CHAC 2024

Climate and Health Africa Conference

29-31 OCTOBER 2024

Cultivating Resilience in Health:

Towards Unified Equitable Strategies for Climate Adaptation and Mitigation in Africa

Harare | Zimbabwe

ABSTRACT eBOOK

CeSHHAR Zimbabwe

Climate, Environment and Health Department

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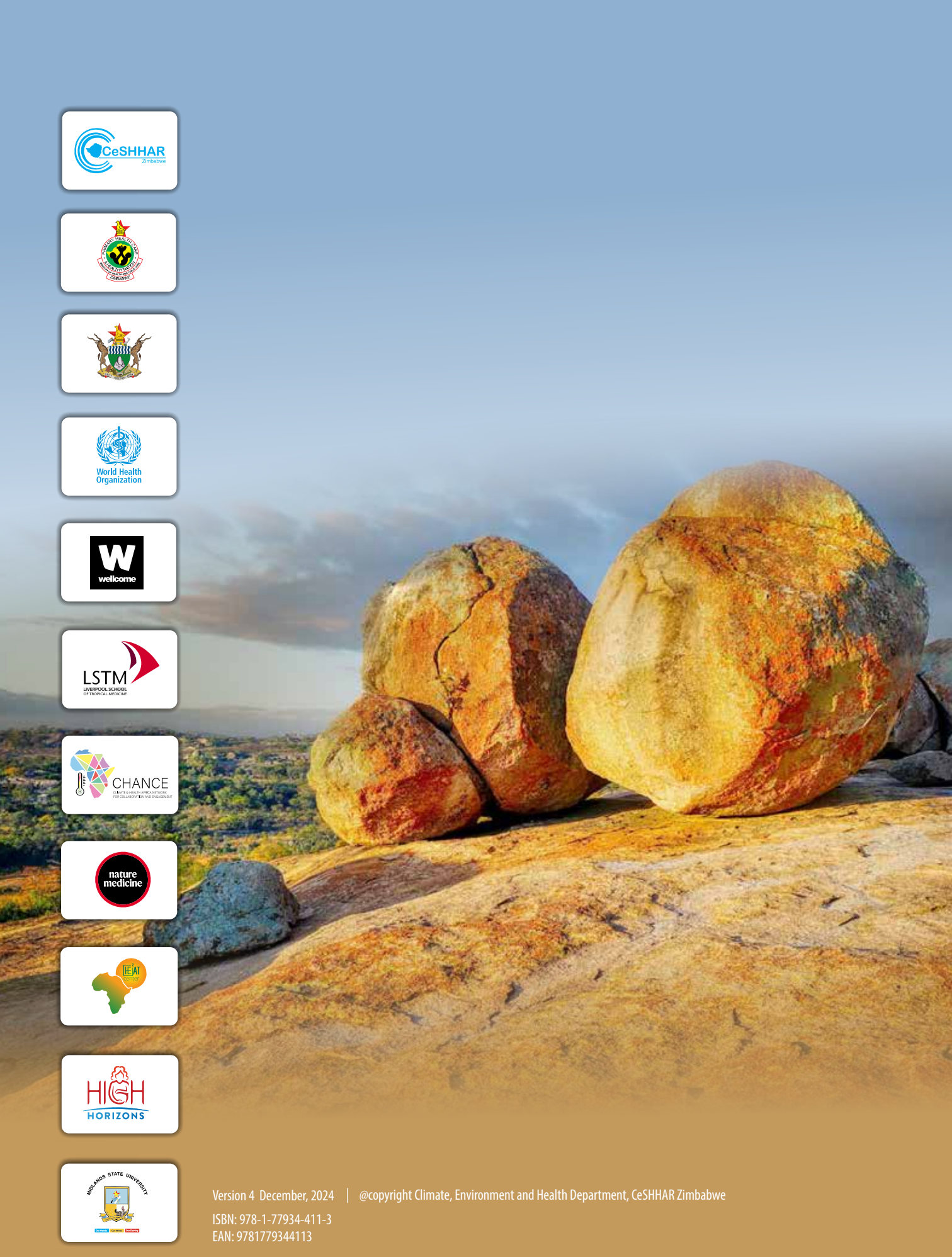

Version 4 December, 2024
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ISBN: 978-1-77934-411-3
EAN: 9781779344113

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Abstract book compiled by the scientific committee with the leadership of the CHAC Chairs
1st international Climate and Health Africa Conference 2024, 29-31 October 2024, Harare, Zimbabwe.
Dr Fortunate Machingura and Prof Stanley Luchters, chairs. Harare: Centre for Sexual Health and HIV AIDS Research; Zimbabwe

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ABSTRACT PROCESS

Scientific Tracks

Track A: Pathophysiology and Biological Mechanisms

This track examined the physiological and biological mechanisms through which climate change and environmental factors impacted human health. It investigated the direct effects of these factors on human physiology, focusing on pathways, processes, and underlying mechanisms. Key areas of investigation included:

- The effects of climate change and environmental factors on various bodily systems, such as respiratory, cardiovascular, gastrointestinal, neurological, and immune systems.
- Unique genetic variations and physiological responses of African populations to health challenges induced by climate change.
- The influence of traditional African healing practices and herbal medicine on the biological mechanisms underlying climate-related health issues.

Track B: Environmental Exposures and Climate-Health Epidemiology

This track expanded the evidence base for the health impacts of climate change and environmental factors, measuring exposures relevant to climate-health epidemiology and analysing health risks, disease patterns, and trends. Specific investigations included:

- Associations between climate change-related environmental exposures and adverse health outcomes across the life course.
- Systematic reviews linking climate-related exposures to specific health outcomes in African contexts.
- Harmonisation of definitions, indicators, and measurement methods for climate-health research.
- Development of novel data-driven methods for characterising climate-related exposures and linking them with health records.
- Disparities in health vulnerabilities across African communities, particularly concerning climate-related diseases.
- Non-stationary effects of climate variables in different regions of Africa.
- Impacts of climate change on traditional African livelihoods, such as agriculture and fishing, and their effects on community health.

Track C: Adaptation Interventions and Building Climate-Resilient Health Systems

This track focused on research into climate adaptation interventions to strengthen health systems and communities against climate-related hazards. It addressed co-production of interventions, behavioural changes, early warning systems, and innovative approaches to health service delivery. Studies included:

- Adaptation strategies for health systems, covering health workforce needs, infrastructure, water and waste management, energy services, and technological advancements.
- Community-led adaptation practices and the role of African cultural heritage in shaping adaptation responses.
- Development and evaluation of climate adaptation interventions, including heatwave response plans, green infrastructure, and policy changes.
- Research into financing strategies, advocacy, and policymaking for health adaptation.
- Integration of adaptation and mitigation interventions, with cross-cutting considerations for gender, equity, and economics.

Track D: Mitigation Actions and Their Co-Benefits

This track explored approaches to mitigating climate change and reducing its health impacts, focusing on sustainable practices and policy interventions with measurable co-benefits for health. Key studies included:

- Utilisation of sustainable energy solutions and renewable technologies that align with Africa's natural resources and cultural values.
- Measurement of greenhouse gas emissions alongside health outcomes resulting from specific actions or policies.

- Co-benefit strategies to achieve low-carbon, resilient health systems.
- Eco-friendly urban planning, reforestation, and infrastructure development for promoting healthy, low-carbon cities.
- Indigenous practices, such as agroforestry, for enhancing carbon sequestration and reducing emissions.
- Case studies demonstrating research translation into policy and decision-making.

Track E: Ethics and Climate Research Equity

This track addressed ethical considerations in climate and health research, focusing on equity, justice, and inclusivity in resource distribution and research practices. Investigations included:

- Ethical practices in research involving African communities, including consent and benefit-sharing processes.
- Decolonisation of climate and health research to ensure equitable representation and leadership of African researchers.
- Implications of climate policies and interventions for African communities, with a focus on social justice and human rights.
- Integration of African indigenous knowledge systems into climate-health responses.
- Balancing human health gains with broader social, ecological, and cultural benefits.
- Development of ethical frameworks that incorporated non-human interests, such as One Health approaches.

For more details, visit the CHAC Abstract Tracks webpage. Abstracts were assigned numbers upon submission through the CHAC abstract management system.

Citation Instructions

Cite this abstract book as:

1st International Climate and Health Africa Conference, 2024. Abstracts Book: 1st International Climate and Health Africa Conference 2024, 29–31 October 2024, Harare, Zimbabwe. Fortunate Machingura and Stanley Luchters, chairs. Harare: Centre for Sexual Health and HIV AIDS Research; 2024.

Cite an individual abstract as:

Author(s). Title of the abstract. In: Machingura F, Luchters S, editors. Abstracts Book: 1st International Climate and Health Africa Conference 2024, 29–31 October 2024, Harare, Zimbabwe. Harare: Centre for Sexual Health and HIV AIDS Research; 2024. p.[page number].

Example

Ndhlovu J, Kojo P, John DE, et al. Heat adaptation strategies among vulnerable populations in sub-Saharan Africa. In: Machingura F, Luchters S, editors. Abstracts Book: 1st International Climate and Health Africa Conference 2024, 29–31 October 2024, Harare, Zimbabwe. Harare: Centre for Sexual Health and HIV AIDS Research; 2024. p.12.

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Abstract Content

The author names, affiliations, titles, and content in the CHAC materials were submitted by the lead authors. Submitting authors ensured all co-authors reviewed and approved the abstract and provided accurate contact information, including email addresses.

Statistics for Abstracts

Total Abstracts Submitted 572

Track A: Pathophysiology and biological mechanisms Submitted 13

Track B: Health impacts and epidemiology Submitted 227

Track C: Adaptation interventions, and building climate resilient health systems Submitted 198

Track D: Mitigation actions and their co-benefits Submitted 80

Track E: Ethics and climate research equity Submitted 54

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Please note: Figures, tables, or other graphics have been removed due to non compliance with the CHAC2024 Abstract Guidelines.

CHAC 2024 SCIENTIFIC PROGRAMME COMMITTEE

The CHAC 2024 Scientific Program Committee is composed of a dedicated group of volunteer experts in climate science, public health, policy, engineering, anthropology, social science, and capacity building. They are tasked with shaping the scientific program for the first Climate and Health Africa Conference (CHAC) to ensure innovative and impactful sessions. These experts have been selected for their expertise and contributions to climate and health research across Africa and beyond.

Core Conference Scientific Committee

Fortunate Machingura

Fortunate Machingura, PhD, is the chairperson of the 1st Climate and Health Africa Conference, fostering connections between academic and policy interests at the intersection of climate and health in Africa. She is a social anthropologist with a focus on climate health and policy and lectures in the Department of International Public Health at the Liverpool School of Tropical Medicine. Additionally, she leads the Climate, Environment, and Health Department at the Centre for Sexual Health and HIV AIDS Research (CeSHHAR) in Zimbabwe.

Stanley Luchters

Stanley Luchters is the Executive Director at the Centre for Sexual Health and HIV AIDS Research (CeSHHAR) in Zimbabwe, and a Professor in Population Health and Environment at the Liverpool School of Tropical Medicine (LSTM). He has expertise in the design, conduct, management, and analysis of interventions that have a population health impact, especially on sexual and reproductive health.

Modi Mwatsama

Modi is the Head of Capacity & Field Development for Climate & Health at the Wellcome Trust. She is responsible for overseeing Wellcome's efforts to mobilise a global field of climate and health researchers and policy stakeholders. She has a policy background in nutrition, public health, and non-communicable diseases. Prior to joining Wellcome, she served as the Director of Policy and Global Health at the UK Health Forum. Modi holds a Doctorate in Public Health from the London School of Hygiene and Tropical Medicine.

Henry Mwandumba

Henry is the Director of Malawi Liverpool Wellcome Research Programme in Blantyre, Malawi and Professor of Immunology and Infectious Diseases at Liverpool School of Tropical Medicine, UK. He is Honorary Consultant Physician at Queen Elizabeth Central Hospital and Honorary Professor of Medicine at Kamuzu University of Health Sciences in Blantyre.

Christopher Jack

Christopher is Deputy Director of the Climate System Analysis Group at the University of Cape Town. He has a background in high performance computing and climate modelling but has increasingly been involved in leading transdisciplinary climate research activities including a focus on the intersections of climate and health across Africa.

Core Conference Scientific Committee (*continued*)

Vincent Pagiwa

Vincent is a health policy analyst and a public health research fellow at the Okavango Research Institute, University of Botswana. His research is in, but not limited to health policy evaluation and analysis, climate change and health policy nexus, and health politics and governance. He led the founding secretariat of the CHANCE Network. Vincent is also a FAR-Leaf Fellow at Future Africa Institute, University of Pretoria.

Judy Omumbo

Judy is an accomplished climate change and global health expert and professional. She is Head of Programmes at the Science for Africa Foundation, managing bespoke initiatives that address emerging global challenges for Africa. Judy also fosters partnerships within the research ecosystem that generate innovative scientific ideas to address the Africa's most pressing developmental needs, while championing the foundation's efforts for funding from early discovery sciences to translation sciences. She is a member of the WMO Research Board and the Adaptation Research Alliance (ARA) steering board.

Scientific Committee Track A (Pathophysiology and biological mechanisms)

Peter von Dadelszen

Peter is an obstetrician-scientist at King's College London and King's Health Partners. A New Zealander (and now Canadian), Peter trained clinically and academically in New Zealand, UK, and Canada. Currently, his research focus is on pregnancy hypertension, fetal growth, preterm birth, and stillbirth through a OneHealth lens.

Zulfiqar A. Bhutta

Dr. Zulfiqar A. Bhutta is Co-Director of the SickKids Centre for Global Child Health and Founding Director of the Institute for Global Health and Development at the Aga Khan University. He leads large research teams based in Karachi, Nairobi, and Toronto working on climate, maternal, newborn and child health globally.

Fani Kalala

Fani Kalala is an immunologist/hematologist and an Assistant Professor of Medical Immunology at the Medical School of University of Thessaly. Her current research includes the HIGH Horizons project focusing on climate, heat and the health of mothers and children.

Scientific Committee Track B (Environmental exposures and climate-health epidemiology)

Tatenda P Makanga

Tatenda is a Research Scientist specialising in Climate and Health with a background in Geoinformation Science. Leading a team of data scientists at CeSHHAR Zimbabwe, Tatenda focuses on investigating the effects of heat on maternal and newborn outcomes. Additionally, Tatenda holds the positions of Senior Lecturer at the Liverpool School of Tropical Medicine and the Midlands State University in Zimbabwe.

Brad Newsome

Brad serves as a Program Officer at the Fogarty International Center (FIC), part of the U.S. National Institutes of Health (NIH). He oversees an applied global health research portfolio geared toward advancing climate and health research, mobile and digital health, point-of-care technologies, data science and innovation, dissemination and implementation research, and medical/research capacity building efforts. Brad is a biomedical scientist trained at the interface of materials engineering, toxicology, environmental public health, and science policy.

Matthew Chersich

Matthew is a Research Professor in the Wits Planetary Health Division, University of the Witwatersrand, South Africa and Research Fellow at Public Health and Primary Care, School of Medicine, Trinity College, Ireland. His research covers impacts of climate change on health, especially in pregnancy, as well as assessment of adaptation interventions.

Debra Jackson

Professor Debra Jackson is inaugural Takeda Chair in Global Child Health and Co-Director of the MARCH Centre at LSHTM, London. She is also Extraordinary Professor, School of Public Health, University of the Western Cape, South Africa. Her current research includes the HIGH Horizons project focusing on climate, heat and the health of mothers and children.

Shawnda Morrison

Dr. Morrison is a Senior Research Fellow at the Yong Loo Lin School of Medicine, National University of Singapore and Technical Lead for 'Cooling Singapore 2.0' investigating heat-health risk in vulnerable populations (e.g. children, elderly). She is an Executive Board Member of the Active Healthy Kids Global Alliance and Certified Clinical Exercise Physiologist

Scientific Committee Track C (Adaptation interventions and building climate resilient health systems)

Veronique Filippi

Veronique is a Professor of Maternal Health and Epidemiology at the London School of Hygiene and Tropical Medicine, UK. She researches the impact of climate change on maternal and newborn health and health workers and the design and evaluation of climate adaptation interventions mostly in Africa within the CHAMNHA, HIGH Horizons and FRM-Matam projects.

Guéladio Cissé

Guéladio Cissé is Adjunct Professor and HEAT Centre project leader at University Peleforo Gon Coulibaly (UPGC) in Korhogo and senior scientist at the Centre Suisse de Recherches Scientifiques (CSRS), in Côte d'Ivoire. He has been the Head of Unit at the Swiss Tropical and Public Health Institute (Swiss TPH) and one IPCC Coordinating Lead Author (CLA) for the health-related chapter in the Sixth Assessment Report (AR6). He is among the WHO roster of experts and trainers on WHO-supported tools and methods for building climate resilient and low carbon sustainable health systems.

Kristie L. Ebi

Kristie has been conducting research on the health risks of climate variability and change for more than 30 years, focusing on estimating current and future health risks of climate change; designing adaptation policies and measures to reduce these risks; and quantifying the health co-benefits of mitigation policies.

Joanna Raven

Joanna is a co- director of the Institute for Resilient Health Systems, reader in health systems research and Deputy Head of Department of International Public Health, Liverpool School of Tropical Medicine. She has over 25 years' experience of research, training and partnerships in Africa and Asia. Her research has focused on fragile and conflict-affected settings in the areas of: health systems resilience, health workforce, strengthening district-level health management, maternal health, gender equity and scaling-up complex health system interventions.

Euphemia Sibanda

Euphemia is an epidemiologist conducting implementation research on HIV and sexual and reproductive health in Zimbabwe. She is also Reader in Global Health and Epidemiology at Liverpool School of Tropical Medicine (LSTM). Her work includes evaluation of different interventions for improving self-care and community-led approaches for uptake and provision of HIV testing, prevention, and treatment, including health systems strengthening. She is co-PI of a new large grant aimed at strengthening health systems resilience to climate crisis.

Scientific Committee Track D (Mitigation actions and their co-benefits)

Brama Kone

Brama KONE is Technical Officer in charge of Climate Change and Health at the Africa regional office of the World Health Organization (WHO/AFRO). He is by training an Associate Professor in Sanitary Engineering and Environmental Epidemiology of the African and Malagasy Council for Higher Education (CAMES).

Prosper Matondi

Professor Prosper Matondi is the Former Permanent Secretary for the Ministry of Climate, Environment, and Wildlife in the Government of Zimbabwe. Prior to his current role, he served as the Chief Director for Environment, Climate, and Meteorological Services.

Robert Hughes

Dr Robert Hughes is dedicated to improving child health through research on the impact of urban environments and climate change. Trained in medicine at Bristol University with a BSc in Global Health from UCL and an MPH from Harvard, he has worked across medicine, government, philanthropy and academia. At LSHTM, his research centres on early childhood development and the effects of climate change on child wellbeing. He combines this research with teaching and consultancy to influence climate and health policy and practice.

Scientific Committee Track E (Ethics and climate research equity)

João Monteiro

João is the Chief Editor of Nature Medicine, one of the top medical journals worldwide, covering the entire landscape of medical research. He has spoken about medicine, science, and publishing in many international conferences, and has championed efforts to raise ethical standards and transparency in the reporting of translational and clinical research, to support young investigators and to harness the potential of scientific research to reduce health inequalities globally.

Katherine Littler

Katherine is the Co-Unit Head of Health Ethics & Governance Unit at WHO in Geneva. She focuses on the intersection of ethics, governance, and policy in global health and global health research. She has a broad portfolio, which includes realizing the potential benefits of emerging technologies in different settings; research ethics, with a focus on priority setting and advancing equity and inclusion in research; governance, ethics oversight and clinical trial design; and climate change, health, and ethics.

Moses Chimbari

Moses Chimbari is Pro-Vice Chancellor for Great Zimbabwe University and Honorary Professor of Public Health at University of KwaZulu-Natal where he served as dean of research in 2013-2018. He co-chairs the NIHR funding committee and is president of Ecohealth International. He is a recipient of several research grants on climate change and health.

Ming Yang

Ming is the Senior Editor of Nature Medicine, handling a broad portfolio of research in the areas of global and planetary health. Ming is passionate about championing equity and inclusion in health research practices, having been leading the implementation of the Inclusion and Ethics initiative in global health research within the journal and spoken about equitable research partnerships in international conferences.

MAIN PLENARY ORAL PRESENTATIONS

SHOWCASING CROSS-CUTTING CLIMATE AND HEALTH INNOVATIONS IN AFRICA

553 TRACK A: Assessing biological vulnerability to extreme heat among pregnant women and infants: longitudinal studies across three countries in sub-Saharan Africa

Dr Ana Bonell[2], **Dr Admire Chikandiwa**[1], Dr Kuda Mutasa[3], Dr Renate Strehlau[4], Dr Robert Ntozini[5], Professor Karl-Gunther Technau[6], Prof Matthew Francis Chersich[7], Professor Andrew Prendergast[8]

[1]Wits Planetary Research Institute, Parktown, South Africa, [2]Medical Research Unit The Gambia, Fajara, Gambia, [3]Zvitambo Institute for Maternal and Child Health Research, Harare, Zimbabwe, [4]University of the Witwatersrand, Johannesburg, South Africa, [5]Zvitambo Institute for Maternal and Child Health Research, Harare, Zimbabwe, [6]University of the Witwatersrand, Johannesburg, South Africa, [7]Wits Planetary Health Institute, Johannesburg, South Africa, [8]Queen Mary University of London, London, United Kingdom

Background: While almost 200 studies have documented linkages between heat exposure and pregnancy outcomes, very few have investigated the underlying biological pathways. Physiological changes in pregnancy may affect thermoregulation, including increased cardiac output, plasma volume and basal metabolic rate, alongside anatomical changes such as decreased body mass to surface area ratio and increased fat deposition. Plausible biological sequelae of heat exposure include epigenetic and immunological changes; aberrant placental implantation, nutrient transport and haemodynamics; altered fetal membrane integrity; sympathetic system activation; and release of hormones that trigger labour.

Three studies in sub-Saharan Africa, funded by the Wellcome Trust, aim to investigate these biological mechanisms, with a focus on preterm birth— the leading cause of under-five mortality globally.

Methods: The first study in The Gambia follows a cohort of 760 pregnant women, together with evidence collected in environmental chambers, to document physiological, biochemical and anatomical changes due to heat stress. The includes a particular focus on placental function and structure. The second study, leveraging existing cohorts in rural Zimbabwe, employs biological sampling to investigate inflammatory pathways associated with preterm birth, and uses a 'fetal chip' system to explore the mechanical properties of fetal membranes under heat-induced stress. A third study in Johannesburg, South Africa, among 200 pregnant women, focuses on inflammatory pathways linked to preterm birth, but also assesses the influence of extreme heat on labour duration, and on breastmilk volume using stable radioisotopes. Across all sites, the teams will align definitions and selected biomarkers to enable cross-study comparisons and pooling, where feasible. Throughout, as evidence accrues, we explore potential protective interventions, including through interviews and community workshops to interrogate the findings, and co-design adaptation strategies.

Implications: Collectively, these studies, across rural and urban settings, and two regions of Africa, will provide evidence of the complex interplay between heat, and maternal and infant health. Synthesising findings from these and other related studies will fill major knowledge gaps, but will also inform the development of targeted, evidence-based interventions.

318 TRACK B: The relationship between extreme weather events and HIV: A systematic review and causal process approach

Prof Collins Iwuji, Prof Celia McMichael[2], Dr Euphemia Sibanda[3], Dr Kingsley Orievulu[4], Prof Kelly Austin[5], Prof Kristie Ebi[6]

[1]Africa Health Research Institute, KwaZulu-Natal, South Africa, [2]School of Geography, Earth and Atmospheric Sciences, The University of Melbourne, Melbourne, Australia, [3]Centre for Sexual Health and HIV/AIDS Research, Harare, Zimbabwe, [4]Africa Health Research Institute, KwaZulu-Natal, South Africa, [5]Dept of Sociology and Anthropology, College of Arts and Sciences, Lehigh University, Bethlehem, USA, [6]Dept of Global Health, University of Washington, Washington, USA

Background: Extreme weather events (EWEs) are increasing in frequency and intensity due to climate change. EWEs pose a risk to health and disproportionately affect vulnerable groups either by exacerbating existing burden of disease or through disruption in peoples' ability to seek care. Our systematic review investigated the impact of EWEs on HIV testing uptake, treatment and care, and HIV transmission.

