced agricultural productivity and heightened food insecurity. Additionally, the two counties differ in their predominant economic activities. Busia relies heavily on small-scale farming, fishing and cross-border trade, while Kilifi's economy is largely driven by tourism and subsistence agriculture.

Study population

The SENIORS study population will comprise older adults aged 65 and above, health workers who provide services to the older adults in the study sites and policy makers who work on well-being of older adults and have insight into adaptation and resilience strategies. Study participants will include men and women to capture any differences in gender dynamics. Participating older adults should have lived in the specific community for a minimum of 10 years to have a deep understanding of seasonality changes in the locality over at least a decade or more. Older adults will be eligible if they live in a household setting in the community, while those living in an institutional setting will be excluded. Those who are physically ill or have cognitive impairment will also be excluded. All participants should be fluent in the local language, kiSwahili and willing to provide informed consent. Health workers will be included to provide a broader view of the observed impacts of seasonality including both flooding and heat stress on the health of older adults and the local response strategies from a health system perspective. To participate in the study, health workers should have worked in the community for at least 5 years and have experience of providing health services to older adults in the community. Policy-makers will be included from both counties and at the national level if they have worked in the county or at national level for at least 6 months and have a deep understanding and experience of the policy environment for older adults and resilience and adaptation strategies.

Sampling strategy

A total of 40 male and female older adult participants from rural Busia and Kilifi County, with 20 from each county, will be purposively sampled based on their deep knowledge and lived experience of the communities to capture diversity of perspectives on seasonality. We will aim for an equal distribution by gender to allow exploration of gender dynamics related to the topic. We will interview 10 health workers from each site as key informants to provide their perspectives on how seasonality affects the health and well-being of older adults. We will also interview 12 policy-makers as key informants, 5 from each devolved county government and 2 from the national level to provide their perspectives on resilience and adaptation strategies. The study sample per participant category was guided by the principle of data saturation, where no new insights are expected to emerge.[24] Table 1 shows the numbers of older adults, health workers and policy-makers to be sampled.

Recruitment strategy

Meetings will be arranged with household heads and local leaders to help identify and recruit eligible older adults from various villages. Older adults' forums in both Kilifi and Busia will be engaged throughout the research process to ensure that participant recruitment is inclusive and culturally and ethically appropriate. These forums will also play a vital role in ensuring that findings are shared in accessible ways, and that older adults are meaningfully involved in dissemination activities, including participation in information-sharing forums. This participatory

Table 1 Sampling strategy

Study population	Busia	Kilifi	National
1. Older adults	20	20	0
2. Health workers	10	10	0
3. Policy-makers	5	5	2

approach will ensure the research remains grounded in the lived experiences of older adults and that their voices are central to both the study and its outcomes. During the community engagement, the research team will explain the study purpose and procedures in the participants' preferred language to ensure clarity and understanding. All study documents will be translated into kiSwahili to ensure participants fully understand the study. For the key informant interviews, health workers will be recruited following information sessions on the study through the counties and the health facilities. Researchers will have the flexibility to recruit both older adults and health workers concurrently. Policy-makers will be approached directly at both county and national level.

Data collection

Data collection will be conducted using an In-Depth Interview Guide for Older Adults, Key Informants Interview Guide for Health workers and Key Informants Interview Guide for Policy makers. After sharing the information, potential participants will be given time to consider their involvement in the study. During this time, they can discuss their participation with family or trusted individuals. On the agreed date, the research assistants will return to collect informed consent, ensuring participants fully understand the voluntary nature of participation. Interviews for all categories of participants will be conducted face-to-face by the research assistants at locations chosen by the participants, to ensure comfort and confidentiality. Interviews will be audio-recorded with the permission of participants to ensure accuracy, with comprehensive field notes taken to capture both verbal responses and non-verbal cues, as well as contextual factors that may enrich the understanding of the data. Interviews will last about 60 min and are anticipated to commence in May 2025.

Data analysis plan

The qualitative data analysis will be grounded in a thematic approach, drawing on detailed field notes and transcriptions from the interviews. Data analysis will be done using NVivo V.14, a qualitative data analysis software.[25] After each interview, field notes will be reviewed and expanded to ensure completeness. Audio recordings will be transcribed verbatim in kiSwahili and translated into English. To maintain confidentiality, codes will be used, and no personal identifiers of participants will be included in both the transcripts and audio files. Deidentified data that include audio recordings and transcripts will be stored in a secure password-protected cloud storage accessible by the study team. Research assistants fluent in both English and kiSwahili will clean each transcript and translate it by reviewing quality against the original audio, and these transcripts will then be checked by two female PhD-level researchers with expertise in qualitative research. Transcriptions and notes will be carefully read and re-read to allow the research team to familiarise themselves with the data.[26] An inductive coding process will then be applied, where meaningful segments of data will be labelled with initial codes.[27] These codes will be systematically grouped into broader categories that capture patterns and recurring ideas. From these categories, overarching themes will be developed to reflect the key experiences, perceptions and coping strategies of older adults in the face of seasonality and climate change across the two regions. Themes and interpretations will be refined through team discussions and validated by feedback from older adults' forums in the study communities to ensure accuracy and relevance. To ensure credibility and accuracy, member checking will be conducted with a selection of participants. During these sessions, preliminary findings and interpretations will be shared with participants to confirm that their views have been accurately represented. Feedback from member checking will inform any necessary adjustments before findings are shared with the broader community and published. The Consolidated Criteria for Reporting Qualitative studies checklist will be used to report our findings.[28]

Patient and public involvement

Patients will not be involved in the study design, recruitment and conduct. A lay summary containing the main study results will be provided for dissemination to participants and their communities.

ETHICS AND DISSEMINATION

All participants will be given detailed information on the aims and objectives of the study. Participants will be informed that participation in the study is voluntary and that they are free to withdraw from the study should they want to, stop an interview or discussion at any time and refuse to answer any question that they do not want to discuss. Only participants who provide signed consent forms will be included in the study. To maintain confidentiality, codes will be used and no personal identifiers of participants will be included in both the transcripts and audio files as the data will be deidentified. Data obtained will be only viewed by the study team, ethics committees, regulatory bodies, study monitors and sponsors as necessary. This will be explained to the research participants and to show their consent, they will be asked to sign the informed consent form. This study has received ethical approval from the Medical College of Wisconsin Institutional Review Board (PRO00055347), the Institutional Scientific Ethics Review Committee at Africa International University (ISERC/EXT227/2025) and National Commission for Science, Technology and Innovation (NACOSTI/P/25/4174079). The study outputs will reflect the views and experiences of older adults, health workers and policy-makers. The findings will be disseminated to the scientific community through conferences and peer-reviewed publications and to the older adults, health workers, communities and policy-makers through videos and dissemination meetings, and policy briefs. The findings will deepen understanding of how climate

seasonality is experienced by older people and shape strategies for resilience and adaptation.

DISCUSSION

The findings of this study will be analysed and may be used to plan climate change mitigation and adaptation strategies for older adults in the country. Sharing our experience in designing and executing this project will be useful to other researchers working on climate seasonality and ageing given that this is an area that is understudied and may be broadly applicable. This research is crucial for informing the development of tailored context-specific interventions and policies that meet the unique needs of older adults in these settings.

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