Methods: We searched PubMed, Web of Science and PsycINFO on the 31st of August 2023 for peer-reviewed published studies using search terms related to climate change, weather, and HIV with no geographical

restriction. We screened the titles and abstracts and selected studies that were published in English and potentially contained data on EWEs and HIV. We excluded reviews, mathematical models, and case reports. We reviewed the full text of articles that met the inclusion criteria and used systems thinking to develop a novel causal framework linking EWEs and HIV. We summarised the results using thematic narrative synthesis and followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Results: Of the 6126 studies identified, 27 met the inclusion criteria. We identified five main themes linking EWEs to HIV: economic and livelihood conditions (12 studies), psycho-social factors (18 studies), infrastructure damage and operational challenges (16 studies), migration and displacement (10 studies), and associated medical conditions and healthcare needs (12 studies). Factors within the psycho-social theme were the most identified reasons linking EWEs to disruption in HIV services. Our approach elucidated how these themes interacted in complex ways resulting in reduction in HIV testing uptake, interruption in HIV care, worsening of disease progression, altered risk behaviours and increased HIV prevalence.

Conclusions: EWEs were associated with disruptions to HIV services. It was not possible to establish a causal relationship between EWEs and HIV incidence based on the design of the included studies, highlighting a research gap. Appropriate adaptation actions and mitigation policies which protect the health and wellbeing of people living with HIV during and following EWEs are warranted. These interventions will be critical to achieving UNAIDS goal of ending HIV as a public health threat by 2030.

528 TRACK C: Interdisciplinary Collaboration in Co-designing Complex Multi-Level, Multi-Component, Heat Adaptation Interventions to Reduce Heat Impacts on Pregnant Women and Infants.

Dr Fortunate Machingura[1,2], Mr Leslie Nyoni[1], Mr Calvin Kunaka[1], Ms Tariro Chinozvina[1], Mr Llyod Pisa[1], Ms Nyaradzo Gonese[1], Mr Lameck Kachena[1], Mr Thabani Muronzie[1], Mr Jaspar Maguma[1], Ms Jetina Tsvaki[1], Ms Concilia Mutasa[1], Dr Gloria Maimmela[3], Dr Clememce Tshuma[4], Professor Veronique Filipe[5], Professor Matthew Chersich[6,7], Professor Stanley Luchters[1,2,8], for the HAPI Study Group & HIGH Horizons Study Group

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Introduction: High ambient temperatures in pregnancy are directly and indirectly affecting adverse birth outcomes and pregnancy-related complications, while poorly ventilated and hot health facilities raise infection rates, impaired health worker performance and care quality. Addressing these risks requires co-designed, interdisciplinary heat adaptation interventions at individual, community, facility, and policy levels. We describe the process and outcomes of co-designing multi-level heat adaptation interventions in rural Zimbabwe.

Case description: Following mixed-methods formative assessments, including surveys, qualitative inquiries, and continuous temperature monitoring, we conducted a participatory stakeholder mapping workshop with 30 purposively selected actors (community, subnational, and national levels) to refine the intervention framework, determine the structure of co-design workshops, and identify participants (Figure 1). The workshop identified 167 stakeholders for three co-design workshops: Community, Policy, and Health Systems/Service Delivery. These workshops, scheduled for August to November, will use small-group activities, plenary sessions, and formal ranking tools, with data transcribed, coded, and ranked based on success likelihood, cost-effectiveness, implementation feasibility, and sustainability.

Workshop participants prioritised behavioural, health systems, building modifications and nature-based solutions. Behavioural interventions included hydration and cooling strategies, light clothing, heat illness self-monitoring, and frequent breastfeeding for infants. Health system interventions involved cooler-time antenatal care scheduling (e.g. early mornings), investments in human resources, health posts, cooler waiting mothers' homes, health facility green-zones and guidelines for managing heat exposure and training care providers (Figure 1). Built environment interventions at health facilities aimed to reduce indoor temperatures through blinds, reflective paint, and indigenous thatching designs, and health facilities upgraded for better ventilation and cooling. Nature-based solutions involved non-timber community woodland management, and planting trees to improve thermal comfort. Policy actions incorporated heat adaptation guidelines in health facilities and rural planning. Resilience measures include drilling boreholes for potable water, food support, and cash transfers.

We draw key lessons from the process,

- Interventions must yield co-benefits, tackling urgent health needs while advancing broader heat adaptation goals.
- Addressing power imbalances through participatory design working with local leaders and community health workers ensures interventions that are contextually appropriate, sustainable, and generate co-benefits for heat resilience and health.
- Resource constraints challenge multi-sectoral interventions. Village councils strategically allocate limited resources to maximise impact, prioritising high-yield adaptations like communal cooling health-posts that serve both immediate cooling and sustained health needs.

Discussion and conclusion: By integrating behavioural changes, health system improvements, built environment modifications, nature-based solutions, and policy actions, the case-study showcases the complexity of heat-related challenges. The process identified critical needs, set technical benchmarks, and engaged local knowledge systems, fostering community capacity and ownership. The outcomes demonstrate the utility of co-design in resource-limited settings and offer a scalable model for other regions, highlighting the necessity of technically sound, culturally grounded, and interdisciplinary approaches in developing scalable heat adaptation strategies. We have learned that heat adaptation in rural Zimbabwe hinges on decentralised governance, resource optimisation, participatory codesign, and co-benefit-driven interventions. Integrating these elements is crucial for addressing the complex challenges of heat, enhancing community resilience, and ensuring sustainable outcomes.

337 TRACK D: Supporting Youth-Driven Climate-Health Action: Learning from the Children & Young People, Cities and Climate (CCC) Initiative

Dr. Jana Alagarajah[1], Theo Gibbs, **Mrs Aly Beeman**
[1]YIabs, Kigali, Rwanda

Introduction and Rationale: The world is on track for severe warming, threatening health everywhere, especially for the most vulnerable, despite the COP26 Glasgow Climate Pact's goal to cut emissions by 45% by 2030. Urban areas, housing most of the population and producing 70% of emissions, are crucial for climate policy but face growing inequalities. Children and young people, most affected by climate change, are energising the climate debate but need more resources for effective advocacy. Their role is vital in pushing for climate action.

Aims: The Children & Young People, Cities and Climate (CCC) Action Lab aims to place the health gains that decarbonisation of cities can offer to children and young people at the centre of urban policy-making, predominantly across the Global South, and to support this with informed policy engagement and advocacy. This project aims to co-create action labs to foster collaboration with young people in Nairobi and Lagos to develop local, evidence-informed, advocacy tactics focussing on air pollution and low-carbon urban development through participatory workshops, leveraging existing youth-led efforts and providing resources and institutional support where needed.

Description of the case: CCC Action Labs took place in February 2024 in Nairobi and Lagos, led by YLabs in collaboration with our partners the London School of Hygiene and Tropical Medicine (LSHTM), Urban Better and C40. The workshops brought together 47 young people, including young environmental officers and city officials, to address air pollution in their cities. Participants worked in groups to develop advocacy strategies using SMART demands, stakeholder mapping and power analysis tools. They produced nine advocacy campaigns focussing on a wide range of environmental and sustainability initiatives, including increasing government support for tree planting and community parks, improving active transportation infrastructure, promoting upcycling in local communities, and incentivizing clean energy adoption among street vendors. They also aimed to reduce air pollution from waste incineration, improve awareness and enforcement of air pollution legislation (e.g. Nairobi Air Quality Act), and promote green transportation options. Strategies included community outreach, recruiting volunteers, organizing events, creating educational content, conducting surveys, and partnering with key stakeholders to achieve their goals.

Discussion and recommendations: Key learnings from the workshops highlight the importance of engaging young local facilitators and youth leaders with pre-existing climate knowledge to co-design climate advocacy campaigns. These facilitators, recruited in each city, effectively communicated technical terms and local youth perspectives, enhancing participant engagement and understanding. Selecting youth leaders from local youth hubs (e.g. C40's Youth Hub) ensured strong stakeholder relationships and contextual knowledge, which facilitated peer learning and strategy development. Involving young city environmental officers fostered relationships between city officials and youth, aiding in drafting feasible advocacy goals. Lastly, creating spaces for youth to take ownership of their climate advocacy campaigns significantly increased their engagement and active participation throughout the sessions. These learnings should be incorporated into future co-creation of climate advocacy campaigns with young people to ensure effective, equitable and youth-centred campaigns.

575 TRACK E:"Incorporating Maasai Indigenous Knowledge Systems in Climate-Health Research and Interventions in Kenya"

Dr Moses Mutua Mutiso[1], Prof Nicolette Vanessa Roman[2]

[1]Moi University, ELDORT, Kenya, [2]University of the Western Cape, Capetown, South Africa

Abstract: Background, Rationale, and Objectives: The Maasai community in Kenya holds extensive indigenous knowledge, developed through centuries of environmental adaptation. This knowledge is crucial for understanding and addressing climate-related health impacts, yet it is often overlooked in conventional climate-health research. The study aims to integrate Maasai indigenous knowledge systems into climate-health research and interventions, ensuring these initiatives are both culturally relevant and effective. The primary objective is to explore how Maasai knowledge can be incorporated into research and policy-making processes to improve health outcomes in the face of climate change.

Methods: A qualitative research design was employed, using participatory action research (PAR) methods to engage the Maasai community. The study involved Maasai elders, community leaders, and local health practitioners. Data collection methods included in-depth interviews, focus group discussions, and participant observations. Collaborative workshops were also conducted with the Maasai to co-develop climate-health intervention strategies. Thematic analysis was used to identify key themes related to indigenous knowledge, climate impacts, and health outcomes.

Results: The research revealed that the Maasai possess detailed knowledge of climate patterns, natural resource management, and traditional health practices. This knowledge is vital for identifying local indicators of climate change, such as shifts in animal behavior and plant growth, which are crucial for early warning systems. The collaborative workshops resulted in the development of culturally appropriate interventions, such as combining traditional practices with modern health strategies to address climate-induced health challenges like waterborne diseases and heat-related illnesses.

Conclusion/Implications: Incorporating Maasai indigenous knowledge into climate-health research and interventions enhances the relevance and effectiveness of these initiatives. The study underscores the importance of ethical collaboration with indigenous communities to co-create solutions that address specific health challenges posed by climate change. This approach not only improves health outcomes but also supports the decolonization of climate-health research, ensuring that interventions are inclusive, equitable, and culturally sensitive. Researchers and policymakers are encouraged to prioritize the integration of indigenous knowledge in climate-health initiatives to better serve affected communities.

SHOWCASING CROSS-CUTTING CLIMATE AND HEALTH INNOVATIONS BY EARLY CAREER RESEARCHERS IN AFRICA

429 TRACK A: Modelling the Effects of Climate Variability on Malaria Prevalence in Benin, West Africa

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In Benin, according to Health statistics, malaria is the primary reason for seeking care in health facilities. Studies have claimed that malaria is an extremely climate-sensitive disease. Malaria is caused by a single-celled parasite of the genus Plasmodium. Climate-based disease modelling has been proposed as a potential tool in climate variability and change adaptation for the health sector.

This study sought to use Vector Auto Regression (VAR) models to model the impact of climate variability on Malaria prevalence in Benin. Using data from several sources we explore rainfall and temperature over Benin, from monthly variability at annual timescales consistent with malaria reported data. We give particular attention to four climate variability and change indicators: Rainfall, Maximum Temperature, Average Temperature, and Minimum Temperature. The study analyzed monthly climatic data from 2009 to 2016 and malaria data for the same period. This study employed the Augmented Dickey-Fuller test, Unit Root function, Vector Auto Regression model, VAR model diagnostic functions, Ganger causality effects test, Sensitive response effect function, Forecast Error Variance Decomposition function, forecast accuracy functions and future prediction function in the time series model developed. Both of climate variables and malaria data were processed in excel.

This study concluded that malaria prevalence in Benin is greatly affected by climate change. Results of the Granger causality tests led to the conclusion that Malaria is influenced/caused by all four climatic indicators (Rainfall, Maximum Temperature, Average Temperature, and Minimum Temperature). The VAR (2) model fitted was tested robust to forecast the effects of climate variables changes on Malaria prevalence.

The sensitive effect analysis indicated that the highest effect of Maximum Temperature and Minimum Temperature on Malaria is observed in March (i.e. at (+) 14750.05 and (+) 2991.068 Malaria cases, respectively),

corresponding to the highest temperatures period of the dry season (December- mid-April). Similarly, average temperature exhibited the highest effect on Malaria prevalence in the same period at (+) 15350.01 Malaria cases in April. Meanwhile, the highest effect of rainfall on malaria ((+)15844.97 malaria cases) is observed in April during the onset of the rain period.

The highest negative effect of Average Temperature and Rainfall is observed in July (i.e. in long rain season, April-September), whereas while, it is observed for Maximum and Minimum Temperatures in October and November, respectively (i.e. in short rain season, September-November).

The decomposition of forecast variance (FEVD) indicates a varying degree of malaria depending to climatic variables, with as high as 74.22 % of the variability trends of Malaria whose will explain by future trend changes in Maximum Temperature (16.70%), Average Temperature (31.85%), rainfall (24.89%) and Minimum Temperature (0.78%) by 2026 horizon.

The climate-based future prediction of Malaria prevalence using the VAR (2)model developed showed an increasing trend of 46.00 % patients (i.e. 227 0246 Malaria cases) of the average observed between 2009-2016 in 2026 horizon.

This is quite significant and therefore, policy-makers should not ignore Rainfall and Temperature (Maximum and Average Temperatures) when formulating policies to address Malaria in Benin and other affected countries worldwide.

433 TRACK B: Impacts of heat exposure on pregnant women, fetuses and newborns: a systematic review and meta-analysis

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Background, rationale, and objectives: Climate Change has wide-ranging and severe health impacts, especially for vulnerable groups. This systematic review and meta-analysis assessed the impact of heat exposure during pregnancy on maternal, fetal and neonatal health.

Methods: Systematic searches were conducted in MEDLINE and Web of Science in 2018, and updated until 2023, according to PRISMA guidelines. Employing Cochrane methodologies on vote counting, narrative synthesis, and meta-analysis, we quantified impacts, and analysed susceptibility periods. We graded the certainty of the evidence using an adapted Intergovernmental Panel on Climate Change grading.

Results: We synthesised data from 198 peer-reviewed articles across 66 countries, and 23 health outcomes. The majority of studies focused on high-income countries (63.3%) and temperate climate zones (40.1%). The most studied outcomes were preterm birth (n=73), low birth weight (n=48), hypertensive disorders in pregnancy (n=28), stillbirths (n=19), and congenital anomalies (n=15). Outcomes had a large majority of studies indicating adverse health effects of heat, except for low birth weight, hypertensive disorders in pregnancy and congenital anomalies, where results were heterogenous. Our results demonstrated increased odds of preterm birth of 1.04 (95%CI=1.03,1.06) per 1°C increase in heat exposure and 1.26 (95%CI=1.08,1.47) during heatwaves. Similar patterns were shown for stillbirths and congenital anomalies. Gestational diabetes mellitus odds increased by 28% (95%CI=1.05,1.74) at higher exposures, while odds of any obstetric complication increased by 25% (95%CI=1.09,1.42) during heatwaves. Critical windows of susceptibility varied by condition, providing insights into when pregnant women are most at risk. Certainty grading revealed very high confidence in preterm birth, high certainty in gestational diabetes, hypertension in pregnancy, and stillbirths, while caesarean sections and neonatal mortality showed very low confidence due to limited evidence and agreement.

The review faced limitations due to heterogeneity in heat exposure metrics, outcome measures, and study designs, complicating data synthesis. Meta-analyses were restricted to studies providing comparable effect estimates, and the high heterogeneity necessitates cautious interpretation.

Conclusion/Implications: The findings highlight significant threats to maternal and neonatal health from rising temperatures and the urgent need for robust public health interventions and targeted climate adaptation strategies. This study informs research priorities and selection of heat-health indicators.

31 TRACK C: How are health systems in Sub-Saharan Africa adapting to protect human health from climate change threats?

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Background: While it only marginally contributed to the climate crisis, sub-Saharan Africa (SSA) stands out as one of the regions most affected. The foreseen negative effect on health adds overwhelming stress to the already overburdened health systems. Health systems' adaptation to climate change is, therefore, unavoidable to protect human health. But understanding the climate adaptation and health nexus in SSA is challenging as the available literature is dominated by impact studies. That is why we undertook this study with the aim of understanding how health systems in the region are adapting to climate change.

Methods: We combined a scoping review exploiting three databases (Arksey and O'Malley, 2007), with a single case study (Yin, 2017). A narrative synthesis of the scoping review allowed an overview of adaptation measures in SSA, while the case study provided an in-depth account of the policymaking process that leads to those measures using Benin national adaptation plan (NAP) as a case study. Walt and Gilson health policy triangle served as policy analysis framework for the case.

Findings: Fourteen papers were included in the review. Climate change adaptation remains a niche literature in SSA dominated by a network of authors from Europe and South Africa. Based on the scoping review, it follows that health systems in SSA are adapting through measures in seven domains: 1) health systems strengthening, 2) policy and planning, 3) financing and implementation, 4) information and capacity building, 5) societal resilience, 6) disaster risk prevention, preparedness, response, and recovery and 7) mitigation (co-benefits). The policy mimicry pattern found in the literature was confirmed by adaptation measures in Benin NAP, which overlap with those in SSA. The Benin NAP's ten-year process generated adaptation options for health risks associated with the prioritized climate hazards. However, it was informed by a limited vulnerability and adaptation assessment that only focused on one health district out of the country's thirty-four. Reasons for that include Benin financial and technical dependency on international actors.

Conclusion: SSA countries are working to make their health systems climate-resilient. However, this study shows that the technical and financial reliance on international actors is jeopardising their efforts. Future studies are needed to explore how they could design in-house adaptation plans that are more context-specific and easily actionable at sub-national levels.

559 TRACK D: CARBOMICA: Application of a financial resource-allocation modelling tool for carbon mitigation interventions in healthcare facilities; a case study from Kenya.

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Introduction and rationale: The healthcare sector contributes significantly to global greenhouse gas emissions, estimated to be between 4% and 8% through operational activities such as energy consumption, production and transportation of medical equipment and pharmaceuticals, patient and staff travel and waste. Mitigating healthcare emissions is crucial for public health, patient care, and cost reduction. However, inadequate funding hinders mitigation efforts, especially in disadvantaged communities facing environmental health risks as there are conflicting priorities with curative and preventative care needs. The HIGH Horizons study group developed a data science tool for optimizing carbon management investments in healthcare facilities, aiming to allocate financial resources efficiently and effectively to support sustainable and quality services.

Aim: CARBOMICA is a financial resource-allocation modelling tool for healthcare facilities, especially in resource-constrained regions (LMICs), to strategically and cost-efficiently distribute resources for carbon mitigation interventions at different budget scenarios. We describe three funding scenarios, each proposing a different mix of mitigation interventions, and their corresponding estimated carbon-offsetting.

Description of the case: CARBOMICA, a data science tool using the 'Atomica' framework from the Optima model. Aga-Khan Hospital Mombasa, a private-tertiary hospital, carbon footprint was measured using the AKDN tool from January to December 2023, and separately

for various scope 1, 2 and 3 emissions. In total, 758,445 Kg CO_2 was emitted, primarily from service delivery activities such as grid-electricity, bottled gas, inhalers, and vehicle fuel, but excluding procurement. Stakeholders identified and costed context specific interventions: solar systems, low-emitting-diode lights, energy-efficient-AC units, biogas-digesters, hybrid-cars, energy-efficient incinerators, lower GWP inhalers, a sustainability policy, and tree planting as potential feasible mitigation interventions. These interventions were assessed for their relative annual carbon saving and cost (implementation and maintenance). The textual non-financial co-benefits i.e. health co-benefits, health service efficiencies, cost savings, and sustainability were captured in the model.

Scenario analysis at $50,000 budget achieves a 19% reduction in the total carbon footprint through installing 100-LED-lights, 5-energy-efficient-AC units, 10-biogas-digesters, 1000-low-GWP inhalers, low-GWP-refrigerants, stopping nitrous-oxide use (anaesthetic gas) and a sustainability policy, leaving a surplus of $1835. The $125,000 budget reduces emissions by 29%, investing in 6x5kva-solar systems, 100-LED-lights, 5-energy-efficient-AC units, 10-biogas-digesters, 1000-low-GWP inhalers, a sustainability policy, low-GWP-refrigerants, stopping nitrous-oxide use and 10,000 trees, with a surplus of $715. The $250,000 budget achieves the maximum emissions reduction 34%, with investments in 150kwP solar system, 100-LED-lights,5-energy-efficient-AC units, 10-biogas-digesters, 1000 low-GWP inhalers, a sustainability policy, stopping nitrous-oxide use and 10,000 trees, leaving $576 (surplus) . The reduction above all excluded additional emissions reduced beyond the baseline scenario 3%, 13% and 13% respectively of the budget allocations.

Discussion and recommendations: This case study accentuates CARBOMICA's pivotal role in promoting environmentally sustainable healthcare practices whilst upholding and promoting good quality care of patients, especially within LMICs. Stakeholder engagement was instrumental in data collection, successful implementation, and aligning the tool with facility needs. Based on the findings, Aga-Khan Hospital is recommended to prioritize investments in renewable energy and energy-efficient technologies to achieve substantial carbon emissions reductions and limit investment to $125,000, as additional spending up to $250,000 shows no significant benefits.

84 TRACK E: Incorporating Indigenous Knowledge Systems in Climate and Health Research in Africa: Evidence from Nigeria

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The intersection of climate change and health presents a multifaceted challenge, particularly in Nigeria, where diverse indigenous knowledge systems offer valuable insights into adapting to and mitigating the impacts of climate change. This research explores how incorporating indigenous knowledge can enhance the understanding and management of climate-related health issues in Africa. Indigenous communities in Nigeria have long relied on traditional practices and ecological knowledge to navigate environmental changes and health challenges. This study examines how these traditional practices can be integrated into contemporary climate and health research to develop more culturally appropriate and effective adaptation strategies. The research employs a mixed-methods approach, including qualitative interviews with indigenous leaders and health practitioners, and quantitative analysis of health outcomes linked to traditional practices. It investigates specific indigenous practices related to climate adaptation, such as traditional agricultural techniques, herbal medicine, and community-based disaster management strategies. The study also explores the potential for these practices to complement modern scientific approaches in addressing climate-induced health risks. Preliminary findings indicate that indigenous knowledge systems offer unique insights into climate resilience, including strategies for managing extreme weather events, preserving biodiversity, and maintaining community health. The integration of these practices into mainstream climate and health research not only enriches the scientific understanding but also ensures that adaptation strategies are culturally sensitive and more likely to be embraced by local communities. This research highlights the importance of collaborative approaches that bridge indigenous and scientific knowledge. It advocates for policy frameworks that recognize and incorporate indigenous perspectives in climate and health research, aiming to foster more inclusive and effective solutions. The study concludes that leveraging indigenous knowledge can significantly enhance climate resilience and health outcomes in Africa, providing a model for integrating traditional and scientific approaches in addressing global climate challenges.

PATHOPHYSIOLOGY AND BIOLOGICAL MECHANISMS

407 TRACK A: Unraveling the Intersection of HIV Care and Climate Change in Midlands Province of Zimbabwe, July 2024.

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Background: Prevalence of Human Immunodeficiency virus (HIV) among adults in Midlands province of Zimbabwe remains high at 13.4% (11.4-15.4, 95% CI). Climate change is expected to affect the mean monthly temperature (TMean) and mean monthly precipitation during the period from historical (1980-2010) to future (2050) and is predicted to result in mean temperature rise coupled with reduced precipitation in Zimbabwean provinces. This review explores the intersection of HIV care and climate change in Midlands province, examining the biological mechanisms underlying this relationship and implications for global health.

Methods: We conducted a comprehensive review of existing literature examining the effects of climate-related factors, such as temperature, humidity, precipitation, and extreme weather events, on HIV transmission, disease progression, treatment outcomes, and healthcare systems in low-income settings. Focus was on peer-reviewed articles published in English between January 2010 and June 2023. The search was performed using the following electronic databases: PubMed, PLOS, BioMed Central and Google Scholar. The inclusion criteria were studies that examined the impact of climate-related factors on HIV transmission, disease progression, or treatment outcomes; studies that investigated the underlying biological mechanisms; and studies conducted in Zimbabwe or other sub-Saharan African countries. We excluded studies that did not address the intersection of HIV and climate change or lacked a focus on the biological mechanisms.

Results: Our findings reveal that climate change exacerbates HIV vulnerabilities, particularly in largely rural provinces like Midlands. Heat stress, water scarcity, and extreme weather events disrupt HIV treatment adherence and healthcare service delivery, leading to suboptimal treatment outcomes and increased risk of advanced HIV disease. Climate-related stressors can also directly impact the pathophysiology of HIV, affecting viral replication, immune function, and the pharmacokinetics of antiretroviral medications. The intersection of climate change and HIV/AIDS in Zimbabwe has significant implications for global health.

Conclusion: There is urgent need for a comprehensive understanding of the biological mechanisms underlying the impact of climate change on HIV care and treatment in Midlands province of Zimbabwe and other resource-limited settings. Climate-resilient healthcare systems, adaptive strategies, and international cooperation are urgently needed to mitigate the impact of climate change on HIV care and treatment in Zimbabwe.

Keywords: HIV care, climate change, Midlands Province, Zimbabwe, biological, sustainable.

533 TRACK A: Dehydration in Healthcare Workers during Extreme Heat: A Longitudinal Study Using Urine Specific Gravity in Rural Zimbabwe.

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Background: Healthcare workers (HCWs) in rural maternity wards are particularly exposed, and thus vulnerable to, extreme heat due to heat-inept infrastructure, with insufficient ventilation and suboptimal access to safe water. These conditions can lead to excessive sweating and dehydration, impairing health outcomes, and job performance. Research demonstrates that occupational heat stress elevates urine specific gravity (USG) in outdoor workers. This study investigates the hydration status of HCWs in high-temperature maternity wards in rural Zimbabwe, a group whose hydration status remains largely unexplored.

Methods: The study was conducted during the hotter season (September–December 2023) with indoor temperatures averaging 30°C, and the cooler season (May–July 2024) with temperatures averaging 17.5 °C. We recruited 44 HCWs from maternity wards to assess intra-individual changes across both seasons. HCWs self-collected urine samples after their shifts, which varied in duration: most shifts lasted 8 hours (08:00 to 16:00,

07:00 to 15:00, and 12:00 to 20:00), while the 19:00 to 07:00 shift lasted 12 hours. A refractometer measured USG ≥1.020 as the dehydration marker. We analysed dehydration differences between seasons using Stata.

Results: Of the 44 women assessed in both the warmer and cooler seasons, 33 (75%) and 26 (59%) showed to have signs of dehydration, respectively. This difference in hydration classifications (hydrated vs. dehydrated) between the seasons, did not reach statistical significance (McNemar's test; P=0.065). In warmer months, median USG was 1.024 (IQR=1.019-1.029), while in cooler months this was 1.022 (IQR=1.016-1.026). A paired t-test revealed a statistically significant difference in mean USG between seasons (P=0.032).

Discussion: Our results show that dehydration levels are very common with more than half the healthcare workers objectively assessed as having dehydration, and this was the case in both the warmer and cooler seasons. Although we assessed a small group of HCWs, there was a tendency towards more dehydration during the warmer months. Key heat adaptation interventions should be considered, and could include hydration protocols, such as scheduled water breaks and improved access to potable water. Additionally, workplace modifications like installing air conditioning could replicate winter conditions in summer to enhance hydration. Future research should focus on larger, longitudinal cohorts with diverse variables to validate these findings and refine intervention strategies.

HEALTH IMPACTS AND EPIDEMIOLOGY

56 TRACK B: The effect of short-term exposure and preterm births from 16 hospitals in Benin, Malawi, Tanzania and Uganda

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Background: Very few studies have examined the effect of high temperatures on preterm births in Africa, with almost none using clinical data. In this study, we assessed the acute effect of ambient temperature on preterm births in four African countries.

Methods: We applied a time-stratified case-crossover study including 135,130 singleton births in a prospective observational study in 16 hospitals in Benin, Malawi, Tanzania and Uganda between July 2021 and December 2023. We used three preterm births categories: very preterm birth (from week 28 to <32), moderately preterm birth (from week 32 to<37), and all preterm births (<37 weeks). Daily mean temperature was estimated at the hospitals obtained from European Centre for Medium-Range Weather Forecasts. We first estimated country-specific nonlinear effects of temperature a week before birth (lag 0-6) using conditional logistic regressions, and then meta-analyzed the associations.

Results: A total of 1916 (1.4%), 14,932 (11.1%), 16,848 (12.5%) were born very preterm, moderately preterm and all preterm births, respectively. We observed that an increase in temperature the week before birth (lag 0-6) from the 75th to the 99th percentile was associated (OR =1.21 (95%CI, 1.02; 1.45) with all preterm births. We observed similar risk for moderately preterm births (OR = 1.20 (95%CI, 1.00; 1.43), and we observed slightly stronger associations between high temperature and very preterm birth but did not reach statistical significance (OR= 1.45 (95%CI, 0.84; 2.50).

Conclusions: In this unique African setting, we observed that short-term exposure was associated with increased risk of preterm births. These findings highlight the necessity for climate adaptation policies and enhanced healthcare measures to protect pregnant women from the increased risk of preterm births associated with rising temperatures.

59 TRACK B: Exploring the intersection of climate change and gender vulnerabilities: A study on sexual exploitation amongst adolescent girls in Kilifi, Kenya

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Background: Climate change and extreme weather events significantly impact health and well-being, increasing risks of diseases, air pollution exposure, and loss of resources. Women and girls face the greatest impact, exacerbating health needs. Poverty, gender inequalities, and societal norms limit women's ability to adapt and recover from climate disasters. Women and girls are more vulnerable to gender-based violence (GBV) during extreme weather, and disruptions in education and health services perpetuate poverty and exploitation. This study aimed to fill the gap in primary data about how extreme weather events worsen gender vulnerabilities. We sought to explore the impact of extreme weather events on GBV within these communities and identify how these adversities compound gender-specific vulnerabilities.

Methods: This community-engaged study was conducted in the Ganze and Magarini Sub-Counties of Kilifi County, Kenya, in October 2023. The primary target population included adolescent girls (14-17 years), younger women (18-30 years), older women (31+ years), younger men (18-30 years), and older men (31+ years). We used a purposive sampling approach to recruit participants. We conducted 16 single-sex focus group discussions with a total of 155 participants. The FGDs were facilitated using a semi-structured interview guide. Discussions were conducted in Kiswahili, recorded, and transcribed. Using NVIVO version R1, thematic analysis was applied to the data to identify key themes and subthemes on primary manifestations of sexual violence and their underlying mechanisms. Ethical approval was obtained from relevant bodies, and we ensured informed consent and confidentiality. We engaged university investigators and Kilifi-based stakeholders to ground the study on community realities and respect local norms.

Results: In all FGDs, participants mentioned experiencing a rise in different types of violence during and after environmental stressors. Sexual violence was a prominent theme. Participants noted an increase in incidents of sexual violence among adolescent girls as a direct result of worsening climate conditions. They described how the risk of sexual assault increased as adolescent girls travelled long distances for food or water. They also reported the loss of homes and schools, which were community safe spaces for adolescent girls, increased their vulnerability by residing in risky, isolated environments. Transactional sex also emerged as a significant issue. They reported that flooding intensified existing socio-economic vulnerabilities – intensified poverty, loss of property, lack of food, and reduced access to basic necessities such as sanitary kits and school supplies. As a survival strategy during climate-induced hardships, adolescent girls were compelled, in some instances, by their parents/caregivers to exchange sexual favours for food, water, financial support, or other necessities. Men acknowledged exploiting these vulnerabilities, offering money or food with the expectation of sexual services in return. These instances of transactional sex sometimes resulted in unintended pregnancies.

Conclusions: This study reveals that the nuanced intersection of climate change with socio-economic challenges creates perilous environments for adolescent girls, markedly increasing their vulnerability to sexual exploitation. Results highlight the critical need for targeted interventions integrating climate resilience with proactive gender-responsive measures. Policies and programs must focus on protecting and empowering this vulnerable group in climate-affected areas.

139 TRACK B: Quantifying heat exposure among vulnerable pregnant and postpartum women in Tshwane, South Africa

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Background: Heat exposure during pregnancy is associated with negative maternal, newborn and child health outcomes. We assessed heat exposure among pregnant and postpartum women (PPW) in a sub-district in Tshwane, South Africa.

Methods: We purposively sampled 25 pregnant women who were expected to deliver at a community health centre (CHC) in Tshwane, between March and May 2024. Heat exposure was measured at four levels: personal exposure through temperature monitors attached to each participant's wrist; household exposure through thermal monitors mounted inside participant's bedrooms; outdoor community exposure through a weather station installed

at the CHC; and healthcare facility exposure through thermal monitors mounted in the labour ward, post-natal ward and waiting room at the CHC. Heat exposure is presented as maximum, minimum and ranges of apparent temperature, which measures the temperature as perceived by humans by combining the effects of air temperature, relative humidity and wind speed.

Results: Between 6th March and 15th May, PPW's average personal heat exposure was 6°C higher than maximum outdoor temperatures, and 12°C higher than minimum outdoor temperatures. Average maximum temperature exposures were highest for personal (32.9°C [range:28.8-36.9°C]), followed by the household (32.5°C [23.8-41.5°C]), clinic (27.1°C [23.7-31.8°C]), and lowest outdoors (26.9°C [16.6-35.3°C]). In the CHC, maximum temperatures in the post-natal ward were on average 2°C hotter than the labour ward. On March 10th, during an official heatwave, PPW were exposed to an average personal maximum temperature of 36.0°C. The average household maximum temperature was 41.5°C, with the warmest house reaching a maximum of 46.9°C. The maximum outdoor temperature recorded was 33.5°C, while the average maximum clinic temperature recorded was 31.8°C. During the study period, maximum indoor temperatures varied by 10°C between different house structures. On average, maximum temperatures were lower in houses with: insulated roofs (5.5°C cooler), surrounding vegetation (3.3°C cooler), concrete blocks (3.2°C cooler than houses made of corrugated sheeting), overshadowed by a tree or building (2.2°C cooler), shading devices (2°C cooler) and windows (1.9°C cooler).

Implications: PPWs heat exposure is higher indoors compared to outdoors and varies depending on house typology and surrounding natural environment.

527 TRACK B: Lessons learnt in the selection and prioritization of Heat-Health Indicators for Maternal, Newborn, and Child Health in South-Africa and Zimbabwe

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Background: The frequency of extreme weather events due to climate change, such as heatwaves, poses a significant threat to health and wellbeing in Africa. Vulnerable groups, including pregnant women and infants face elevated health risks because of heat, and the monitoring of these health impacts is essential. To address this, the World Health Organization has set up an expert group to identify global indicators for tracking impact of extreme heat on maternal, newborn and child health (MNCH). At country-level, the selection and future implementation of heat-MNCH indicators is complex and requires a deep and nuanced understanding of the needs of stakeholders. Here, we describe the process and lessons learnt from national-level stakeholder workshops in two countries to advance the selection and monitoring of heat-MNCH indicators.

Process: A qualitative approach utilising participatory approaches was used to explore the perceptions of stakeholders, ascertain details about heat-health indicators and information that is essential to systematically track impacts of heat on MNCH, and understand the barriers that need to be overcome. Multidisciplinary, cross-sectoral and inter-departmental stakeholders were purposively selected. In South Africa, 40 stakeholders attended, while in Zimbabwe, 50 attended. These representatives came from various sectors, including government departments of health and environment, the private sector, civil society, donor organizations, United Nations agencies and researchers. During the workshops participants were divided into four groups based on their backgrounds: Maternal, Newborn, Child Health, and Heat Exposure. This approach leveraged their existing knowledge and expertise to identify relevant indicators already in use, and to determine additional indicators necessary for assessing heat-related health impacts in the MNCH context. The groups were given the task of prioritizing indicators based on criteria established during the WHO expert group scoping meeting in April 2023, which emphasized that the indicators should be feasible, relevant, and important.

Lessons Learnt: In group discussions, a comprehensive list of indicators was generated, and through ranking and scoring methods, this list was reduced to three key indicators per group, leading to a total of 12 indicators across all four groups.

Stakeholders underscored the importance of data-driven approaches in selecting indicators.

Some potential heat-MNCH indicators were already included in the national monitoring and evaluation framework, which was perceived as advantages.

Collaboration among diverse stakeholders facilitated a comprehensive understanding of the complex relationship between heat exposure and MNCH outcomes.

Emphasis on policy considerations, such as engaging the private sector and defining extreme heat events uniformly, highlighted the need for a holistic approach to address health impacts, including agreements between the ministry of health and the meteorological service to ensure data.

Formation of technical working groups were planned to further discuss potential heat indicators by consolidating all points raised during the workshop.

Conclusion: The collaborative efforts in Zimbabwe and South Africa, involving diverse stakeholders, has been a successful initial effort which led to the identification of potential feasible, relevant and important indicators to track MNCH health impacts from heat. Continued collaboration, monitoring progress, and integrating heat indicators into existing systems will be vital in enhancing public health preparedness.

564 TRACK B: Personal PM2.5 Exposure in Pregnant and Post-Partum Women in Sub-Saharan Africa: Preliminary Findings from the PRECISE-DYAD Air Quality Sub-study

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Background: African communities face significant challenges from high levels of ambient and household air pollution, primarily due to the widespread use of biomass for cooking. This exposure leads to considerable health risks, especially for vulnerable groups like pregnant and post-partum women. Despite its importance, empirical data on air pollution in Africa is limited. Understanding the geographies of exposure is crucial for developing effective, place-specific interventions to improve health outcomes for these women and their children.

Methods: As part of the PREgnancy Care Integrating translational Science Everywhere (PRECISE) project, this study monitored 343 women aged 16-49 years between March 2022 and January 2023. Participants carried sensor bags with air pollution monitors and GPS data loggers to track PM2.5 exposure across various microenvironments and activities: at home, away from home, and cooking. Ambient monitors were also installed at select health facilities. Exposures were classified as either personal or regional. Mixed-effects models were used to identify key determinants of PM2.5 exposure. The study hypothesized that behaviours, particularly cooking with biomass, significantly modify exposure levels.

Results: Only 7.09% of 268 valid days recorded daily mean PM2.5 exposures below the WHO 24-hour guideline of 15 µg/m^3. The highest PM2.5 exposure was in Illiasa, The Gambia (median 12.00 µg/m^3), and the lowest in Mariakani, Kenya (8.20 µg/m^3). Key determinants of higher PM2.5 exposure included the time spent cooking and the type of fuel used. Microenvironmental analysis revealed that cooking at home with biomass significantly increased PM2.5 levels, while being away from home generally reduced exposure.

Interpretation: This study provides novel insights into the microenvironmental determinants of PM2.5 exposure among pregnant and post-partum women in sub-Saharan Africa. It confirms the hypothesis that behaviours, particularly cooking with biomass, play a pivotal role in modifying exposure levels. Findings indicate that personal PM2.5 exposures frequently exceed WHO guidelines, especially in settings using biomass for cooking. High-exposure microenvironments include the home environment during early morning and midday peaks.

Conclusion: The key determinants of PM2.5 exposure in pregnant and post-partum women are the time spent cooking and the type of fuel used. Addressing these determinants by reducing reliance on biomass for cooking and improving home ventilation can significantly lower PM2.5 exposures, thereby improving maternal and child health in sub-Saharan Africa. The use of GPS data for precise microenvironmental classification represents a significant advancement, allowing for targeted identification of high-exposure activities and locations.

Keywords: Air pollution, PM2.5, personal exposure, ambient exposure, pregnant women, sub-Saharan Africa, PRECISE-DYAD.

28 TRACK B: The impact of Cyclone Freddy on Maternal Healthcare uptake: Analysis of Data from a National Maternal Surveillance Platform in Malawi

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Background: Climate change is one of the most pressing challenges of our time, and is a driver of increasingly frequent and intense climatic events in low-resource settings. The consequences are far-reaching and may significantly impact health, especially for vulnerable populations such as women and children in low-income settings. However, disasters and climate-change related events and their effects on maternal healthcare utilisation and health outcomes are poorly documented in such settings. Using an existing Maternal Surveillance Platform (MATSurvey), we estimated the immediate impact of Cyclone Freddy on maternal health care service utilisation in Malawi.

Methods: We analysed facility-level data for pregnant women up to 42 weeks post-partum using the national MATSurvey database. We compared incidences of service utilisation before (1 January to 19 February 2023) and after (20 February to 30 March 2023) the cyclone using a negative binomial regression approach, accounting for potential confounding by variations in geographical zones and overdispersion. Likelihood ratio tests were applied to test for effect modification between the cyclone period and the geographical zone.

A Difference-in-Difference (DiD) test was conducted to examine the difference in trends in service utilisation between the same periods in 2022 (the year without Cyclone Freddy) and 2023 (the year when Cyclone Freddy occurred).

Findings: Between 1 January and 30 March 2023, a total of 37,445 live births, 50,048 antenatal clinic attendances, 23,250 postnatal clinic attendances, 84 maternal deaths, and 1,166 neonatal deaths were recorded by 33 facilities in the MatSurvey database. There was an immediate reduction in service utilisation in the post-cyclone period, including the postnatal attendance per week (pre-cyclone median: 355.0 [IQR 279.0–552.0], post-cyclone median: 261.0 [IQR 154.3–305.5], RR 0.56 [95% CI 0.44–0.71, p <0.001]) and the antenatal attendance per week (pre-cyclone median: 860.0 [IQR 756.5–1060.0], post-cyclone median: 656.5 [IQR 486.5–803.3], RR 0.66 [95% CI 0.55–0.78, p <0.001]). Stratified analyses by geographical zones revealed a stronger reduction in postnatal clinic attendance in the Southwest (RR 0.50 [95% CI 0.29–0.85, p = 0.010]) and the Northern (RR 0.29 [95% CI 0.15–0.56, p <0.001]) regions of Malawi. Difference-in-difference analyses demonstrated significant change in trends of service uptake in 2023 as compared to 2022 (p <0.001).

Conclusions: Cyclone Freddy resulted in an immediate decline in the uptake of maternal and reproductive health services in both the cyclone-affected and unaffected regions of Malawi. This study indicates the immediate effects of such climatic events in low-income settings and underscores the need for disaster-resilient healthcare structures to better withstand the effects of climate change and climate-related disasters. Policies and interventions should thus be tailored to emphasise the critical role of maternal and reproductive health services within disaster response frameworks to ensure continuity and accessibility during and after such events. Further studies with extended observation periods are warranted to comprehensively examine the long-term effects of intense cyclones on maternal and child health outcomes in the region. Additionally, research should focus on the development and implementation of climate change adaptation strategies in healthcare systems to enhance their resilience and capacity to provide uninterrupted care during climatic disasters.

570 TRACK B: The effect of temperature on neonatal mortality: An individual-level time-stratified case-crossover study in five East African countries

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Background, rationale, and objectives: Due to their underdeveloped thermoregulatory system, neonates are at increased risk of morbidity and mortality from non-optimal temperatures. However, the relationship between non-optimal temperatures and neonatal mortality in low- and middle-income countries (LMICs) is poorly understood due to limited research on this topic. This study aimed to analyse the effects of temperature on overall, very early, early and late neonatal mortality in 5 East African countries.

Methods: The neonatal mortality data were obtained from the most recent (2011 – 2022) Demographic and Health Surveys (DHS) while the temperature data were the ERA5-Land hourly data obtained from the Copernicus Climate Data Store (CDS). Neonatal mortality was further stratified into very early (0 – <24 hours), early (≥24 hours – <7 days) and late neonatal deaths (≥7 – <28 days). An individual-level time-stratified case-crossover design with distributed lag non-linear models was used to model the effect of temperature on neonatal mortality. Analyses were conducted for the pooled and individual-country levels, comparing odds ratios (OR) at minimum mortality temperature and at different temperatures with the median temperature (centering value).

Results: There were a total of 1373 neonatal deaths, with 40.0% (n = 549) and 40.9% (n = 561) very early and early neonatal deaths respectively. Comparing the OR at the MMT with the centering (median) temperature, showed no evidence of effect of temperature on the overall, very early neonatal, early neonatal, or late neonatal mortality. The odds ratios were 0.88 (95% CI: 0.76 – 1.01) for overall neonatal mortality, 0.87 (95% CI: 0.69 – 1.09) for very early neonatal mortality, 0.95 (95% CI: 0.78 – 1.16) for early neonatal mortality, and 0.71 (95% CI: 0.48 – 1.07) for late neonatal mortality. Individual-country level analyses showed variable and complex effects of temperature on neonatal mortality. Variable lagged effects for up to 5 days were observed for pooled and country-specific analyses.

Conclusion and policy implications: This is one of the first studies to explore the relationship between maternal mortality and overall, very early, early and late neonatal mortalities in LMICs. The study reveals a complex relationship between mean daily temperature and neonatal mortality, with variable effects. The findings underscore the need for further research and interventions to mitigate the impact of non-optimal temperatures on neonatal mortality. The study's main limitations are data quality and low study power.

55 TRACK B: Research-grade wearables to asses the impact of extreme heat on residual labour capacity in subsistence farmers in Burkina Faso

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Background: Climate change related heat stress disproportionately affects sub-Saharan Africa (SSA) and is known to reduce outdoor workers' labor capacity. Despite the critical role of subsistence farmers in regional food security, few studies measure their physiological response to heat and its effects on labor capacity, accounting for sex-related differences in this context. This study aims to address this gap by monitoring subsistence farmers' labor capacity and wellbeing using time-series data from research-grade wearables.

Methods: We recruited healthy couples aged 20-45 years from the Nouna Health and Demographic Surveillance System (HDSS) in Burkina Faso. We measured Wet Bulb Globe Temperature (WBGT) both indoors and outdoors, along with Actigraphy (ACT), Core Body Temperature (CBT), Heart Rate (HR), and GPS-individual tracking. We assessed the Physiological Strain Index (PSI) both inside and outside the field, while evaluating the impact of heat on working patterns throughout the year. Additionally, we monitored sleep and activity, and conducted monthly follow-ups where vital signs and surveys on heat response and were conducted. The data was analyzed with linear mixed models.

Results: Seventy-eight participants were monitored from August 2021 to August 2022. PSI and HR were positively correlated with WBGT, even after controlling for activity ($p < 0.0001$). Average and maximum PSI during fieldwork decreased with WBGT ($p < 0.001$). Participants worked longer and started earlier on hotter days, with average work intensity decreasing with heat only for men workers ($p < 0.001$). Sleep duration declined with temperatures, with each degree of WBGT reducing sleep by seven minutes ($p < 0.0001$). Step count increased with WBGT ($p < 0.0001$) and varied by season.

Conclusions: While heat increases physical strain and reduces labor capacity, we find that self-employed subsistence farmers in sub-Saharan Africa reduce physical strain by lowering labor intensity, spreading work throughout the day, and shifting tasks to cooler months. Women implement fewer pacing strategies due to dual

responsibilities of household chores and fieldwork. The future effectiveness of these strategies is limited by longer hot seasons, with further increases in heat degrading sleep quality. These findings emphasize the need for adaptation strategies to maintain work capacity amid rising temperatures.

82 TRACK B: Wearable Sensor Technologies for Monitoring the Health Impacts of Climate Change in Sub-Saharan Africa: Evidence from Burkina Faso and Kenya

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Background, Rationale, and Objectives: Climate change is expected to disproportionately affect vulnerable populations in sub-Saharan Africa, exacerbating existing health disparities. This study investigates the feasibility and utility of wearable devices and environmental sensors to monitor the direct health impacts of extreme weather events in rural Burkina Faso and Kenya, with ongoing research expansion to Malaysia. The study aims to address the lack of granular data on the direct impacts of climate-sensitive exposures on individual health in these regions.

Methods: In Burkina Faso, 143 participants from the Nouna Health and Demographic Surveillance System (HDSS) wore Withings Pulse HR wearables for 11 months, capturing continuous data on daily activity, sleep, and heart rate. Weather data were collected from five local weather stations, and heat index and wet-bulb globe temperature (WBGT) were calculated as measures of heat exposure. In Kenya, 83 participants from the Siaya HDSS wore similar wearables for 3 weeks, capturing health metrics alongside weather data from a local station. Linear mixed-effects models were used to quantify the relationship between weather exposures and wearable-derived health parameters.

Results: In Burkina Faso, heat exposure was significantly associated with decreased sleep duration ($p<.001$) and altered daily activity patterns, with activity increasing with WBGT up to 30°C and then decreasing. Heavy rainfall was linked to increased sleep duration and decreased activity. In Kenya, a positive correlation was found between step count and maximum WBGT ($p=.008$), suggesting increased activity in high heat. Both studies demonstrated the feasibility of using wearables for health monitoring in these settings, although challenges with heart rate data completeness were noted.

Conclusion/Implications: Wearable devices and environmental sensors offer a promising approach for monitoring the direct health impacts of climate change in sub-Saharan Africa, with potential for broader application in climate-vulnerable regions like Malaysia. This granular, real-time data can inform targeted interventions, improve public health surveillance, and guide policy decisions to protect vulnerable populations. Further research is needed to validate these findings, address technological challenges, and explore the potential of this technology in diverse contexts.

440 TRACK B: Synoptic approach to evaluate the association between temperature variability and cardio-respiratory mortality in South Africa.

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Background, rationale, and objectives: This study aims to evaluate the relationship between temperature variability (TV) and mortality, as well as the possible modification by season and spatial synoptic classification (SSC) weather types in five South African cities (namely: Bloemfontein, Cape Town, Durban, Johannesburg, and Port Elizabeth) located in different KÖppen-Geiger climatic zones.

Methods: Quasi-Poisson generalized linear regression and distributed lag non-linear model (DLNM) were used to estimate the association between the TV and cardiorespiratory (CVD: I00-I99 and RD: J00-J99) mortality. This study first assesses the cardiorespiratory mortality risks associated with TV. Second, it examines the modifying effects of season (warm or cold) on the relative risks of mortality due to TV. Third, the modifying effects of SSC weather types on the relative risks of mortality due to TV is also assessed. We further examined vulnerability by age (<65 or ≥ 65) and gender (females or males).

Results: At national level, 1°C increase in TV at lag 0 was associated with a significant increase of 1.08 (95% CI:1;1.17) in cardiorespiratory mortality. Higher effects of TV were observed in the warm season (RR=1.15, 95% CI: 1;1.29). Stratified analysis showed people ≥65 and females more sensitive to TV in the warm season, while people<65 and males were more vulnerable during the cold season. For the entire study population, greater association was observed during moist tropical (MT) weather conditions in Bloemfontein (1.87 95% 0.96-3.63), dry tropical (DT) weather conditions in Cape Town (1.27 95% CI0.83-1.95), moist moderate (MM) weather

conditions in Johannesburg (1.35, 95% CI:0.51-3.56) and during TR weather conditions in Durban (1.17, 95% CI0.63-2.19) and Gqeberha (1.35, 95% CI:0.51-3.56).

Conclusion/Implications: Our findings demonstrate that mortality risks of TV differ by season and SSC weather types. We anticipate that the presented results will increase awareness among the public health community and policymakers regarding climate-related factors that make it challenging to objectively assess the effects of temperature changes on human health.

339 TRACK B: Assessing the Impact of Ambient Temperature and Heat Stress Indices on Preterm Births in Greece: A Time-Stratified Case-Crossover Analysis

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Background: Accumulating evidence suggests that heat exposure during pregnancy is associated with an increased risk of preterm birth (PTB). This study aimed to evaluate and assess the effects of various climatic factors on preterm birth in Greece by examining the association of 12 human thermal stress indices with the occurrence of PTB.

Methods: Birth data were acquired from the Hellenic Statistical Authority (ELSTAT), including all births occurring between 1999 and 2021. For the purposes of exposure assignment, a dataset was created, encompassing daily mean, minimum, and maximum values of ambient temperature and 12 heat stress indices aggregated per Greek commune from 1998 to 2022. The dataset was created by processing ERA5 and ERA5-Land data, produced by the European Centre for Medium-Range Weather Forecasts (ECMWF).

A time-stratified case-crossover analysis combined with distributed lag non-linear models (DLNM) was performed to determine the relationship between each indicator and PTB. Exposure of the previous 0-6 days was assigned to each case and control based on the heat stress indices values at the commune of residence. A conditional logistic regression was performed, stratified by the matched case-control group identifier. Associations were displayed as odds ratios of the 95th percentile of exposure vs. the 50th percentile.

Results: All heat stress indices showed a similar exposure-effect pattern, which was captured by a U-shaped curve suggesting adverse effects at both high and low heat levels. Exposure to high levels of ambient temperature (95th vs. 50th percentile) was linked to increased odds of preterm birth. The Odds Ratios (ORs) were 1.12 (95% CI: 1.08-1.16) for mean daily temperatures, 1.15 (95% CI: 1.10-1.20) for minimum daily temperatures, and 1.08 (95% CI: 1.04-1.12) for maximum daily temperatures. The magnitude of association across all examined heat indices was also very similar, ranging from 1.06 (95% CI, 1.03; 1.10) for maximum Mean Radiant Temperature (MRT) to 1.16 (95% CI, 1.11; 1.21) for mean MRT.

Conclusion: The study confirmed that heat exposure is linked to a higher risk of preterm birth in Greece. It also revealed that various heat stress indices derived from climate models and attributed at the individual level yield similar associations.

Acknowledgement: HIGH Horizons has received funding from the European Union's Horizon Framework Programme under Grant Agreement No. 101057843. Project partner LSHTM is funded by UKRI Innovate UK reference number 10038478.

496 TRACK B: Leveraging Synthetic Data to Assess the Suitability of Reanalysis Climate Models to Attribute Extreme Heat Exposure to Negative Birth Outcomes

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Persistent increased temperature and an increasing number of extreme heat events are expected across the world, because of climate change. Pregnant women, especially those from poor socio-economic backgrounds with the least ability to adapt, are amongst the most vulnerable to heat impacts. To address further research into this critical domain, the HE2AT centre research project 1 aims to create a comprehensive database of human maternal and neonatal health data across the African continent by retrospectively harmonising data from various unrelated clinical trials.

A key challenge in reusing existing data for heat and health research is that detailed in situ temperature measurements specific to each patient or clinic are not available. In these cases, global climate reanalysis products are an alternative source of information. Two examples being ERA5 and a higher resolution land only alternative ERA5-Land. Whilst these models represent

the most complete picture of the global climate system currently available, they are by no means an exact replication. An analysis assigning 3-month mean maximum daily temperature using observations from the Global Historical Climatology Network at 5 sites across Africa shows a mean absolute bias of 2.4 and 1.9 degrees celsius, and a mean absolute error of 0.8 and 0.9 degrees celsius for ERA5 and ERA5-Land respectively. However, these values alone are not sufficient to assess whether these models are accurate enough for use in attributing heat to negative birth outcomes.

To assess the utility of these models for this specific use case, we design a synthetic cohort using in situ temperature measurements to first assign exposures before assigning health outcomes in line with those found in previous studies and meta-analyses. Making use of in situ temperature observations from the Global Historical Climatology Network to construct the cohort. We then reassign temperature exposures to each patient instead using the indicated exposures from that of ERA5 and ERA5-Land. This allows us to recreate the temperature to risk ratio response curves for each dataset and compare them to what the expected response curve is.

Using the above methodology, we find that in 3 of the 5 sites we analyse the reanalysis datasets are sufficient to capture the expected response from our synthetic cohort, albeit with reduced responses at temperature extremes. However, in the remaining 2 sites we find the reanalysis models are not sufficient. Importantly when considering the bias and mean error alone we found the reanalysis model performed similarly at all 5 sites. This highlights the utility in constructing research use-case specific benchmarks.

444 TRACK B: Exploring variability in heat exposure assignment methods for cohort studies

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Background and objectives: Exposure to extreme heat is increasingly being linked to a growing number of adverse maternal health outcomes as demonstrated within the growing body of literature in this domain. Whereas much is now known concerning pathways to adverse maternal health outcomes following sustained excessive heat exposure, there is currently no existing standard on appropriately characterizing and assigning heat exposure. The inconsistency in methods of exposure characterization constrains accurate comparability of different epidemiological studies and can be detrimental to the conclusions that are drawn on the perceived associations between heat exposure and different health outcomes. In this paper we explore the extent to which the classification of cohorts into heat exposure categories is meaningfully influenced by the approach to exposure assignment employed.

Methods: We focus on heat exposure values assigned to women from Kenya, Mozambique and The Gambia participating in the Pregnancy Care Integrating translational Science Everywhere (PRECISE) study. Initially we mapped the geographical locations of villages, neighborhoods and health facilities reported by women at the 3 study sites using location data from the Health and Demographic Surveillance System (HDSS) supplemented by auxiliary information from field surveys and public geoportals. We then extracted mean monthly temperature values from Landsat, MODIS and ERA-5 Land gridded products assigned at three commonly used levels; neighborhood polygon, neighborhood centroid and nearest health facility, processed within the Google Earth Engine platform.

Results: There are varying magnitudes of differences in percentiles of heat exposure into which different neighborhoods in the 3 countries are classified using the different assignment methods. Comparisons of differences in exposures from the different data sources showed maximum differences of up to 100% among Kenya neighborhoods when assigned at the health facility level, and by at least a decile across all 3 study sites at the different levels of assignment. Across all 3 sites neighborhoods were classified similarly when exposures were assigned at either neighborhood polygon or centroid levels but differed by up to 2 deciles on average in Gambia, even for course resolution ERA-5 temperature product.

Conclusions: We conclude that both the heat exposure dataset and the level of assignment used determines whether cohorts resident at different locations will be classified as highly exposed or not, regardless of season.

24 TRACK B: The 2024 extreme heat in the Sahel: causes, impacts and way forward

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The West African Sahel region has long been known for its harsh climatic conditions, but the 2024 hot season has brought unprecedented temperatures and extended heat waves that have exceeded historical records. This research aims at analysing the meteorological extent of the event and the driving causes as well as assessing the impacts across different socio-economic sectors. The analyses were conducted using data and materials provided by the national meteorological services of the region, as well media reports of impacts and interviews with experts.

Initial findings indicate that temperatures were significantly higher than the long-term average, with several locations breaking their historical records and many recording temperatures above 45°C for extended periods, especially between mid-April and mid-May. Human-induced climate change and El Nino were found to be the leading causes of the unusually hot conditions. Despite early warnings from global forecasting centres, the region faced severe impacts because of a lack of preparedness and heat risk management strategy. Due to a chronic lack of reporting and impact data, it is difficult to make a robust quantitative assessment of the heat impacts observed during the events. Notwithstanding, significant disruptions were perceived across various sectors, including water and energy, with prolonged power cuts in Mali and Burkina Faso. The health sector was severely hit with substantial mortality rates and hospital admissions reported in major cities such as Bamako and Ouagadougou. The elderly and people suffering from chronic diseases made up most of the victims of the heat waves. The burden has been exacerbated by the coincidence between the peak of the heat and the fasting month of Ramadan.

The impacts highlighted the urgent need for enhanced anticipatory and response strategies to address extreme heat. Recommendations for the way forward include building the capacity of national meteorological services to monitor and predict extreme heat, reinforcing epidemiological surveillance, and developing comprehensive heat action plans. An interdisciplinary approach involving public health, urban planning, and community engagement is essential. The healthcare system must be strengthened to manage increased demand during heat waves, and communities should be mobilized to contribute to local resilience efforts.

259 TRACK B: Impact of Tropical Cyclones on health services utilization and Neglected Tropical Diseases in Southern, Malawi. A monitoring study.

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Introduction: Extreme weather events such as floods, storms and tropical cyclones pose a threat to health systems in many low- and middle-income countries including Malawi. Over the past five years, southern Malawi has experienced over eight cyclones, with Cyclone Ana in 2022 and Cyclone Freddy in 2023 being the most severe, killing over 2,000 people. While the health impacts of cyclones are documented, the focus on Neglected Tropical Diseases (NTDs) is limited. This study aims to describe the impact of Cyclones Ana and Freddy on health service utilization and Schistosomiasis cases in southern Malawi.

Methods: We analyzed routine secondary data from the District Health Information System (DHIS2) on health service utilization and Schistosomiasis from January 2021 to December 2023. We used data from all health facilities in 13 districts across southern Malawi and excluded non-reporting facilities. We focused on two monthly aggregated indicators: the total number of outpatient visits (OPD) and the total number of new Schistosomiasis cases (NSC). We computed the median and interquartile range (IQR) and used generalized linear models with a negative binomial distribution to estimate the monthly counts.

Results: Overall, the median monthly OPD visit was 720615 (IQR: 399,373 – 1041857) and for NSC was 1740 (IQR: 789-4269). OPD visits decreased by 31.9% [95% PI: -35.2%, -28.3%] across all districts compared to before Ana and further decreased by 35.2% [95% PI: -40.3%, -29.7%] after Cyclone Freddy. During Ana, Chikwawa (33.1%) and Nsanje (19.7%) districts experienced the most significant declines in OPD visits whereas during Freddy, Blantyre (38.2%), Chikwawa (29.0%), Phalombe (24.9%) and Nsanje (18.1%), and Thyolo (11.3%) recorded the most. While we observed a decrease of 27.3% [95%PI: -33.5%, -20.8%] on NSC compared to before Ana, there was a rapid increase with 6 months post-cyclone. Similar results were observed for NSC during Cyclone Freddy.

Conclusion: Cyclones impacted health service utilization and the number of new schistosomiasis cases, the vulnerability of health systems to extreme weather events. Implementing strategies to mitigate the immediate and future impacts of cyclones remains essential.

311 TRACK B: Ambient air pollution, heat islands and human well-being in Africa: A systematic review.

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Background, rationale and Objective: Air pollution and heat islands pose real health risks, and they exacerbate each other. Worldwide, their individual effects on health are better documented, but their magnitude in a context of rising temperatures, particularly in Africa, makes them very worrying. Therefore, the question of the combined effects of air pollution and UHI on health in Africa merits further investigation. This systematic review aims to provide an overview of the existing literature on the combined effects of air pollution and urban heat islands (UHIs) on the health of the urban population in Africa.

Method: Searches were conducted in accordance with PRISMA methodological guidelines, using PubMed, Taylor & Francis, BMC, Cochrane Library, Emerald, Iris, VHL, Annual Reviews, Google Scholar, Science Direct, PlosOne et Sage Publishing databases to identify articles published in English, French and Portuguese between 2010 and 2023.

Results: Of the 21 studies meeting the inclusion criteria, more than 50% were conducted in South Africa. According to the results, the synergistic effect of combined exposure to pollutants (PM_{10}, $PM_{2,5}$,NO_2, SO_2, and O_3) and heat was significantly related to the respiratory and cardiovascular health of the populations. Sensitivity analysis by gender and age revealed that women and the elderly are the most vulnerable. Also, people's health histories exacerbate their vulnerabilities to diseases linked to the synergistic effect of air pollution and UHI.

Conclusion and implications: This review highlighted the gaps in the literature on these topics, particularly in the context of Côte d'Ivoire. Based on this systematic review results, a doctoral study focusing on the Ivorian context was launched under the working title "Air pollution, heat islands and population well-being in Abidjan" as part of the HE2AT Center project.

Keywords: high temperature - heat exposure - PM_{10} - NO_2 - SO_2 - admission - mortality-health

325 TRACK B: Characterising sources of PM2.5 exposure for school children with asthma: a personal exposure study across six cities in sub-Saharan Africa

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Objective: The aim of this study is to identify potential exposure reduction strategies for school children with asthma in urban areas in Sub-Saharan Africa (SSA).

Material and Methods: Personal exposure to particulate matter (PM) was monitored in 297 asthmatic school children in six cities in sub-Saharan Africa (Blantyre, Malawi; Durban, South Africa; Harare, Zimbabwe; Kumasi, Ghana; Lagos, Nigeria; and Moshi, Tanzania). Monitoring was conducted by use of a bespoke backpack with a small air pollution monitoring unit for week long periods. Children filled in a questionnaire detailing potential sources of air pollution during monitoring and exposures were tagged into three different microenvironments (school, commute, and home). Mixed-effects models were used to identify the most important determinants of children's exposure.

Results: Only 20% of days monitored were lower than the current WHO 24 h PM2.5 exposure health guideline. Children in Blantyre had the highest PM2.5 exposure (41.8 µg/m3), whereas children in Durban (16·0 µg/m3) and Kumasi (17·9 µg/m3) recorded the lowest exposures. Children had significantly higher PM2.5 exposures at school than at home in Kumasi, Lagos, and Moshi, while children in the other three cities monitored had significantly higher PM2.5 exposures at home and while commuting than at school. The mixed-effects model highlighted the following determinants for higher PM2.5 exposure: presence of smokers at home (+23%), use of coal or wood for cooking (+27%), and kerosene lamps for lighting (+30%). Lower exposures were found for children who went to schools with paved grounds compared with those whose school grounds were covered with loose dirt (-37%).

Conclusion: Our study suggests that most effective changes to reduce exposures in these cities would be to; provide paving in school grounds; increase clean fuel use for cooking and light in homes; and discourage smoking within homes. However, our study showed different cities require different prioritisation of exposure reductions policies.

354 TRACK B: The relationship between Climate Change Induced Natural Disasters and selected Nutrition Outcomes and WASH practices: A Case of Cyclone Idai

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The relationship between Climate Change Induced Natural Disasters and selected Nutrition Outcomes and WASH practices: A Case of Cyclone Idai

Presenter: Vimbainashe Dembedza

Background: Changes or variability in climate can lead to an increase in the frequency of climate hazards and can amplify the risk of extreme weather disasters. Due to these temperature changes, there has been an increase in the occurrence of floods, droughts, wildfires and cyclones, especially in sub-Saharan Africa. The increased frequency of climate induced natural disasters has exacerbated the risks of malnutrition in the already vulnerable regions. This study was aimed at exploring the effects of Cyclone Idai on WASH and nutrition outcomes of women of child-bearing age and children under five years.

Method: The household-based cross-sectional study was conducted in Eastern Zimbabwe. Data were collected through face-to-face interviews to determine food consumption score (FCS) and household dietary diversity (HDDS), minimum dietary diversity for women (MDD-W) and minimum dietary diversity for children (MDD-C). Severity of Cyclone Idai was grouped into five categories based on the extent of damage to infrastructure and loss of human lives. Association between continuous and categorical variables was tested using Pearson correlation test and Chi square test, respectively. Linear and binary logistic regression was performed to investigate determinants of food security. The WASH parameters assessed included the main water source, the type of toilet in the household, the number of households sharing a toilet and the presence of a handwashing facility for use after using the toilet.

Results: A total of 535 households were interviewed. There was a significant correlation between severity of

Cyclone Idai and MDD-W (p=0.011), HDDS (p=0.018) and FCS (p=0.001). However, severity of Cyclone Idai was not a determinant of any nutrition outcome, but gender of household head was a negative predictor of HDDS (β=-0.734, p=0.040), and marital status of household head was a positive predictor (β=0.093, p=0.016) of FCS. Only the most affected and resettled population groups (in camps) had better access to improved WASH infrastructure, although sharing of toilets was high and the use of handwashing facilities was low in all settlement types. There was a significant association between severity of Cyclone Idai and water source, adequacy of drinking water, sharing of toilets and ability to purify drinking water.

Conclusion: The cyclone negatively affected most food security indicators with the relocated households faring better possibly due to aid. Though at household level dietary diversity was adequate, this did not translate to adequate women and child dietary diversity. Food security indicators for children were below acceptable levels indicating inadequacy of relief activities for children and women dietary requirements. Water and sanitation practices had greatly improved mainly in camps due to new structures which had been built for them but due to high volumes of households the hygiene practices were greatly compromised. These findings provide a good baseline to inform future programming of food aid and WASH activities during disasters. More so, our findings call for evidence-based policies regarding composition of a food aid basket and targeting of beneficiaries.

364 TRACK B: Validation of pollution proxy indicators using personal exposure air quality data from 3 sub-Saharan African Context

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Abstract: Background, rational, and objectives: Poor air quality is the 2nd leading risk factor for death worldwide. Characterizing exposure to poor air quality remains a key challenge, especially in resource-poor settings. Proxy air quality indices are an important alternative where ground sensor data is not routinely collected, however, these require validation for effective and representative application. This project aimed to validate proxy indicators of pollution exposures using personal exposure datasets

Methods: 1,048,576 multi-dimensional exposure data points that were recorded by low-cost personal exposure sensors that were carried by 500 women for 11 months in the PREgnancy Care Integrating translational Science Everywhere (PRECISE) project (Gambia and Kenya) were used in the study. The data was segmented into various themes i.e. (indoor and outdoor) using R Studio. The segmented outdoor exposure data set was used to validate the proxy indicators using the validation criteria that included performing normality tests , correlation, overlay analysis, spatial autocorrelation, hotspot analysis , spatial coverage, spatial lag regression.

Results: The results from the validation process reveal that all the proxy indicators had a spatial coverage ratio of more than 0.9 (90%) in the study areas. Spatial overlay analysis in Gambia showed that high concentrations (µg/m3) of NO2 and PM 2.5 were found near main roads, with statistically significant hotspots detected at a 99% confidence interval (p<0.001). Correlation analysis in Gambia revealed that high pollution values were spatial associated with high values of weighted road network density (WRND), evidenced by a moderate positive relationship between NO2 and Euclidean distance from main roads (EM) (Spearman's: 0.155, p=0.214; Kendall's tau: 0.117). Similarly, Kenya's EM was inversely correlated (Spearman's: -0.013, p=0.001; Kendall's tau: -0.01, p=0.001) with higher PM 2.5 values and WRND showed a significant relationship with NO2 (p=0.05). Spearman's correlation between WRND and Euclidean distance from highways (EH) in Kenya was (0.287, p=0.019), as was Kendall's tau (0.187, p=0.027).

Conclusion/implications: The significant correlations and spatial overlays found in the results indicate that proxy indicators like WRND, EM and EH can effectively model pollution exposure, aiding in the use of big data science in the characterization of health outcomes across Africa.

521 TRACK B: Implications for anticipatory actions for drought-related health impacts in Lesotho

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Background, rationale, and objectives: Drought has become a common feature of climate change in Lesotho that causes crop failure resulting in negative food security, nutrition, and mental health outcomes, especially in rural communities. Current drought-related research has focused on rainfall and crop production interactions hence, a notable gap still exists in understanding people's lived experiences of drought-related health impacts and their perceptions about their anticipatory actions to mitigate such impacts. The study, therefore, seeks to answer the following research question: what are people's experiences of drought-related food and nutrition security and mental health impacts and potential anticipatory actions that could mitigate these impacts?

Methods: A qualitative research approach where 48 genderized focus group discussions consisting of mixed elderly, mixed youth, middle-aged men and women and nine key informant interviews was adopted. Furthermore, interviews with stakeholders in disaster risk reduction sub-sectors at the district level were conducted. A content analysis approach was employed in the development of repeated themes. The study was conducted in the Mountains, Southern Lowlands and Northern Lowlands of Lesotho.

Findings: The study revealed malnutrition, stress, anxiety and depression as key drought-related health impacts. Informants also perceived that these impacts can be mitigated amongst others through the following actions as drought is manifested: targeted early warning messages, tailor-made drought-relevant advisories, access to drought-tolerant seeds, water, sanitation and hygiene advisories and services as well as alternative sources of livelihoods. It is imperative to streamline policy interventions regarding the dissemination of early warning messages and anticipatory action addressing food and nutrition and mental health outcomes resulting from drought.

Conclusion/Implications: This study delivers an understanding of drought-related health impacts as lived and felt by the communities and the anticipatory actions perceived essential in reducing these impacts. Future humanitarian and policy interventions that address drought-related health impacts can use this evidence to inform their support interventions that would be the most well-received by communities.

ADAPTATION INTERVENTIONS AND BUILDING CLIMATE RESILIENT HEALTH SYSTEMS

264 TRACK C: Impact of extreme heat, flooding and poor air quality on health outcomes in Ghana

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Background, rationale, and objectives: Extreme weather conditions, including extreme heat, flooding, and poor air quality, significantly impact healthcare in Ghana. This study investigates health system vulnerabilities in Accra and Tamale associated with these extreme weather events and explores resilience-building strategies by service providers.

Methods: Using temperature measurements, carbon dioxide concentration (CO2) recordings (as a proxy for indoor air quality), and semi-structured interviews in health facilities, the study reveals the substantial health risks posed to both patients and healthcare workers by these environmental challenges.

Results: Health facilities are sited in low-lying areas with poor drainage systems and can be 6°C warmer at night than nearby weather stations report, due to the urban heat island effect and the greater thermal inertia of buildings. Extreme heat exacerbates existing health conditions, increases the prevalence of heat-related illnesses, and strains healthcare infrastructure due to higher demand for medical services. Recurrent flooding displaces populations, destroys healthcare facilities, and heightens the transmission of waterborne diseases such as cholera and typhoid, further burdening the healthcare system. Air-conditioned wards often have the poorest indoor air quality, with maximum CO2 concentrations reaching 3286 ppm, indicating insufficient ventilation relative to occupancy levels. Elevated CO2 levels can arise from inadequate ventilation, overcrowding, and insufficient air quality management systems, significantly impacting healthcare delivery. Poor indoor air quality exacerbates respiratory issues and increases the risk of healthcare-associated infections. To mitigate these challenges, health facilities are making infrastructural and operational adjustments, such as elevating equipment to protect from floods, improving ventilation during extreme heat, and using alternative power sources for emergency surgeries and storage during outages.

Conclusion/Implications: More timely and targeted information systems and emergency response plans are needed to ensure preparedness and resilience to extreme weather events. These environmental vulnerabilities necessitate a robust, adaptive response from the healthcare sector, including improved infrastructure,

enhanced disease surveillance, and targeted public health interventions. The intersection of these climatic factors with healthcare underscores the urgency for integrated policies and resilient health systems to safeguard public health amidst increasing climate-induced risks.

121 TRACK C: Impact of the climate crises on health workers: what we know and what we can do?

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Background: Climate-resilient health systems capable of responding to immediate and medium-term shocks and stressors are needed to protect health. The health workforce (HWF), a key component of the health system, should be supported to be responsive to climate change to successfully achieve Universal Health Coverage. Our study synthesized the available literature on how the health workforce responds to the climate crisis, including any barriers and facilitators.

Methods: We conducted a scoping review and identified 38 English language documents between 2014 and 2023 with 7 articles from LMICs. Data on health workforce responsiveness was extracted and collated in excel, and findings synthesized.

Results: Health workers are in a unique position to raise public awareness and educate the public about the health impacts of climate crisis and advocate for climate action and climate policies. They are expected to protect individual and community health amidst new and compounding health risks, support health systems to cope with increasing disease burdens and treat climate-exacerbated illnesses.

However, there are challenges to HWF engagement in climate crisis activities. These include health workers' insufficient knowledge about climate crisis, workload or time constraints, and perceived lack of community interest. Wider constraints also exist such as limited leadership, no consideration of climate crisis in local health plans, insufficient support to guide HWF responses from national and local levels, and inadequate funding for implementing effective adaptation measures. These issues are compounded by existing challenges such as weak HWF management, shortage and inequitable distribution of health workers, health worker migration and inadequate infrastructure and facilities.

Practical recommendations to strengthen the HWF include establishing new cadres of staff, training for health workers and community members on emerging health needs due to climate crisis, and establishing or strengthening community disaster planning committees.

Conclusion: Most studies investigating interventions for HWF strengthening for climate crisis have been exploratory and descriptive, conducted in high-income countries and urban settings, with very limited research from resource-constrained contexts. There is a lack of evidence on health workers' understanding of climate change and their role in climate action, their willingness and capacity to engage in new roles, the barriers they face, and support required. Research is urgently needed to support climate resilient health workforce.

531 TRACK C: Links between heat and maternal health worker quality of care, productivity, and well-being: a conceptual framework

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Background: Understanding the impact of heat on maternal healthcare workers (HCWs) is crucial, as it directly affects their ability to deliver quality care for women and newborns and maintain personal health, thereby ensuring the resilience and efficiency of healthcare services in a warming world. As part of the HIGH Horizons project, to identify modifiable risk factors and points of intervention, we developed a conceptual framework depicting the links between elevated heat and maternal HCWs' productivity, wellbeing and provision of quality care in South Africa and Zimbabwe.

Methods: We undertook mixed-methods research in

2023-2024 focusing on delivery care in five maternity wards in Zimbabwe and South Africa. Methods included participant observation, qualitative interviews with HCWs and hospital administrators, a time motion study of labour and delivery, a HCW wellbeing survey, tracking of biological markers and thermal monitoring of the built environment. Following an interim analysis, we developed an initial conceptual framework mapping out the links between heat, HCWs' wellbeing and the quality of care they provide using Miro collaborative software, allowing multiple people to interact with the framework simultaneously. Results were integrated and refined through further review of the evidence and consultations to create a final model.

Results: The framework accounts for evidence from different sources and demonstrates the pathways in which heats affects health workers and the health system, which in turn influence the provision and experience of quality of care. The framework also takes non-health system factors into consideration, such as heat effects at home, work commutes, and HCWs' biological attributes that may be exacerbated by elevated heat. We also demonstrate the steps involved in turning complex interdisciplinary results into explanatory narratives around a visual tool that can be operationalised to further probe links in specific settings, with the aim of developing interventions for adaptation and coping at individual, facility and health system levels.

Conclusion: The resulting framework is an essential stage in establishing the links between elevated heat and HCW wellbeing and performance, The process and model can be adapted to different settings, data sources and evidence, serving as a guide for similar investigations and intervention development.

556 TRACK C: Building climate resilient systems in Uganda: lessons from districts that experience extreme weather events

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Background: Uganda's climate has been changing with the average temperature in semi-arid areas rising, the frequency of hot days increasing amidst a shrinking of the ice caps on the Rwenzori mountains. These changes in the climate have contributed to significant extreme weather changes including increased frequency and intensity of droughts, floods, heatwaves, and landslides. Extreme weather events are impacting health systems. This study documented how extreme weather events have impacted health systems and their resilience in Bududa, Kasese and Moroto districts to inform strategies for building climate-resilient health systems in sub-Saharan Africa and similar settings.

Methods: This study employed qualitative interviews among key informants (KI) who were purposively selected. A total of 55 interviews were conducted among stakeholders at the national and district health and non-health officers, health workers, programme managers, and directors or unit heads. Interviews were audio-recorded and transcribed verbatim. Study transcripts were coded in relation to the impacts on the health system and mitigation and adaptation in line with the World Health Organization (WHO) Operational framework for climate-resilient and low-carbon health systems. Study quotations were added to supplement the study findings.

Results: The study established that landslides, floods, and droughts impacted all facets of the health system building blocks in the three districts. To adapt, the health system employed several strategies including instituting policies, early warning systems, capacity building for health workers, and stocking district stores with medicines and supplies. The other mechanisms were improving water and sanitation at facilities, relocating some facilities, engaging the community on potential diseases and risks and mobilizing funding support. Overall, factors such as a clear policy framework including mechanisms for stakeholder coordination, political will, availability of resources and health workers, high community engagement, and robust surveillance and strong early warning systems were key enablers for the health system in the three districts.

Conclusions: These lessons should be integrated into strengthening the capacity of health systems to anticipate, respond to, cope with, and recover from extreme weather events.

505 TRACK C: Nurses' Knowledge, Awareness, and Behaviours Towards Climate Change in Western Cape Province

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Introduction: Climate change poses escalating threats to global health, evidenced by rising temperatures, sea levels, extreme weather events, and heightened carbon dioxide levels. Health impacts include compromised water and air quality, increased allergens, altered vector ecology, environmental degradation, and extreme heat, with amplified effects in Africa due to existing disease burdens, particularly in LMICs. Calls from local and international bodies urge health professionals, notably nurses, to address climate change's health impacts. With nurses comprising the majority of the healthcare workforce, especially in LMICs, they play a pivotal role in healthcare delivery. PHC serves as a strategic platform for implementing mitigation and adaptation strategies. Nurses in PHC settings represent the initial point of contact for individuals affected by climate-related illnesses. Despite global research on nurses' knowledge and attitudes toward climate change, comprehensive studies are lacking in South Africa. Addressing this gap is crucial amidst increasing climate-related challenges. Aim: To determine awareness, motivation, and behaviours of nurses working in PHC regarding climate change. Methods: A descriptive cross-sectional survey was conducted on a sample of 202 nurses working in PHC. The Climate, Health, And Nurses Tool (CHANT), initially developed in the USA by Schenk et al. (2019), was adapted for South Africa to assess nurses' awareness, motivation, and behaviours regarding climate change.

Results: Majority of participants were females (73.5%) and mean age 41years. Most (71.9%) had heard of climate change before, 52.5% showed awareness but had limited knowledge of climate change effects on health. TV news (75%), social media (60.9%) and Internet (57%) were the main sources of climate change information with only 14% and 11% having had input from professional organisations and courses respectively. Motivation was high (3.23/4) with sustainable behaviours more pronounced at home (2.11/4) than at work places (1.56/4). Conclusion: Nurses have moderate awareness of climate change but lack formal education on climate change to improve their knowledge levels. They are motivated to act but are unable to practice eco-conscious behaviours at their work places. This calls for inclusion of planetary health topics in nurse training.

476 TRACK C: Assessing Climate-resilient and environmentally sustainable health care facilities in Somalia

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Background: Sufficient evidence exists that climate change poses a threat to countries around the world. Climate change impact is more often widely felt in the Horn of Africa due to a greater degree of climate variability and inadequate adaptation strategies. Available data indicates that average temperatures in Somalia have steadily increased while annual rainfalls have declined. Puntland is vulnerable to climate change hazard and Karkar region has experienced episodes of flush floods, tropical storms, and droughts. In light of climate change impact concerns on health, an assessment was conducted with a view to determine the vulnerability of the health care facilities to impacts of climate change and to propose adaptation strategies.

Methodology: The study used a multi-level design approach to find all relevant information. This study used desk/literature review, health facilities survey interviews, and Focus Group Discussions. The study was conducted in 46 health facilities in Karkar region, Puntland, Somalia. Health Facility Assessment was undertaken by deploying a contextualised WHO developed checklists to assess vulnerabilities of health facility in the context of climate change. These are designed as a critical assessment tool intended to probe into extant health facility climate impact vulnerabilities in key fundamental requirements for quality health care services (Health workforce, Water, sanitation and health care waste, Energy, Infrastructure, technology, and products).

Result: About 76% HFCs note that health workers are not equipped with knowledge, experience, training, and resources to manage emergencies and reduce climate change hazard risks and impact at HCFs and in communities and about 85% of health facilities are at high risk (unprepared) to respond to climate hazard such as drought as health workforce are not trained to identify health conditions made worse by droughts. About 84% of HCFs do not have water quality monitoring plan for human consumption while 80% of the health facilities have no guidelines and 80% don't have schedule for emptying latrines in advance of flood season to avoiding overflow while 60% have no safe waste disposal systems. Around 64% of HCFs do not have emergency back-up generators to cater for the energy requirements for critical services & equipment during hazard conditions with huge impact on staff and patients should power outage come to pass in the event of climate hazard.

Recommendations: The study is recommending (1) The need to implement climate change health adaptation measures to address HCFs problems associated with impact of climate change hazard (2) The need for improved coordination among organizations that deal with climate change issues (3) The need to address capacity building (human, financial and institutional) across health governance tiers (4) The need to address information gaps and to identify critical climate change health areas of research.

185 TRACK C: A Photovoice study exploring women's experiences, coping strategies and barriers to heat adaptation in a peri-urban township in South Africa

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Background: Rising global temperatures and increasing heatwaves pose major health risks, especially to vulnerable groups such as pregnant women and infants. In peri-urban townships in African cities, where informal housing is common, these risks are exacerbated by dense living conditions and inadequate infrastructure. We explored the vulnerabilities and adaptive strategies of pregnant women and mothers with infants in these settings. The analysis presented is part of a study that co-creates heat-health warning messages for pregnant women and mothers.

Methods: We conducted this study in the hot season (December-January) using an adapted Photovoice methodology to engage 14 women (7 pregnant women and 7 post-partum mothers) living in a peri-urban township in Tshwane district, South Africa. We held two structured workshops with the women. The first included a body and community mapping exercise and involved reflective discussions about navigating heat exposure in their homes and communities, coupled with training in basic photography skills. Over two weeks, the women captured images on heat-related themes using a disposable camera or their mobile phones. In a follow-up workshop, a printed selection of images was reviewed and discussed with the women. We present a reflection on participants' experiences of heat and the barriers they face, as documented through their photographs and narratives.

Results: Over 300 images were submitted by the women; many of which highlighted their general living conditions. Their common heat-coping strategies included staying at home, undressing, soaking their feet in water, and using wet towels for cooling. Mothers with infants bathed them frequently and kept them undressed or lightly dressed. However, significant barriers to cooling were prevalent. These included presence of heat-trapping housing materials, the absence of cool or green spaces, inability to open windows owing to mosquitoes or odours from nearby rubbish dumps, and limited access to water and electricity.

Conclusion: The collection of photographs and individual narratives underscore the limited adaptive options available to women for managing extreme heat in these settings, alongside barriers that hinder basic cooling practices. This highlights the urgent need for effective and targeted adaptation strategies to improve the resilience of this vulnerable population to heat exposure.

Key words: Maternal and child health, Photovoice, Heat impacts and coping strategies, Adaptation interventions, Informal housing, Peri-urban township

Acknowledgement: HIGH Horizons has received funding from the European Union's Horizon Framework Programme under Grant Agreement No. 101057843. Project partner LSHTM is funded by UKRI Innovate UK reference number 10038478

537 TRACK C: Integrating local voices via photovoice to shape heat early warning messages for pregnant and postpartum women ,Rural Mt Darwin Zimbabwe.

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Integrating local voices via photovoice to shape heat early warning messages for pregnant and postpartum women in Rural Mt Darwin Zimbabwe.

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Introduction: Climate change presents a grave threat to global health, particularly impacting vulnerable populations like pregnant and postpartum women in rural areas. Among the myriad consequences of climate change, the increasing frequency and severity of heatwaves stand out. Early notification of heat events, through the use of mobile phone-delivered messages, could allow for adaptive behaviours. This study aimed to develop tailored heat-health early warning messages to help pregnant and postpartum women effectively manage heat exposure.

Methods: A participatory workshop was conducted with pregnant and postpartum women (n=22) who were purposively recruited from healthcare facilities and local communities. Participants were provided with mobile phones to capture their encounters with heat, cooling methods, and adaption strategies to high temperatures. Two photovoice workshops explored their knowledge of climate change and heat-health effects and involved collectively workshopping the messages derived from the images captured by participants. A total of 222 photos were captured. Thematic analysis was employed to analyse the pictures and data collected.

Results: Workshops highlighted the importance of integrating clothing choices, such as wearing lighter fabrics for cooling, regulating indoor temperatures, and utilizing evaporative and passive cooling methods in early warning messages. Participants also emphasized the critical need for staying well-hydrated, scheduling activities to avoid peak heat periods, and reducing outdoor exposure during extreme heat. Seeking cooling environments like shaded areas, using shaded pathways, and leveraging support structures for additional shading were identified as key strategies.

As a result, 26 Shona messages were drafted. Participants stressed the necessity of tailoring early warning messages to the broader socio-environmental context of pregnant and postpartum women, as this context significantly influences their reception and action upon such messages.

Conclusion: The work highlighted the significance of images and narratives in the co-creation of messages, and early warning strategies for pregnant and postpartum women, and how these are attuned to local socio-environmental contexts. The participatory nature of the photovoice method enables researchers and participants of diverse social backgrounds to become co-learners, bridging cultural differences and equitably sharing expertise derived from both personal experiences and professional knowledge.

530 TRACK C: Investigating power dynamics in shaping context-specific heat adaptation interventions: A case study of pregnant women in Mt Darwin, Zimbabwe.

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Background: In rural Zimbabwe, pregnant women face increased susceptibility to heat-related illnesses, with their vulnerability further exacerbated by gender and power normative imbalances. While adaptation interventions often focus on women's roles in the home, many women lack decision-making power, limiting autonomy over their bodies and resource access. This reflects the Foucauldian concept of biopower that governs bodies and health through societal structures and norms. This study leveraged Foucault's concept of biopower to understand how social power dynamics shape pregnant women's vulnerability to heat exposure and their ability to adopt culturally-appropriate heat adaptation interventions.

Methodology: Mt. Darwin district was chosen for its persistent high temperatures in the warm season. The study conducted 21 serial in-depth interviews with purposively-selected women in their third trimester of pregnancy. Each woman was interviewed twice during pregnancy and 6 weeks postpartum to elucidate the power structures that influence their decision-making. Additionally, 15 key informants including health and climate change stakeholders, were engaged to explore the social positioning of women within the decision-making matrix regarding their bodies.

Results: The study found strong culturally-bound expectations that women prioritise caregiving and domestic responsibilities, such as fetching water, cooking, farming and collecting firewood over heat related interventions. These obligations limit their ability to participate in decision-making about adaptation measures, which are perceived as less important/urgent/concerning/or lesser value than their traditional roles. Women with lower socioeconomic status reported

especially limited access to resources and support systems necessary for adapting to rising temperatures compared to those with better socioeconomic status. At a wider level, women are systematically excluded from community and institutional decision-making structures, preventing them from advocating for policies and interventions that address their specific needs concerning heat exposure.

Discussion: Women's limited influence in household and community decision-making processes, coupled with the cultural construction of womanhood, further marginalise their voices and agency. This exclusion exemplifies biopower, wherein socioeconomic structures sustain existing hierarchies, preventing women from advocating for policies that address their specific needs regarding heat exposure. For adaptation interventions to be effective and context-specific, they must tackle these power imbalances by recognising and integrating women's voices and experiences into adaptation strategies.

522 TRACK C: Climate Change Impact on Child Health and policy implications: Perspective from Children and caregivers in Zimbabwe. May 2024

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Background, Rationale, Objectives: UNICEF supported the Government of Zimbabwe to conduct children-led consultations on the impacts of climate change on health. The aim was to gather experiences and generate evidence-based recommendations to inform policy and programmatic interventions aimed at improving child health in the face of climate change.

Methods: Over 1,000 randomly selected children and caregivers were engaged through focus group discussions, interviews, and the digital community U-Report across the ten provinces of Zimbabwe with a special consideration given to children with disabilities.

Results: Ninety-eight percent of the consulted children in Zimbabwe are aware of climate change. Children highlighted how droughts and scarcity of water compromise their access to food exacerbating malnutrition and posing a risk to water, sanitation, and hygiene related livelihoods. Floods devastate infrastructure such as schools, bridges, and clinics, hampering children's access to these vital services and resulting in contamination of water and increasing the incidences of waterborne diseases such as cholera and typhoid. They highlighted changes in rain patterns resulting in an increased threat of vector-borne diseases like malaria, an increased risk of children to pneumonia and other respiratory infections, largely due to air pollution; skin cancers resulting from sunburns, adolescent pregnancies, sexually transmitted infections. were identified as prevalent conditions exacerbated by climate change, as children are pushed into child marriages or transactional sex to alleviate poverty. Children mentioned how floods, have claimed the lives of their loved ones, and left them depressed, and how the occurrence of extreme weather events adds to their anxiety.

Conclusion/Recommendations: Key recommendations to policy and decision makers from the consultations were to:

- Have more investments in climate actions that directly benefit children and young people. COP 29 decisions to clearly spell out child-focused climate investments in the Loss and Damage Funds, New Climate Quantified Goal (NCQG) and the Global Adaptation Goal. There is need for child-specific indicators to measure allocation of funds targeted for children.
- Make climate change policies, strategies, and plans child sensitive. All Parties to seriously consider making climate policies and plans gender and child sensitive.
- Have meaningful engagement and participation of children in the climate agenda. All Parties to avail platforms and opportunities for meaningful engagement in all their diversity, in climate action and finance decision-making processes at all stages and levels.
- Protect children from climate change-related hazards. Parties to enhance the climate resilience of essential services that are critical for children's survival, development and health, including water, sanitation, health, education, nutrition and child and social protection services.
- Regular evidence generation on impacts of climate change on children and young people and measures to address the impacts required.

230 TRACK C: Vulnerability of OVC Most at Risk HIV: Findings from a Climate Change Vulnerability Analysis in Masvingo and Manicaland Provinces Zimbabwe

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Background, Rationale and Objectives: Climate change threatens children's survival, development, nutrition, education, and access to health care in forging progress towards 95-95-95, with Zimbabwe ranked third in Southern Africa in terms of climate risk . FACT Zimbabwe, under the USAID/PEPFAR funded SPACE for OVC program, conducted climate change vulnerability assessments (CCVAs) in Masvingo and Manicaland provinces. The assessment explored the contextual climate change impacts, vulnerability, and adaptive capacity among OVC most at risk of HIV and their families. Specifically, the assessment sought to document how climate change impacts OVC across four program domains: health, household economic stability, education, and safety.

Methods: The assessment employed qualitative methods using primary and secondary data sources. Primary data was collected through FGDs (n=585) and KIIs (n=51) targeting OVC sub-populations and community leadership from March-April 2023. Seven districts (Chipinge, Makoni, Mutare, Chiredzi, Chivi, Gutu and Masvingo) and thirteen wards were selected through bio-climatic clustering to ensure all agroecological zones, and urban and rural contexts, were represented. Per ward, four FGDs were conducted with in-school OVC aged 10-14, in/out-of-school 15–24-year-old OVC, caregivers, and traditional leadership. Four data collection tools (daily clock, vulnerability matrix, impact chains and historical timelines) were employed in the FGDs. Interviews with key counterparts in government departments and other development collaborators were held to provide an overview of vulnerability and adaptation. Purposive sampling was used to select participants from OVC, caregivers and traditional leader groups from the COP22 cohort.

Results: Recurrent cyclones and perennial droughts were identified as the most common climatic hazards across the two provinces, pathways in which climatic hazards contributed to barriers in achieving health outcomes. Food insecurity was identified as a major impact of climate change with further downstream effects. Tertiary health effects reported include high viral load cases among OVC due to malnutrition which affects ART effectiveness; migration of caregivers to South Africa and Mozambique for new opportunities leaving children exposed to abuse including sexual; parent absenteeism affecting ART adherence and high viral load cases among OVC. Inaccessibility of schools during flooding combined with school dropouts due to climatic-induced economic hardship and hunger was shown to affect OVC education and expose them to sexual abuse at home as schools function as safe spaces. Access to health facilities was threatened by climatic hazards such as flooding as roads passed as inaccessible affecting the ability of OVC to access ART refills and other health services.

Conclusion/Implications: Climate change impacts efforts to achieve HIV Epidemic Control by 2030. FACT will incorporate climate resilience components within the stable, safe, schooled and health domains under the SPACE for OVC program through climate change awareness amongst program participants, and the adoption of community strategies identified to address the impacts of climate amongst OVC households. FACT will aim to strengthen the capacity for OVC families to implement adaptation strategies such as the collection of water by OVC in groups, supporting multi-month ART dispensing, solar technologies, conservation agriculture, improved water harvesting, and growing drought & pest resistant crops.

509 TRACK C: Addressing Gender Based Violence in a changing climate, the case of Muzarabani District in Zimbabwe.

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Introduction and Rationale: Climate change has increased extreme weather patterns in Zimbabwe and sub-Saharan Africa, causing floods and other consequences. This has disproportionately affected people in the rural areas as they are forced to travel long distances in search of water during drought periods. Zvandiri and other key stakeholders noted with concern, some Gender Based Violence (GBV) cases experienced by adolescent girls and young women (AGYW) at water collection points in Muzarabani district. This includes sexual harassment, demand for sexual favours by men in exchange of collecting water early or jumping long queues, increasing the risks of sexually transmitted infections (STIs). The AGYW who rejected male advances were forced to wait longer increasing their vulnerability to GBV and exploitation. Additionally, AGYW were

missing their scheduled clinical appointments due to long wait at water points.

Aim: To strengthen community resilience by increasing climate change awareness and sexual and reproductive health rights among vulnerable AGYW at water collection points.

Description of the case: As part of mainstreaming climate change in its programming, Zvandiri is working in collaboration with Ministry of Health and Childcare (MoHCC), community gatekeepers and other key stakeholders to raise awareness of climate change and its impact of health specifically sexual and reproductive health among adolescents and young people (AYP). The study was carried out in Muzarabani utilizing focus group discussions (FGDs). 37 AYP, women and men, participated in these FGDs.

The findings revealed that inadequate water collection points caused delays resulting in prolonged queuing times for AGYW. This increased their susceptibility to gender-based violence (GBV) related issues. Some AGYW were failing to attend to their clinical review dates and missing their scheduled ART time for medication due to these long waits.

In collaboration with community gatekeepers, Zvandiri placed its staff and peer service providers at the water collection points to raise awareness of climate change and its impact on the communities. AYP and caregivers were engaged through support groups and caregiver meetings covering topics on climate change and SRHR rights among AYP. Champions from the communities were trained in GBV and SRHR and are now supporting their communities at the water collection points so that these points are not centres for violation of women's rights. The initiative led to a notable improvement in clinic attendance and GBV awareness.

".....through this session, I have realized how our actions as men can cause harm.....", said one participant.

"Climate change may take our water but may never take our dignity", said a grade six pupil.

Discussion and Recommendations: This case study demonstrated a scalable model for integrating climate change mitigation and adaptation strategies into community-based initiatives, contributing to a more resilient, climate and GBV literate society. It is critical to involve community gate keepers in the response to climate change effects. Communities have already shared their plans for water harvesting to lessen the burden at the existing water collection points.

MITIGATION ACTIONS AND THEIR CO-BENEFITS

490 TRACK D: Pathways to a healthy 'net zero' future: The Pathfinder Initiative

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Concept: Urgent action is required to keep global warming within the 1.5°C target of the Paris Agreement. Demonstrating the benefits to human health from climate mitigation can increase motivation and capacity for climate action among decision makers.

Results: The Pathfinder Initiative analysed evidence from modelled and implemented mitigation actions that impact health across a range of sectors, scales and regions. Pathways to health include reduced air pollution, consumption of healthy, low greenhouse gas (GHG) emission diets and increased physical activity.

Modelled studies assessed using an umbrella review approach, provided evidence of impacts on GHG emissions and health from sectors, including energy, industry, transport, agriculture, food and the built environment. Case studies of implemented mitigation actions with measured climate and health benefits were also gathered as part of the project and are displayed in an online 'climate and health evidence bank'. Policies identified included national policies to transition from fossil fuels to clean renewable energy, city-level initiatives to encourage active travel, and nature-based solutions.) There was a significant evidence gap in both modelled and implemented actions within Africa.

In its next phase, the Pathfinder Initiative plans to launch a new Coalition on Climate Action for Health along with a community of practice that will bring together committed actors, including national, local or state-level government, NGOs and other organisations. The aim is to provide evidence for effective action, advocate for adequate finance and access to appropriate technologies (particularly across Sub-Saharan Africa), strengthen capacity to evaluate progress, ensure accountability and to advocate for a systems approach to climate mitigation action to better address trade-offs, synergies and promote health while delivering net zero GHG emissions.

In this presentation we will both summarise the key results and recommendations arising from the Pathfinder commission and will also explore the key implications for Sub-Saharan Africa, including the need to link adaptation and mitigation actions, and the path dependency

associated with different (urban) development trajectories.

Audience: Researchers working in the field of health co-benefits from climate action, decision makers and funders of climate action, national governments and city leaders interested in global public health.

463 TRACK D: Review of the Impact of Integrated Eco-Friendly Urban Planning and Reforestation on Carbon Mitigation in African Cities.

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Introduction: African cities are experiencing rapid urbanization, leading to increased carbon emissions and environmental degradation. This review explores the impact of integrated eco-friendly urban planning and reforestation strategies on carbon mitigation in African urban centers. By examining diverse case studies and synthesizing findings from various sources, we aim to provide a comprehensive overview of the potential and challenges of these approaches in reducing carbon footprints and enhancing urban sustainability in the African context.

Methods: We conducted a narrative review of evidence to answer the aim of the study. The search was conducted in March 2024 and evidence published between March 2018 and January 2024 were included. Data reported in this article were obtained from reports, literature in peer-reviewed journals found in PubMed, PubMed Central, and ScienceDirect, grey literature, WHO Regional Committee for Africa informational documents, and other data sources. The authors also snowball further data to gather information for this review.

Results: Our review reveals a growing trend in the adoption of integrated eco-friendly urban planning and reforestation strategies across African cities. These approaches have shown promising results in carbon mitigation. Cities implementing such strategies have reported reductions in carbon emissions, improvements in air quality, and decreases in urban heat island effects. Urban forests and green spaces have been found to play a crucial role in carbon sequestration and enhancing overall urban environmental quality. Moreover, these initiatives have demonstrated additional benefits, including improved public health outcomes, enhanced biodiversity, and increased urban resilience to climate change impacts.

Discussion: The findings of this review highlight the significant potential of integrated eco-friendly urban planning and reforestation in mitigating carbon emissions in African cities. These approaches offer a holistic solution to urban environmental challenges, addressing not only carbon mitigation but also broader sustainability goals. However, the review also identifies several challenges, including limited financial resources, competing land-use priorities, and the need for long-term political commitment. Future research directions should focus on developing context-specific strategies for different African urban settings, exploring innovative financing mechanisms, and assessing the long-term impacts of these initiatives on urban sustainability and climate resilience in Africa.

400 TRACK D: Assessment of urban climate mitigation actions and health co-benefits

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Cities can play a pertinent role in the transition to a healthy, net-zero future. Africa is home to the fastest-growing urban population in the world and its young workforce presents a unique opportunity to drive development. Whilst the African region only contributes to 3% of global emissions, this is expected to grow due to rapid urbanisation and population growth. There are large opportunities in the region to follow a low emissions growth path by leapfrogging directly to green pathways. African cities, however, are increasingly facing other compounding pressures including chronic stress on water, energy, and food systems, and weather-related disasters. Due to this confluence of challenges, climate action is often not regarded as priority. Actions to mitigate emissions can, however, often deliver near-term health co-benefits, which could facilitate the harmonisation of climate action and other developmental needs. Despite these significant health benefits for local populations, health co-benefits of mitigation actions have not gained sufficient political traction. Understanding the enablers and barriers for cities to recognise and acknowledge the health co-benefits of mitigation policies is crucial to drive change.

We use publicly available global data from the 2022 CDP cities survey on 550 cities and 3468 reported mitigation actions and co-benefits. We quantitatively assess potential correlates of cities reporting on health co-benefits from mitigation action, including Gross Domestic Product (GDP) per country, city population, geographical location, implementation status and sector of the action. We conduct a descriptive analysis of the data and a generalised linear mixed-effects model using R.

We find that most mitigation actions were reported from cities in North America (n= 1226) and Europe (n= 952), only 68 mitigation actions were reported from Africa. The most commonly reported co-benefits were Economic (n= 2279) and Social (n= 1917), Health (n=1412) was only the third. Most actions from the Transport (n=718; 67.2%) and Agriculture, Forestry and Other Land Use (AFOLU) (n=161; 57.1%) sector reported health co-benefits. The findings highlight a gap between the potential and actual role of health co-benefits in policymaking and the need to raise awareness about the health co-benefits of climate mitigation actions among urban policymakers.

399 TRACK D: The Role of Urban Green Spaces in Mitigating Climate Effects and Promoting Health: A Review

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Key words; Urban green spaces, Climate change mitigation, Health co-benefits, Air quality, Mental health, Green infrastructure

Background, rationale, and objectives: This literature review aimed to understand how urban green spaces, including parks, gardens, and green roofs, could counteract urban heat islands, improve air quality, and support carbon sequestration while providing significant health benefits such as enhanced mental well-being, increased physical activity, and reduced rates of respiratory and cardiovascular diseases. The primary objective was to synthesise current research on the role of urban green spaces in climate change mitigation and health promotion, with a particular focus on Sub-Saharan Africa.

Methods: The review used a systematic approach to gather and analyze relevant studies from scientific databases, focusing on empirical research, reviews, and meta-analyses published in peer-reviewed journals.

Results: The findings indicated that urban green spaces effectively reduced urban heat islands, improved air quality by filtering pollutants, and enhanced carbon sequestration. Health benefits included increased physical activity, lower obesity rates, and reduced incidence of chronic diseases. Additionally, green spaces contributed to improved mental health by reducing stress, anxiety, and depression, and fostered social cohesion through enhanced community interaction. Challenges in implementing and maintaining green spaces, particularly in rapidly urbanizing areas with limited resources, were discussed. Strategies for maximizing the benefits of green spaces included community involvement, policy integration, and innovative design approaches tailored to local contexts.

Conclusion/Implications: The review concluded that urban green spaces were a multifaceted solution to climate and health challenges and called for increased investment in green infrastructure and collaborative urban planning efforts to ensure equitable access and sustainable development. The review emphasized the need for policymakers to integrate green space development into urban planning frameworks and suggested further research to quantify the economic benefits and explore innovative green infrastructure solutions.

450 TRACK D: Community-Based Adaptation and Mitigation Strategies: A Literature Review on Enhancing Resilience and Health Co-benefits

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Track D: Mitigation interventions

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Key Presenter: Liliosa Pahwaringira

Key Words: Community-Based Adaptation, Mitigation Strategies ,Health Co-benefits ,Climate Resilience, Sustainable Development ,Environmental Health

Background, Rationale, and Objectives: Climate change poses significant threats to communities, necessitating adaptive and mitigative strategies to enhance resilience and health outcomes. Community-based adaptation (CBA) and mitigation strategies are gaining recognition for their dual benefits in addressing climate impacts and promoting health. This literature review aims to synthesize existing research on these strategies, examining their effectiveness, health co-benefits, challenges, and best practices. The key research questions include: What are the primary community-based adaptation and mitigation strategies? What health

co-benefits do these strategies provide? What challenges and best practices are identified in the literature?

Methods: A systematic literature search was conducted using databases such as Google Scholar, PubMed, and Scopus, employing keywords like "community-based adaptation," "mitigation strategies," "health co-benefits," and "resilience." The inclusion criteria encompassed studies published from 2000 to 2024, focusing on various geographical regions and types of community-based strategies. A thematic analysis was used to categorize and analyze the literature, emphasizing adaptation, mitigation, health outcomes, challenges, and best practices.

Results: The review identified several effective community-based adaptation strategies, including sustainable agriculture, water management, and disaster preparedness, and mitigation strategies like renewable energy projects, reforestation, and waste management. These strategies demonstrated significant health co-benefits, such as reductions in waterborne diseases, improved air quality, enhanced mental well-being, and strengthened community cohesion. Additionally, social and economic benefits, including improved livelihoods and food security, were noted. Common challenges in implementing these strategies included funding constraints and community engagement issues. Successful approaches and best practices highlighted the importance of participatory planning, capacity building, and policy support.

Conclusion/Implications: Community-based adaptation and mitigation strategies offer substantial co-benefits for health and resilience to climate impacts. The findings suggest that integrating these strategies into local and national policies can enhance their effectiveness and sustainability. Future research should focus on addressing identified gaps, such as long-term health impacts and the scalability of successful strategies. Policymakers and practitioners are encouraged to adopt and promote community-based approaches to climate action, leveraging their potential to improve both environmental and health outcomes.

45 TRACK D: Dynamics of Carbon Emissions and their Implications in Climate Change Adaptation Strategies on Rural Livelihoods.

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Background, Rationale, and Objectives: Carbon emissions, a major driver of climate change, have complex dynamics that influence these impacts. Understanding these dynamics is crucial for developing effective climate change adaptation strategies. This study investigates the relationship between carbon emissions and adaptation strategies in rural communities, focusing on how emission levels and sources affect the effectiveness of these strategies. The primary objectives are to quantify carbon emissions in rural areas, assess current adaptation practices, and recommend improvements to enhance resilience.

Methods: A mixed-methods approach was employed, combining quantitative and qualitative data collection and analysis. The study was conducted in Jotsholo, Lupane District, involving a sample of 100 households. Quantitative data on carbon emissions were collected using carbon monitoring tools and household surveys. Qualitative data were obtained through focus group discussions and in-depth interviews with community members, local leaders, and agricultural extension officers. The intervention description included an examination of existing adaptation strategies such as crop diversification, agroforestry, and water conservation techniques. Data analysis involved statistical evaluation of carbon emission levels and thematic analysis of qualitative data to identify key patterns and themes related to adaptation strategies.

Results: The findings indicate that the primary sources of carbon emissions in Jotsholo are agricultural practices, deforestation, and biomass burning for energy. Adaptation strategies currently in place, such as crop diversification and agroforestry, have shown varying levels of effectiveness in reducing emissions and enhancing resilience. Crop diversification and agroforestry significantly reduce carbon emissions and improve adaptive capacity, but their adoption is hindered by limited resources and knowledge.

Conclusion/Implications: This study concludes that understanding carbon emission dynamics is essential for designing effective climate change adaptation strategies in rural areas. A multifaceted approach, incorporating both modern and traditional practices, is necessary for effective adaptation. Policymakers and development practitioners should prioritize resource allocation and knowledge dissemination to support the adoption of effective adaptation practices. Further research should investigate the long-term impacts of these strategies on carbon emissions and rural livelihoods. The study underscores the need for comprehensive policies that integrate carbon management with climate adaptation to sustain rural livelihoods in the face of climate change.

97 TRACK D: Sustainable diets for Ghanaian adults under transition: An optimisation modelling exercise using data from the RODAM Study

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Introduction: Modernising dietary practices among African populations, driven by economic development, urbanisation, and European migration, has led to unsustainable diets. This study aimed to use optimisation modelling to identify optimal diets for Ghanaians in Ghana and three European cities, addressing nutritional needs, reducing greenhouse gas emissions (GHGE), achieving affordability, and maintaining cultural acceptability.

Methods: Cross-sectional data from the Research on Obesity and Diabetes among African Migrants (RODAM) study, encompassing 5,898 Ghanaian adults aged 18-96 years, collected in Ghana, Amsterdam, Berlin, and London from 2012 to 2014, formed the basis of the analysis. Food intake was collected using the 134-item Ghana food propensity questionnaire, while life-cycle analysis provided food-related GHGE data. The study also evaluated diet costs through a market survey and employed a linear programming-based optimisation algorithm across three cycles. The linear and quadratic programming-based optimisation algorithms were used in this study to determine the optimal food intake. This approach involved three cycles with specific objectives. Firstly, the algorithm aimed to identify a food intake pattern to ensure nutrient adequacy while minimising deviation from the observed diet. Subsequently, a 50% reduction in GHGE was included in the optimisation process. Finally, the algorithm was developed to stabilise food costs to guarantee the sustainability of the resulting food intake pattern.

Results: In this study population (mean age: 47±12 years; female: 62%), optimisation modelling achieved nutrient adequacy and decreased costs with minimal GHGE reductions in Ghana and substantial European reductions for both genders. GHGE reductions ranged from 50 to 65%, translating into 1.5 kg CO2eq per day (Europe) to 2 kg CO2eq per day (rural Ghana), with cost reductions ranging from €1.06 (Berlin) to GH¢5.00 (rural Ghana). The food portion size analysis revealed elevated consumption of fish, fruits, vegetables, cereals, and starchy tubers in all study sites compared to the Ghana-FPQ, advocating for sustainable and cost-effective dietary patterns. Recommendations included substituting fish, vegetables, and legumes for red meat and meaty dishes.

Conclusion: The study identified consistent dietary patterns between genders within each study site. It emphasised promoting healthy, climate-friendly, culturally acceptable, and affordable diets for Ghanaians transitioning. Although smaller in quantity than the observed, these optimised diets highlighted consuming high-plant foods rich in fruits, vegetables, cereals, starchy tubers, and fish and seafood instead of red meat or meaty dishes and sugary foods.

Keywords: Optimisation modelling, sustainable diets, Ghanaian migrants, dietary patterns, RODAM study

57 TRACK D: Biodegradation, nutrient release characteristics and potential of palm oil mill effluent as an organic fertiliser

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Palm oil mill effluent (POME) is a major organic waste in palm oil production constituting environmental concerns, but has potential as a valuable organic fertilizer for crop production due to its nutrient-rich composition. However, the rates of its biodegradation and mineralisation remain insufficiently documented. This study sought to establish baseline data on the biodegradation and mineralisation potential of POME and its potential as organic fertilizer for crop production.

The study was conducted over 90 days using standard laboratory procedures. Fresh POME from the Nigerian Institute for Oil Palm Research underwent mineralisation with Nitrogen, phosphorus and potassium contents (mg/L), pH, bacteria and fungi counts (CFU/mL) monitored at 15-day intervals. Data were analysed using descriptive statistics and ANOVA at 5% level of probability.

Nitrogen, phosphorus and potassium contents of mineralised POME increased from 112.33±1.45 (day-0) to 1610.00±0.89 (day-90), 683.33±4.41 (day-0) to 2200.00±2.89 (day-75) and 683.83±1.20 (day-0) to 3108.33±2.19 (day-75), respectively. The pH significantly increased from 4.3±0.0 (day-0) to 8.1±0.0 (day-90). Bacteria and fungi counts ranged from 3.8×104 (day-90) to 6.3×106 (day-45) and 2.3×102 (day-0) to 8.7×105 (day-60), respectively. Mineralisation of palm oil mill effluent reached its peak at 75 days.

The study underscores biodegradability and nutrient richness of POME, attributed to its favorable pH and organic matter content, thereby enhancing microbial activities crucial for degradation and mineralization processes. These findings emphasize the potential of repurposing POME as a sustainable organic fertiliser for crop production while preserving the environment.

Keywords: Environmental sustainability; Microbial activity; Mineralisation; Organic matter; Wastewater

66 TRACK D: What Suits Us? Unraveling Micro-Level Perspectives of Riparian Wetland Communities for Driving Sustainable Climate Change Resilience: An Evidence-based Study

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Wetlands (covering about 1.5-1.6 billion hectares globally), are critical biodiversity/ecosystem and livelihood hotspots and replenish the global economy with $47.4 trillion/year worth of ecosystem services. A critical intangible contribution is the amelioration of micro and global climate, which helps sustain livelihood assets and activities. By jealously guarding wetlands, progress toward sustainable development goals, and livelihood welfare are possible. To support sustainable wetland governance, global mechanisms engulfed under the 2021 Global Wetlands Outlook report have been charted. Unfortunately, since the 1970s, 35 percent of natural wetlands have been lost, and this could be worse in wetland zones situated in remote tropical regions. The loss of wetlands mainly due to anthropogenic activities has coincided with the increase in greenhouse gas emissions, with dire effects. For instance, in Uganda, urban growth and industrialization have led to human establishments/settlements in wetland zones which has increased flood risk (due to torrential flash rains around Lake Victoria). In rural areas, the encroachment on wetlands has led to increased temperatures, drought, and the lowering of the water table. Despite the recognition of these threats, limited research has been undertaken to understand how micro-level communities' perspectives can be used as a building block for CC resilience. In this research, the overarching aim is to uncover key insights that can help drive community resilience to CC shocks. To do this, a mixed research approach was used involving the bibliometric analysis of 1819 documents on wetland vulnerability in Uganda and participatory engagements with 150 citizens sedentary along 105 sampled wetland zones in 14 sub-counties in Mityana district. Findings from the bibliometric analysis revealed that although research on wetlands has increased, specific focus on CC mitigation is lacking or limited. Most studies are also focusing on natural science research, with limited focus on social science or micro-level stakeholder engagements. From the field, wetlands avail several resources that sustain livelihoods. Human activities are threatening wetland cover and sustainable livelihoods. Resilience to CC is low due to loss of livelihood assets/capital. Most dominant threats are human-induced, such as eucalyptus growing. Due to ecological and livelihood grief from wetland loss, urgent action is needed. To contribute to this, we co-developed the Sustainable Wetlands Management Action Pathway (SWeMAP) provides seven (7) coherent steps, including critical social science insights that could aid sustainable wetlands governance and management across geographies. In the SWeMAP, we show the relevance of how gazetted wetlands are critical to sustainable development, and the creation of nature-based solutions for CC resilience, among riparian wetland communities. To further promote avenues for CC resilience along riparian wetlands, that are community-led, there is an urgent need for the co-development and financing of micro-level wetland action plans, including inventories. This could further help create avenues for sustainable wetlands management.

ETHICS AND CLIMATE RESEARCH EQUITY

293 TRACK E: Ethical Implications of Climate Change Policies and Interventions on Kenyan Communities: Case of Urban Slum Dwellers in Mathare, Nairobi County

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This paper explores the ethical implications of climate change policies and interventions on Kenyan communities, focusing on social justice and human rights, with a specific emphasis on slum dwellers. These communities face unique vulnerabilities and challenges due to their disproportionate exposure to climate impacts such as flooding, landslides and health risks; and exclusion from policy benefits. This study considered how climate change policies in Kenya can exacerbate existing inequalities and human rights violations, and offers recommendations for more inclusive and equitable approaches in mitigating the imminent challenges. Two research questions guided this inquiry: (1) How do existing climate change policies and interventions impact the socio-economic conditions of slum dwellers in Mathare, Nairobi County, Kenya? (2) What measures can be implemented to ensure that climate change policies promote social justice and protect the human rights of these communities? This study employed a mixed-methods approach, combining document analysis

and qualitative interviews. Data on socio-economic indicators and climate change impacts were analysed. Additionally, qualitative data gathered through interviews with 30 residents (purposefully sampled) from the slum were analysed to gain insights into their unique experiences and perspectives. The findings reveal that current climate change policies neglect the needs of slum dwellers, leading to inequitable resource distribution and that the available support for adaptation and mitigation is not adequate. Many slum residents reported increased vulnerability climate change effects such as flooding, disease outbreak, and mental health, without sufficient governmental support. Furthermore, the study highlighted cases of evictions, displacement and economic relocation resulting from responses to climate change effects, exacerbating extreme poverty and social exclusion. The study concluded that climate change policies in Kenya do not adequately address the specific vulnerabilities and needs of slum dwellers, leading to social justice and human rights concerns. The need for policies that ensure active inclusion of slum communities in decision-making processes and equitable resource distribution emerged. The following recommendations were derived: slum dwellers should be actively involved in the planning and implementation of climate change policies; policies should safeguard the livelihoods of vulnerable members of these communities like women, children and people living with disabilities; and the need for awareness and education programs that empower slum dwellers to engage with and benefit from beneficial climate change policies.

Key words: Ethical implications, climate change policies, poverty, gender, health equity, social justice, human rights.

334 TRACK E: Ethical Implications of Climate Change Policies on HIV Prevention and Treatment Access in African Communities

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Background, Rationale, and Objectives: Climate change poses significant challenges to global health, with African communities particularly vulnerable due to socio-economic disparities, limited healthcare infrastructure, and environmental changes. Climate policies often overlook the specific needs of populations living with HIV, exacerbating health inequities and impacting HIV prevention and treatment access. Understanding the ethical implications of these policies is crucial for ensuring that climate change strategies do not inadvertently harm vulnerable populations. This scoping review aims to explore the ethical considerations of climate change policies concerning HIV prevention and treatment access in African communities, focusing on social justice and health equity. Key research questions include: What are the ethical challenges posed by climate change policies on HIV care in Africa? How do these policies affect the equitable distribution of resources for HIV prevention and treatment?

Methods: A scoping review methodology was employed to map the existing literature on the intersection of climate change policies and HIV access in African contexts. This involved a systematic search of peer-reviewed articles, reports, and policy documents from databases such as PubMed, Scopus, and Google Scholar. Inclusion criteria encompassed studies addressing the ethical dimensions of climate policies affecting HIV care and treatment in African countries. Data extraction focused on ethical challenges, policy implications, and the impact on healthcare access. The analysis was thematic, identifying common ethical issues and evaluating policy effectiveness in promoting health equity.

Results: The review identified several ethical challenges, including the marginalization of HIV-affected communities in climate policy planning, inequitable resource allocation, and inadequate infrastructure for healthcare delivery. Climate policies often prioritize environmental goals over health equity, leading to reduced access to antiretroviral therapy (ART) and HIV prevention services. The lack of community engagement in policy formulation further exacerbates these challenges, limiting the consideration of local needs and knowledge. Findings suggest that current policies may inadvertently increase vulnerability among HIV-positive individuals by neglecting the social determinants of health.

Conclusion/Implications: The scoping review underscores the need for ethical frameworks in climate policy development that prioritize health equity and social justice for HIV-affected populations. Policymakers should integrate community perspectives and indigenous knowledge systems to create inclusive strategies that address the unique challenges faced by African communities. Recommendations include incorporating health equity metrics in climate policy assessments, fostering multisectoral collaborations, and ensuring that HIV care considerations are integral to climate adaptation and mitigation efforts. This approach can enhance the resilience of healthcare systems and promote equitable access to HIV prevention and treatment amidst climate change challenges.

439 TRACK E: Research Ethics in Crisis: Ethical Challenges in Research with Climate-Displaced Africans.

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Significant environmental disruptions have been triggered by climate change, which has indirectly led to the displacement of millions of individuals worldwide. In Africa, climate refugees—those forced to leave their homes due to extreme weather events, desertification, and sea-level rise—represent an increasingly vulnerable population. These challenges are compounded by their loss of livelihood, health risks, and socio-political marginalization. Given the perilous circumstances surrounding climate refugees, research in this domain is both vital and consumed by ethical complexities. Based on this foundation, this research aims to explore the ethical principles that must guide research with climate-displaced populations in Africa and propose strategies to ensure that research does not perpetuate their vulnerabilities.

Research question: What ethical frameworks are most effective in protecting the rights and well-being of climate refugees during the research process?

Through the adoption of a desktop research methodology, primarily evaluating existing literature on ethical guidelines, frameworks, and case studies relevant to climate-displaced populations. Peer-reviewed articles, policy documents, and ethical codes from international organizations will be reviewed, with a primary focus on research ethics in vulnerable populations.

This critical analysis illustrated that several critical ethical challenges exist, such as obtaining informed consent, ensuring confidentiality, preventing exploitation, and respecting cultural contexts. It becomes evident that traditional ethical frameworks fail to address the complexities faced by climate refugees comprehensively. Informed consent must be deemed a requirement for all research to ensure that participants fully comprehend the nature, purpose, and potential risks of the study. However, language barriers, illiteracy, and cultural differences can hinder this process, making it difficult for participants to make informed decisions. Similarly, confidentiality must be prioritised, especially in the context of refugee communities and their limited privacy. Researchers must be conscious of protecting participants' identities and personal information, which, if disclosed, could further marginalize them or put them at risk. Any benefits derived from the research must be shared equally between participants, to mitigate exploitation of the vulnerabilities of climate refugees, who may be desperate for resources or assistance. From a cultural perspective, researchers must engage with local customs, traditions, and values, building trust with participants and community leaders, and being sensitive to cultural norms and power dynamics.

A recurring theme that was observed was the necessity for researchers to adopt a participatory approach, specifically, the engagement of refugees as active contributors as opposed to passive subjects. This approach enhances trust, promotes transparency, and mitigates potential harm. By doing so, researchers can foster a sense of agency and empowerment among participants, ensuring that the research is conducted ethically and respectfully.

Consequently, a nuanced, context-specific approach is necessary, which prioritises the rights and dignity of refugees. Further, the integration of participatory methodologies, establishing robust community partnerships, and adhering to culturally sensitive practices must be implemented on a broad scale. These recommendations are aimed at preserving research ethics to ensure the investigations positively contribute to the well–being of climate refugees, as opposed to perpetuating their vulnerabilities.

49 TRACK E: Ethical Frameworks in Climate and Health Research: Integrating Non-Human Interests and One Health for Climate Migrants.

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As climate change increasingly drives human migration, particularly in vulnerable regions, it also impacts ecosystems and non-human species, necessitating comprehensive ethical frameworks in climate and health research. This desk review study explores the integration of non-human interests within ethical frameworks of climate and health research, focusing on the One Health approach as a theoretical framework, which recognizes the interconnectedness of human, animal, and environmental health. Case studies from Bangladesh, Kenya, and the Philippines are analyzed using thematic synthesis to identify key ethical considerations and practical applications for inclusive and sustainable health policies. The study underscores the importance of interdisciplinary collaboration and the inclusion of non-human interests to ensure holistic health outcomes amidst climate migration challenges. Recommendations include adopting One Health principles in climate and health policies, developing ecosystem-sensitive approaches, and establishing ethical guidelines that harmonize human and non-human health priorities. Future research should further explore and validate

these frameworks across diverse contexts to enhance the resilience of ecosystems and communities in the face of climate change.

Keywords: Ethical frameworks, Climate change, Health research, Climate migrants, Non-human interests, One Health approach.

474 TRACK E: Assessment of livelihood vulnerability to desertification Inkaita local government area, Katsina, State, Nigeria

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Vulnerability has become a central aspect of studies of food insecurity, poverty and livelihoods a climate change and desertification or land degradation especially in front line state of Nigeria. The aim of this research was to assess the livelihood vulnerability to desertification in Kaita local government area of Katsina state. Data and information for this dissertation were obtained from a direct field study based on the result of 375 questionnaires that were administered to household heads in the twelve villages of the study area. Similarly Key Informant Interview (KII) and Focus Group Discussion (FGD) was conducted to complement the questionnaire. Simple descriptive statistics was used to describe the socioeconomic characteristics of the respondents. Supervised classification analysis of Landsat 4 TM 1990, Landsat 7 ETM +2000 and 2010, and OLI images 2020. Landsat zones of 32 P189 R052 were used to processes images for change detection using time series of ten years intervals. Vulnerability index analysis were used to assess the degree of vulnerability, normalization of indicators using functional relationship was done so that they all lie between 0 and 1. The result of the study revealed that Zabbakau (VI = 0.294) and Gafiya (VI = 0.375) ,Abdallawa (VI= 0.380) were less vulnerable, ranking 12 , 11 and 10 respectively; Kaita (VI = 0.431), Dankaba (VI = 0.454), Yandaki (VI = 0.469), U\Jibo (VI = 0.493), Dankama (VI = 0.515), Nasarawa (VI = 0.550), Gande (VI = 0.553), Jifatu (VI = 0.560) and Yanhoho (VI = 0.563) were moderately vulnerable, ranking 9,8,7,6,5,4,3,2 and 1 respectively. Findings revealed that, households in these communities has low level of education, find it difficult to adjust from impacts of desertification. It further reveals that, there were high migration due to insufficient water supply in the area, this reduced the number of or active people in agricultural production. Furthermore, households in those communities were located at the middle of the market were also found to be moderately vulnerable. The study recommends that in areas found to be moderately vulnerable, measures should be taken for effective management of environmental resources such control grazing, stop cutting down of trees, soil, vegetation and water. Provide range land management this would greatly reduce the sudden death of animal due to low posture. And sustainable management of land resources are essential for maintaining the productive capacity. There is need for making livelihoods less susceptible to climate change and desertification which implies development of irrigation, establishment of conservation –effective techniques, making fertilizer and soil amendment for farmers. And development of farming\cropping system which are less vulnerable to decline effective rains and worming temperature and improve in shelter belt to reduce wind volume.

518 TRACK E: Exploring heat vulnerability and indigenous adaptation practices among pregnant and postpartum women in rural Mt Darwin District, Zimbabwe

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Background: Heat stress poses a threat to the health and well-being of pregnant and postpartum women in rural Africa, particularly in the context of rising temperatures and erratic rainfall. This study aims to develop a nuanced understanding of how women experience and perceive heat stress, and how Indigenous Knowledge Systems shape adaptation strategies.

Methods: We deployed photovoice, an anthropological approach, to explore heat vulnerability and indigenous adaptation-practices among 23 pregnant and postpartum women purposively selected for variations in age, rurality, education and socio-economic status. Women received training on camera use and photography ethics considerations. Over 14 days, they captured images reflecting their heat experiences and adaptation, emphasising indigenous knowledge. In a participatory analysis workshop researchers and women identified common themes. We also conducted key informant interviews with community experts (n=15) to gather insights into how indigenous knowledge informs heat adaptation strategies. Discussions were recorded and transcribed, with coding used to extract themes and insights.

Results: Heat experiences included heat exhaustion, dizziness, fatigue, dehydration, and heat rash. Captured images and narratives identified "Josack," a thick cotton sack-wrapped water container, and "Kasusu," a well-ventilated thatched hut, along with shade and cooling practices, hydration methods, traditional protective clothing, and agricultural knowledge. Women create

protective micro-environments by resting in shade and soaking feet in water to prevent overheating. Consuming water-rich foods like "manwiwa" was used to maintain hydration. Photos show women in traditional clothing that protects from the sun while allowing airflow, highlighting cultural and functional aspects. Heat adaptation practices align with spiritual beliefs involving "Mwari," the deity, and "Midzimu," the ancestral spirits. Women adopt approaches involving spiritual practices to enhance community resilience, including communicating with "Masvikiro," spirit mediums, through Midzimu to maintain people-nature harmony. This communication is done through "Kudetemba," a form of prayer, seeking blessings and protection, linking spiritual beliefs with daily adaptations when "the sun is falling" (when heat is extreme).

Conclusion: This study contributes to understanding the lived experiences of pregnant and postpartum women in rural settings of Zimbabwe amidst changing climatic conditions and increasing ambient temperatures. This study highlighting the ongoing role of indigenous knowledge in heat adaptation mechanisms.

335 TRACK E: The Intersection of Climate Change, HIV, and Gender Inequality in Africa: Ethical Considerations and Implications for Policy Development

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Background, Rationale, and Objectives: Climate change, HIV, and gender inequality are interconnected issues that disproportionately affect women and girls in Africa. While climate change exacerbates existing vulnerabilities, HIV further complicates the socio-economic landscape, making women more susceptible to health and social inequities. Gender inequality limits access to healthcare, education, and resources, hindering the effectiveness of interventions aimed at addressing both climate change and HIV. This scoping review aims to explore the ethical considerations at this intersection and examine the implications for policy development. The key research questions include: How do climate change and HIV intersect with gender inequality in Africa? What are the ethical challenges in addressing these issues? How can policies be designed to promote gender equity and health justice?

Methods: This study adopts a scoping review methodology to systematically explore the literature on the intersection of climate change, HIV, and gender inequality in Africa. A comprehensive search was conducted across multiple academic databases, including PubMed, Scopus, and Web of Science, focusing on peer-reviewed articles, reports, and policy documents published between 2000 and 2023. The study population includes African women and girls impacted by climate change and HIV. The review follows a thematic analysis approach to identify key ethical considerations, barriers, and policy implications. Outcome definitions include increased vulnerability to HIV, limited access to healthcare, and socio-economic disparities due to climate-induced challenges.

Results: The review reveals that climate change exacerbates gender-specific vulnerabilities to HIV, particularly in rural and resource-limited settings. Women and girls face increased risks due to climate-induced migration, food insecurity, and lack of access to healthcare services. Ethical challenges include inequitable resource distribution, inadequate representation in policy-making, and the marginalization of indigenous knowledge systems. The study identifies critical barriers to gender equity, such as cultural norms and structural inequalities, hindering effective interventions. Policy analysis highlights a lack of gender-responsive strategies that integrate climate change and HIV prevention, indicating a need for comprehensive and inclusive policy frameworks.

Conclusion/Implications: The findings underscore the urgent need for ethically grounded policies that address the intersection of climate change, HIV, and gender inequality in Africa. Policymakers must prioritize gender equity by integrating ethical considerations into climate and HIV strategies. Recommendations include developing gender-responsive policies that ensure equitable access to healthcare and resources, promoting women's leadership in policy development, and incorporating indigenous knowledge systems. These efforts are crucial to achieving sustainable development goals and improving health outcomes for African women and girls in the face of climate change.

HEALTH IMPACTS AND EPIDEMIOLOGY

5 TRACK B: Investigating the Associations between Drought, Poverty, High-Risk Sexual Behaviours, and HIV Incidence in Sub-Saharan Africa: A Cross-Sectional Study

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Background, rationale, and objectives: Climate change is increasing the likelihood of drought in sub-Saharan Africa, where HIV prevalence is high. Drought could increase HIV transmission through various mediating mechanisms, such as through increasing poverty, which may affect sexual behaviours associated with increased risk of HIV transmission. For example, drought increasing poverty, increasing the likelihood of women requiring food/money resorting to transactional sex, increasing the risk of HIV transmission. We aimed to investigate these associations.

Methods: We used data on people aged 15-59 from Population-Based HIV Impact Assessment surveys from 2016 in Eswatini, Lesotho, Tanzania, Uganda, and Zambia. Survey data were geospatially linked to precipitation data for 2014-2016, with local droughts defined as cumulative rainfall between 2014 and 2016 being in <15th percentile of all 2-year periods over 1981-2016. Using multivariable logistic regression, stratified by sex and rural/urban residence, we examined associations between (a) drought and poverty, (b) wealth quintiles and sexual behaviours (transactional, high-risk, and intergenerational sex), (c) sexual behaviours and recently acquiring HIV, and (d) drought and recent HIV. To classify recent HIV infections, HIV-1 limited antigen avidity immunoassays were used. Samples were considered a recent infection if there was a normalised optical density <1.5 and the individual did not have a suppressed viral load or detectable antiretroviral drugs.

Results: Among 102,081 people, 57.2% were women, 33.7% lived in urban areas, and 31.5% resided in areas affected by drought during 2014-2016. Experiencing drought was positively associated with poverty for women and men in rural, but not urban, areas. For each group, increasing wealth was negatively associated with transactional sex. For rural women, intergenerational sex was positively associated with wealth. Women reporting each sexual behaviour had higher odds of recent HIV, with strong associations seen for high-risk sex, and, for urban women, intergenerational sex, with weaker associations among men. Women in rural areas who had been exposed to drought had higher odds of having recently acquired HIV (2.10 [95%CI: 1.17-3.77]), but not women in urban areas, or men.

Conclusions: Droughts could potentially increase HIV transmission through increasing poverty and then sexual risk behaviours, particularly among women in rural areas.

141 TRACK B: Identifying climate-drivers of three common infectious diseases in Madagascar via participatory modeling

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Background: Climate change is expected to increase the frequency and strength of human health hazards in Madagascar, a country which already experiences higher rates of childhood and all-age mortality than nearby nations. Rapid and evidence-based health system adaptations, such as early warning systems, are key opportunities for mitigating human health costs. However, few models have been developed as forecasting tools integrated into health management information systems, often due to a lack of transparency and validation of forecasting models with health actors. Participatory modeling aims to overcome these limitations via an iterative, interdisciplinary approach to statistical modeling, resulting in models that are relevant to the local context and validated by decision makers.

Methods: We used participatory modeling to identify climate drivers of malaria, diarrheal disease, and acute respiratory infection (ARI) at the community level for the district of Ifanadiana, Vatovavy, Madagascar. We conducted two weeklong participatory modeling workshops with 16 public health actors to develop conceptual models of disease and validate statistical models. Community-level case notifications were collected from January 2016 - December 2021 from all 21 health centers in the district. Environmental and climate data were derived from satellite imagery and hydrological models at resolutions as fine as 10m. We performed hierarchical regression via Integrated Nested Laplace Approximation models, accounting for spatio-temporal trends.

Results: Model performance varied across diseases, with R2 values ranging from 0.125 for ARI to 0.345 for malaria. Variable importance scores revealed that climate variables were most relevant for malaria and ARI, while seasonal variables were more relevant for diarrheal disease. The coherence between conceptual and statistical models of disease and the ability to forecast seasonality were identified as the most important model characteristics by participants during the validation phase.

Conclusions: Participatory modeling can identify context-relevant drivers of climate-sensitive diseases and result in accurate forecasting models, although model performance is disease-dependent. The approach improved participants' knowledge and trust in the forecasts resulting from these models. Work is on-going to integrate forecasts into a DHIS2 platform, and the relationships formed during this process will facilitate adoption of this e-health tool.

382 TRACK B: Understanding the influence of climate change and water management in large irrigation schemes on schistosomiasis transmission dynamics

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Background, Rationale, and Objectives: Schistosomiasis, a neglected tropical disease, thrives in aquatic environments and is highly sensitive to climate change and water management practices. Irrigation can accelerate its spread, especially in communities reliant on freshwater. Understanding the interaction between climate change, environmental modifications, and human behaviors is vital for effective schistosomiasis control. This study aims to assess the impact of agricultural practices on transmission, evaluate the role of climate changes in altering prevalence, and identify critical factors affecting transmission dynamics.

Methods: A mixed-methods approach combined quantitative and qualitative data collection. Longitudinal malacological studies, cross-sectional epidemiological surveillance, and ethnographic methods were employed to gather data on vector abundance, ecological factors, disease prevalence, and human interactions with water sources over a year.

Results: The study found significant correlations between agricultural practices, particularly irrigation, and increased schistosomiasis transmission, with high-risk sites identified at ponds, drains, and streams. Two not previously reported snail species were found along with Bulinus africanus and globosus species (n=3952): Biomphalaria pfeifferi (n=200) and Orientogalba viridis (n=400), all of medical importance. Climatic changes, such as heavy flooding, were linked to introducing Biomphalaria snails, the intermediate host for intestinal schistosomiasis, into previously unreported habitats like streams and drains within irrigation schemes. Among primary school children, the prevalence of urogenital schistosomiasis was 35%, and intestinal schistosomiasis was 1.9%. The highest rates were observed in those with access to water bodies, particularly in communities relying on freshwater for domestic and recreational use. Areas near irrigation schemes, especially those experiencing water scarcity, are vulnerable to changes in freshwater sources and irrigation patterns, likely expanding habitats for schistosomiasis vectors and increasing transmission rates.

Conclusion/Implications: Three snail species of medical importance were primarily collected from agricultural water bodies identified as high-risk transmission sites. Schistosomiasis was prevalent in communities near these water bodies, as they relied on them as water sources. Climate and environmental changes facilitate schistosomiasis transmission in irrigation-dependent and water-scarce areas, posing significant public health risks. The findings highlight the need for policies incorporating climate adaptation strategies into public health planning and water management to mitigate schistosomiasis and protect vulnerable populations.

392 TRACK B: Quantifying the impact of climate indicators on malaria incidence in Malawi from 2004-2024: Towards malaria elimination

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Background, rationale and objectives: Malawi is moving towards malaria elimination by 2030 after years of decline in prevalence. To achieve this milestone, continued surveillance to monitor Malawi's changing malaria patterns due to different factors including climate change and variation is essential. Climate change, including the increased frequency of extreme weather events such as cyclones, threatens to derail progress towards malaria elimination in Malawi. Therefore, to achieve elimination, understanding the changes in malaria patterns over the last two decades is necessary to refine our approach to interventions. This study aimed to quantify the relationship between climatic indicators and malaria incidence and assess the impact of extreme weather events such as El Nino and tropical cyclones.

Methods: Monthly malaria case data from 2004 – 2020 were extracted from the Health Management Information System (HMIS). Corresponding climatic data (precipitation, maximum and minimum temperature) including extreme weather events were obtained from the Department of Climate Change and Meteorological Services (DCCMS). We fitted interrupted time series (ITS) and Bayesian hierarchical models to estimate the incident rate ratios. From the Bayesian spatio-temporal model, we estimated and mapped the climate-adjusted incident rate ratios at the district level to reveal malaria hotspots. Cross-validation was conducted to ascertain the robustness of the estimates.

Results: ITS results indicated a sustained reduction in prevalence after short-lived spikes following extreme events. The spatio-temporal models provided a more nuanced picture of disease patterns by revealing hotspots in some parts of the country, mostly along the lake and Shire River valley in southern Malawi. Despite the general decline across the country, localised increases in prevalence were noticed, with the highest relative increase in the prevalence ratio of 27% and 31% over 20 years observed in the lakeshore districts of Salima and Nkhotakota respectively.

Conclusion: This 20-year malaria analysis highlights the impact of climate on malaria which is crucial for achieving elimination. The mapping offers clear, actionable insights for targeted interventions in vulnerable areas prone to extreme weather, aiding the design, adaptation and implementation of effective malaria control programmes. Such targeted actions can disrupt local transmission chains, advancing Malawi's progress towards malaria elimination.

281 TRACK B: Evaluating Malaria Risk Projection under Climate Change Scenarios in Senegal

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The impacts of climate change on our planetary health pose a significant threat to various sectors, impacting more fragile economies and has far-reaching implications for public health. Malaria, a vector-borne disease in many parts of the world, remains a severe threat to human well-being. Moreover, malaria prevalence is anticipated to increase, as is the case with climate change, in the foreseeable future. The expected increase in the frequency of natural disasters, such as droughts and floods, is likely to create conducive environments for breeding disease-carrying mosquitoes, thus exacerbating the spread of malaria. Thus, understanding the implications of climate change on malaria prevalence is of utmost importance, particularly for Senegal, a country in Sub-Saharan Africa where malaria is endemic. Senegal, located in West Africa, has a Sudano-Sahelian climate favourable to the proliferation of pathogens responsible for several diseases, including malaria. The spread of malaria is uneven throughout the country as a result of climatic zones and seasonal variations. While several studies have been carried out to quantify the associations between climatic factors and Malaria risk in Senegal, there are knowledge gaps in understanding the relationship between hydrometeorological conditions (such as extreme drought and extreme wet conditions) and malaria risk occurrence, as well as the delayed effects of these conditions on transmission. In this context, we quantified the association between hydrometeorological conditions (such as drought or flood) and malaria incidence and projected malaria risk related to climate for the future (2050) under different climate-change scenarios (SSP2.6, SSP4.5, SSP7.0, SSP8.5). To achieve these objectives, we employed a spatiotemporal Bayesian model with distributed lag non-linear models (DLNM) to explore the non-linear and delayed effects of hydrometeorological extremes on malaria risk across different regions of Senegal. Our findings highlight that the recorded malaria cases are strongly linked with hydrometeorological conditions. Specifically, we observe that dry and wet conditions, with a 2-month lag, were linked to an increased risk of malaria during 2016 and 2021. Furthermore, distinct variations in malaria risk trends were observed between the northern and

southern regions of Senegal. Our results also project an increased risk of malaria in the northern part of Senegal (Sahel zone), especially in regions such as Dakar, Thies, and Louga, where conditions are expected to become more humid. Conversely, a decrease in malaria risks is anticipated in the southern regions of Senegal, such as Tambacounda, Kedougou, and Kolda, which are projected to experience mild drought conditions. Overall, these results will help stakeholders develop adaptation and mitigation plans to reduce future malaria risks in Senegal. The results of this study can be improved and adapted as a baseline for anticipatory action for malaria control strategies.

Keywords: Climate change, SPI, Malaria, Senegal, GCM, CMIP 6

62 TRACK B: Zoonotic pathogen spillover at the human-animal interface in a biodiversity hotspot in Ibarapa District of South-Western Nigeria: A Descriptive Study

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Background: With 2.5 billion cases of human illness and 2.7 million deaths annually, zoonosis continues to pose a significant threat to global health security and the world is making slow progress in reducing the likelihood of spillover events. The Ibarapa District of South-Western Nigeria is an important biodiversity and infectious disease hotspot, with the communities highly dependent on ecosystem services such as hunting, and unaware of the risk of spillover event.

Method: We conducted a cross-sectional mixed-method study from March 2023 to August 2023, using a multi-stage sampling approach to ensure representative sample. A semi-structured interviewer-administered questionnaire was administered to 405 randomly-selected villagers across the seven towns (Igbo Ora, Lanlate, Eruwa, Ayete, Idere, Igangan, Tapa) in Ibarapa. Consequently, a total of 7 focus-group discussions were conducted with 7-10 participants (including men and women) to explore the attitudes and perceptions of the community about hunting wildlife and their health-seeking practices concerning zoonosis. Qualitative data were analyzed using content analysis to check for recurrent themes while quantitative data were analyzed using R version 4.3.2 software package.

Result: The mean age of the respondents was 49.2 ±14.8 years. Respondents mostly involved in wildlife hunting such as bush rodents 152(37.5%), wild ruminants 104(25.7%), and 19(4.7%) non-human primates with forest interior 217(53.6%) as the perfect location for hunting wildlife. Consumption and sales were the major reason communities hunt 219(54.1%), followed by recreational purposes and exercise 28(6.9%), and to derive valuable products for medicinal uses 18(4.4%). Other reasons for the persistent hunting of bush meat were due to their deliciousness and perceived immunity. Few respondents 45(11.1%) reported illnesses after consumption of bush meat. Generally, most respondents 323(79.8%) were aware that disease can be transmitted from wildlife to animals with 382(94.3%) having heard of Rabies or Ebola. Poor knowledge of zoonotic diseases ($\chi2 = 7.396$, CI: 95%, $p= 0.025$), involvement in hunting ($\chi2 = 11.855$, CI: 95%, $p= 0.008$), and numbers of people involved in preparations of hunted meats ($\chi2 = 62.529$, CI: 95%, $p= <0.001$) were associated with falling sick after consuming bushmeats. Compared to the unemployed group, participants involved in hunting were 9.53 times higher odds (CI: 95%, OR = 9.53, CI = 1.28-3.47) of being attacked by wildlife.

Conclusion: This research provides insight into the major pathway for spillover event at human-wildlife nexus driven by likelihood needs and the need for government and concerned stakeholders in Nigeria to develop risk communication strategy for the communities in Ibarapa with special consideration for specific exposure risks and knowledge about zoonosis. Targeted education programs aimed at farmers and participants with lower education levels to better improve their understanding of zoonotic disease transmission alongside prevention is highly recommended. While participants involved in hunting shows higher odds of being attack by wildlife—an important risk factor for zoonosis, there is a need for concerned public health professionals to develop an enhanced surveillance system for zoonotic diseases in human-wildlife conflict areas.

228 TRACK B: Climate-Driven Changes in Seasonal Malaria Transmission in Sub-Saharan Africa: Timings, Spatial Variation, and Temporal Changes

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Malaria transmission in Sub-Saharan Africa is intricately linked to key climatic factors such as temperature, rainfall, and humidity, which significantly influence the breeding, development, and survival of malaria vectors and the Plasmodium parasite. Despite substantial progress in reducing malaria incidence in the region, there remains a critical knowledge gap concerning the nuanced impacts of climate variability and change on the seasonal dynamics of malaria transmission. Specifically, there is a need for detailed spatial and temporal analyses to uncover localized trends and anomalies that may inform more effective interventions. To address these gaps, our study integrates high-resolution climate projections with epidemiological data to provide a comprehensive analysis of how shifting climate patterns are altering malaria transmission across diverse locales in Sub-Saharan Africa. We employed a regional-scale high-resolution weather-driven dynamical malaria model to simulate the relationship between climatic variables and malaria incidence, offering a more granular understanding of the spatial and temporal heterogeneity in transmission dynamics. Our findings revealed significant variations in the timing and intensity of malaria transmission across different regions, underscoring the importance of localized climate-driven changes. This research provides critical insights for predicting future malaria trends under various climate scenarios, enabling policymakers and public health practitioners to design more targeted and effective malaria control and prevention strategies. Ultimately, our work contributes to the broader goal of malaria elimination in Sub-Saharan Africa by enhancing our understanding of the complex interplay between climate and malaria transmission.

118 TRACK B: The Friendship Tent: A Climate-Friendly Mental Health Center

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Introduction and Rationale: In Nigeria, over 3 million individuals are internally displaced, with young people disproportionately affected and experiencing significant mental health crises. These young internally displaced persons (IDPs) face higher rates of depression and post-traumatic stress disorder (PTSD) compared to the general population. Traditional mental health services are often inaccessible for young IDPs, creating a pressing need for innovative, sustainable solutions.

Climate-friendly innovations offer a unique opportunity to improve the mental health of vulnerable populations like IDPs. By utilizing renewable energy sources and eco-friendly materials, these innovations address environmental concerns while ensuring the sustainability and resilience of mental health interventions. The Friendship Tent initiative exemplifies this approach, leveraging solar-powered, eco-friendly mental health and wellness centres to support the well-being of young IDPs in Northern Nigeria.

Aims: The primary objective of this study was to assess the effectiveness of utilizing a climate-friendly innovation to improve mental health outcomes among young IDPs. Specifically, the study sought to understand how solar-powered, eco-friendly materials can create a sustainable and effective environment for delivering mental healthcare.

Description of the Case: The Friendship Tent was constructed in two IDP camps in Northern Nigeria. These solar-powered mental health and wellness centres were built using repurposed old cargo containers and other eco-friendly materials. They serve as safe havens where trained community members, known as Community Mental Health Therapists, provide basic psychotherapy to young IDPs with mild to moderate depression, anxiety, PTSD, and substance abuse disorders.

The use of solar energy ensures a reliable, sustainable, and uninterrupted power supply, essential for the continuous operation of mental health services. This innovation not only meets the operational needs but also aligns with environmental sustainability goals. The eco-friendly construction further reinforces the commitment to climate-friendly practices.

One hundred young IDPs, aged 13-24, with symptoms of mild to moderate depression, anxiety, PTSD, and substance abuse disorders received care in the Friendship Tent bi-weekly over nine months. By the end of the period, 83% completed all 18 sessions, 69% showed clinically significant improvement in depression symptoms, and 40% demonstrated significant improvement in anxiety symptoms.

Discussion and Recommendations: The Friendship Tent has proven to be an effective climate-friendly centre for addressing mental health needs in marginalized communities. This case study highlights the critical link between climate action and mental health improvement. The success of The Friendship Tent underscores the potential for similar approaches to be adapted and scaled in other settings facing comparable challenges.

Future recommendations include expanding the initiative to more IDP camps, enhancing the training of community mental health therapists, and strengthening partnerships with organizations committed to both environmental sustainability and mental health advocacy.

In conclusion, The Friendship Tent serves as a powerful example of how climate adaptation can be seamlessly integrated into health systems to support vulnerable populations. By leveraging renewable energy and eco-friendly materials, the initiative not only provides essential mental health services but also promotes environmental stewardship, offering a holistic solution to the dual challenges of mental health and climate change.

130 TRACK B: Healthcare worker perceptions of the effects of heat on their wellbeing, performance, and quality of care in Tshwane, South Africa

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Background: The frequency, duration and intensity of temperature extremes are increasing year-on-year. With heat exposure, healthcare workers (HCW) physical and emotional coping capacities may become strained, potentially affecting work performance, health outcomes and quality of care (QoC).

Methods: A self-administered electronic survey was conducted in the hot season (February to March 2024) at two facilities in Tshwane district, South Africa, targeting clinical and non-clinical staff working in antenatal, maternal and neonatal wards. The survey covered HCW's wellbeing, perceived heat stress, thermal comfort, and current and future heat adaptations. Urine specimens collected towards the end of their shift assessed hydration using urine specific gravity (USG).

Results: Eighty female HCWs, aged 20-64years, participated in the survey; 65%(n=52) were clinical staff. Majority of HCWs reported their working conditions as hot or very hot (n=46,58%), with light to no air movement (n=42,53%). On the hottest day in the past week, HCWs reported getting very or extremely thirsty (n=40,50%), being so tired they wanted to take a break (n=19,24%), and severe sweating (n=17,21%). Two-thirds (n=53,66%) of HCWs were dehydrated (USG>1.015). During the hottest day in the preceding week, 55%(n=44) reported being at least uncomfortable, with 5%(n=4) being so uncomfortable they wanted to quit. When asked about their experiences during the last heatwave, HCWs reported impacts on performance and QoC: every time or often observing a reduction in the productivity level per person (n=42,52%), poorer communication with patients (n=32,40%) and between healthcare workers (n=28,35%). Existing heat adaptation mechanisms were limited: 66%(n=53) reported few or no trees near their workplaces, 30%(n=24) had no access to cooling spaces, 21%(n=17) reported never or rarely having access to air conditioning, and 26%(n=21) never or rarely had cold refrigerated water available in the ward. While most (n=69,86%) HCWs did not know of an existing workplace heat policy, 53%(n=37/69) thought having one would be useful.

Implications: HCWs reported experiencing negative effects of heat on their well-being, performance and QoC rendered to patients. Future health facility adaptations could include improving air conditioner coverage, cold water provision for staff, providing shaded areas around the facility, and introducing formal facility-specific heat policies.

HIGH Horizons has received funding from the European Union's Horizon Framework Programme under Grant Agreement No. 101057843. Project partner LSHTM is funded by UKRI Innovate UK reference number 10038478

315 TRACK B: Evaluating Indoor Heat Stress in Khayelitsha: A multi-method approach to assessing thermal comfort in low-income housing.

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Background, rationale, and objectives: Extreme heat events are increasingly becoming common due to climate change. The brunt of rising temperatures may be felt most acutely in Africa, with projections indicating a more rapid increase in surface temperatures compared to other regions. Subsequently most African countries, due to their developing status, are especially at risk. Extreme heat poses significant health risks, especially in low-income housing areas. This study, nested within the Heat Adaptation Benefits for Vulnerable Groups in Africa (HABVIA) project, aims to assess the risk of heat stress in Khayelitsha by analyzing indoor wet bulb temperatures, a key indicator of thermal comfort. By modelling indoor wet bulb temperatures over the past 50 years, we aim to determine the impact of climate change on indoor thermal conditions and the frequency of exceedances of critical wet bulb temperature thresholds.

Methods: Indoor temperature and humidity data from 60 houses in Khayelitsha was recorded using iButton loggers at 30-minute intervals. The measuring Period started in November 2023 and covers the entire summer period. 5-year outdoor climate variables data were provided by the South African Weather Services (SAWS) while the rest of the 50-year historic data was downloaded. The data was used to calculate indoor wet bulb temperatures. Statistical models, including multiple linear regression and principal component analysis (PCA), were employed to predict indoor temperatures and classify housing types based on building characteristics. The models also assessed the risk of thermal discomfort using the Wet Bulb Temperature (WGT) heat index.

Results: Preliminary findings indicate significant variability in indoor temperatures across different housing types. Informal housing, particularly those constructed with materials like iron and wood, exhibited higher indoor temperatures compared to formal housing. The models revealed that certain building characteristics, such as wall type and roof material, significantly impact indoor temperature variability. Over the past 50 years, there has been a notable increase in the frequency of wet bulb temperature exceedances, correlating with rising outdoor temperatures.

Conclusion/Implications: The study highlights the critical need for targeted interventions to enhance thermal comfort in low-income housing. The findings underscore the importance of climate-resilient housing strategies to protect vulnerable populations in Khayelitsha from heat stress.

375 TRACK B: The effects of climate change on mental health of young women in urban Kampala: Findings from the TOPOWA Study

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Background: Climate change is a significant global health threat, but low-resource settings such as urban slum areas of Uganda, bear the greatest burden due to . In this study we assessed the prevalence of climate change anxiety and its association with generalized anxiety among young women living in urban slums to determine the need for community mental health strategies and resilience building.

Methods: We used data from "The Onward Project On Wellbeing and Adversity" (TOPOWA) study, a multi-component, prospective cohort study examining the mechanistic pathways of mental illness in the context of social determinants of mental health among young women ages 18 to 24 years living in the urban slums of Kampala. The cohort consists of 300 women recruited in 2023 from three study sites (i.e., Banda, Bwaise, and Makindye). Interviewer- administered surveys were used to assess climate change anxiety at baseline, using a 13-item measure of climate change anxiety to determine cognitive (8 items) and functional (5 items) impairment. Bivariate and multivariate analyses were computed to determine the associations between climate change anxiety, generalized anxiety and demographic characteristics.

Results: Of the 300 women, 22% reported moderate to severe climate change anxiety, while the rest reported minimal to mild levels of climate change anxiety. The multivariate analysis conducted to assess the association between climate change anxiety, generalized anxiety, and demographic characteristics indicated that higher levels of generalized anxiety were significantly associated with higher levels of climate change anxiety. Also, older age was associated with higher climate change anxiety while higher education and more household generations were significantly associated with lower climate change anxiety.

Conclusion: Results indicate a significant proportion, one in five, of young women in urban Kampala present with

moderate or severe climate change anxiety, which is also significantly associated with generalized anxiety. These findings indicate a strong need for targeted mental health interventions, educational programs, and community-based initiatives to reduce climate change anxiety among young women. Our findings also indicate that leveraging family support-driven programs should also be considered.

422 TRACK B: The effect of temperature on sleep behaviour in African-origin adults from the Modeling the Epidemiologic Transition Study (METS): Preliminary results.

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Background: The impact of excessive temperature is emerging as a novel risk factor for sleep disruption. Sub-optimal sleep has been implicated in the development of non-communicable diseases including cardiovascular and metabolic disorders. Elevated ambient temperatures can disrupt the thermoregulatory processes needed for optimal sleep quality and duration. Additionally, socio-economic factors, geographic location, and health status may exacerbate vulnerability, prompting the need to evaluate these associations in diverse populations. Preliminary data from the Modelling the Epidemiologic Transition Study, a multi-country cohort study investigating cardiometabolic disease risk, is presented here.

Methods: Data from 615 adults (57% women), ages 25-66 years, from sites in Ghana (N=124), South Africa (N=190), Jamaica (N=114), and Seychelles (N=186) were included in this preliminary analysis. Demographic and health data were collected using questionnaires and clinical measures. Actigraphy-measured sleep was collected and scored using the criteria established by Patel and colleagues. Participants with less than 5-valid nights of recorded sleep were excluded. Sleep outcomes of interest include efficiency (%), duration, onset latency, and sleep time. Daily maximum temperature was recorded by nationally operated automated weather stations located near each of the study sites and obtained from the National Centers for Environmental Information's climate database. Generalized Estimating Equations were used to explore the associations between daily maximum temperature and sleep outcomes.

Results: Adjusted models indicate that sleep efficiency ($\beta = -0.11$, 95% CI: -0.18 to -0.27); duration ($\beta = -3.11$, 95% CI: -4.31 to -1.91); and sleep time ($\beta = -2.86$, 95% CI: -3.90 to -1.82) were negatively associated with increasing maximum temperatures. While onset latency increases per degree of temperature increase ($\beta = 0.19$, 95% CI: 0.17 to 0.37). Sleep efficiency was higher in Jamaica and Seychelles ($\beta = 1.99$; 4.49, $p<0.05$) and lower in South Africa when compared to Ghana ($\beta = -3.26$, $p<0.05$). While onset latency was longer in South Africa compared to Ghana ($\beta = 3.72$, 95% CI: 1.34 to 6.11).

Conclusion: These initial findings suggest that increasing maximum temperatures have deleterious impacts on various outcomes associated with optimal sleep. Further differences between sites suggest that key socio-economic and climatic variables may be contributing factors.

ADAPTATION INTERVENTIONS AND BUILDING CLIMATE RESILIENT HEALTH SYSTEMS

349 TRACK C: Empowering Women in Agriculture: Climate Adaptation Strategies, Health Impacts, and Citizen Science Approaches in Kakamega County, Kenya

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Climate change is posing substantial challenges to agriculture in Kakamega County, disproportionately affecting women who are central to the agricultural sector. These challenges extend beyond productivity to include health implications, as climate-related stressors impact both physical and mental well-being. This study aimed to assess the effectiveness of climate adaptation interventions specifically designed for women farmers, focusing on enhancing agricultural resilience and addressing health outcomes. The primary objectives were to identify effective adaptation strategies employed to improve agricultural productivity and mitigate health risks, and to evaluate the role of citizen science in these interventions.

A mixed-methods approach was utilized, integrating quantitative and qualitative methodologies. A cross-sectional survey was conducted with 300 women farmers across three sub-counties—Navakolo, Matungu, and Mumias in Kakamega County—assessing their agricultural practices, health impacts, and adaptation needs. In-depth interviews and focus group discussions provided detailed insights into their experiences and health challenges. The intervention included training on climate-smart agricultural practices and health-focused strategies, such as improved water quality and nutrition. Data on agricultural yields, health outcomes, and adaptation practices were analyzed using statistical techniques to determine the effectiveness of the interventions.

The study found that targeted climate adaptation strategies, including the use of drought-resistant crops and enhanced water management, significantly improved agricultural productivity and resilience. Health outcomes also showed improvement, with participants reporting a reduced incidence of climate-related illnesses and better overall health due to improved nutrition and water quality. Citizen science approaches facilitated the incorporation of local knowledge into both agricultural and health adaptation strategies, increasing their effectiveness and acceptance.

Integrating climate adaptation strategies with health-focused interventions and citizen science effectively enhanced the resilience and well-being of women in agriculture. The findings highlighted the importance of addressing both agricultural and health impacts in adaptation planning. Recommendations included expanding these approaches and incorporating health considerations into climate adaptation policies to ensure holistic and sustainable outcomes.

163 TRACK C: Effect of refurbishing a health care facility on indoor thermal exposures

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Wordcount (max 350): 327

Background: Using numerical thermal simulations, this study evaluated the effect of building refurbishment on the indoor environment of a health care facility in Zimbabwe.

Methods: Both active and passive refurbishment were evaluated, individually and in combination with others. Simulations were carried out with a current and a future weather file for the year 2080. The simulations were based on weather data for the geographical location of the facility.

Evaluation criteria included the number of hours during a year when the operative temperature exceeded 32oC.

In addition to a baseline model representing the current state of the building, the following refurbishment scenarios were compared:

Combination 1: added reflective roof paint and ventilation grills in the exterior walls

Combination 2: added reflective roof paint, ventilation grills in the exterior walls, and insulated ceiling and exterior walls

Combination 3: added reflective roof paint, insulated ceiling and exterior walls, new windows, a large overhang and split air conditioning units

Combination 4: added reflective roof paint, insulated ceiling and exterior walls, a large overhang and an air handling unit with cooling.

Results: Simulations showed that excessive overheating was reduced considerably by the implemented measures, as all combinations nearly eliminated indoor temperatures above 32oC. Reflective roof paint increased the solar reflection index of the roof from -6 to 109 and it was the most cost-effective way to reduce overheating. Consequently, Combination 1 resulted in only 1 hour above 32oC in the north-oriented room as compared with 2000+ hours in the baseline model.

The active systems such as air conditioning or air handling unit with cooling generally provided comfortable indoor conditions, but the associated costs and environmental impacts were clearly higher than with the passive systems. Sustainable operation of the active systems will therefore require the installation of photovoltaics.

Conclusion: The study revealed that in the absence of any interventions, rising outdoor temperatures would lead to a significant rise in overheating indoors compared to a scenario where none of the proposed interventions were adopted.

Acknowledgement: HIGH Horizons has received funding from the European Union's Horizon Framework Programme under Grant Agreement No. 101057843. Project partner LSHTM is funded by UKRI Innovate UK reference number 10038478.

215 TRACK C: From Policy to Practice: Perspectives of Primary Healthcare Managers on Building Climate-resilient and Sustainable Health Systems in Ghana's Low-resource Settings.

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Introduction: Globally, only fifty percent of countries have developed strategies and plans to address the impacts of climate change on health, of which the majority are only low to moderately implemented. Inconsistent policies, resource constraints, and the lack of capacities further complicate the ability of Primary Healthcare (PHC) actors to mainstream climate change adaptation and mitigation into their operations. By 2015, Ghana had estimated the cost of health sector adaptation to climate change and mainstreamed actions into health sector medium-term development plans, but progress is slow after a decade of policy commitment. This paper presents cost-effective interventions proposed by PHC managers and a co-created collaborative framework for sustainably mainstreaming climate action into the operations of PHCs in low-resourced settings of Ghana.

Methodology: Sixty-five of 67 PHC facility managers (97%) from three low-resourced Districts of the Upper Region of Ghana participated in the study. First PHC managers assessed the vulnerability and impacts of recorded climate hazards by their respective health facilities from September 2021 to September 2022 using the World Health Organization checklist for assessing the vulnerability of healthcare facilities in the context of climate change. After analysis, design thinking methodology was applied to propose low-cost actions and co-create a collaborative framework for mainstreaming proposed climate change adaptation and mitigation interventions into PHC operations.

Results: Eighty-two percent of PHC facilities experienced multiple climate hazards. An average of eighty-three percent of PHC facilities were unprepared (unable to respond or at higher risk) to the impacts of climate hazards of storms, heatwaves, floods, droughts, and wildfires. PHC managers proposed low-cost climate resilience and environmentally sustainable interventions including nature-based solutions for recorded hazards in the components of the workforce, WASH and healthcare waste, energy and infrastructure, technology, products, and processes. PHC managers rapidly co-created a collaborative framework for mainstreaming proposed intervention using District Health Sector Medium-term Development plans, legally mandated transdisciplinary committees, and a network of community structures as levers for building momentum for mainstreaming climate action among PHC actors.

Conclusion: The collaborative framework for mainstreaming climate action into PHC will stimulate climate-sensitive investments in PHC by local government actors("windows of opportunity") and collective action because of trust and the willingness to invest in PHC. This approach will stimulate autonomous adaptation and provide a framework for PHC to partner with NGOs, who are essential partners in developing PHC systems. It also can allow PHC to extend its influence on health-determining sectors and community actors and strengthen bottom-up approaches for sustainable action.

Keywords: Primary Healthcare, Mainstreaming, Climate change, Adaptation and Mitigation

492 TRACK C: Exploring the Value of High Resolution Climate Model Simulations for Heat Information within African Cities

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Due to climate change excessive exposure to heat is becoming more frequent and this will have health implications. Africa is especially vulnerable to this, thus spatial information on heat stress areas within African cities is valuable for understanding these health implications. However the data required for this information is not always available or does not have the required temporal and spatial resolution needed. For example, meteorological station data may not have the needed spatial density thus the information has to be estimated using satellite data which provides land surface temperature but doesn't provide the required air temperature. High Resolution Climate Models can be used as an alternative to provide the required variables at the needed spatial and temporal resolution. This study forms part of the HE2AT Project, which aims to create new knowledge about the impacts of heat on the health and lives of people living in urban areas in Africa. With this in mind, this study assesses whether high resolution climate model simulations could be useful towards providing the climate information required for this knowledge production. We use the Weather Research and Forecasting Model (WRF), with a single layer urban canopy model (SLUCM) to run a year (2015-2016) simulation over two African cities, Johannesburg and Abidjan, with a 3km resolution. Sensitivity experiments are performed to assess the tuning process required for more accurate results. The preliminary results indicate that WRF is able to capture the general spatial pattern of temperature over Johannesburg and Abidjan. The sensitivity results should provide an idea of the resources needed to tune the model for more accurate simulations and the added value provided by this tuning.

398 TRACK C: Economic burden of heat adaptation among coastal urban dwellers in Accra, Ghana: an exploratory study

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Background: Globally, people in urban areas are more affected by heat than those in non-urban areas. In sub-Saharan Africa (SSA), heat-related health risk continuous to increase. This study explores the economic burden associated with heat adaptation strategies from the perspective of residents in a coastal urban community in Ghana.

Method: The study employed an exploratory cross-sectional design. We conducted six focus group discussions (FGDs) among 44 purposively selected urban residents of Accra, Ghana. The FGDs were conducted face-to-face in July 2024 using a topic guide developed by the researchers based on literature review and previous research with the community. The data was analyzed using a conceptually guided thematic approach, aided by QSR NVIVO Version 13.

Results: The FGDs involved 24 males and 20 females. The average age of the participants was 48 years. 36.4% of the participants were traders, 11.4% were artisans, 18.1% were engaged in other work activities and 34.1% were unemployed/retired. All study participants reported high economic burden associated with extreme heat adaptations and productivity loses. Overall, five themes emerged from the FGDs. These are: household impact (cost of heat control devices (i.e., air conditioners and fans), electricity bills, increased water consumption, multiple bathing in a day); psychosocial burden (sleeplessness, fatigue, stress, family tension); health impact (cost of medication for headache, elevated blood pressure and skin conditions); security impact (theft resulting from leaving windows and doors ajar at night for ventilation); livelihood impact (productivity loses due to fatigue from sleeplessness). A participant stated, "The gadgets we use to control heat consume a lot of electricity...it drains our finances". For most participants, electricity bills double (up to about US$33.91 per month) during extreme heat seasons. Averagely, these electricity costs are more than two-thirds the average monthly wage [US$49.93] in the community.

Conclusion: Our findings highlight the multifaceted costs contributing to a considerable economic burden of heat adaptation in urban areas of Ghana. Future heat adaptation interventions in urban poor communities should consider cost-effective measures (example, heat absorbent and reflective paints) to mitigate the high costs associated with heat control, and improve ventilation through tree planting within the communities.

Keywords: heat, coping strategies, cost, economic burden, urban, Ghana.

356 TRACK C: Integrating Gender in Health Interventions for Adapting to Extreme Heat in LMICs: A Scoping Review

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Abstract: Background and Objectives: Climate change has increased the frequency of Extreme Heat (EH) events, which are having a disproportionate impact on vulnerable populations, including women, living in low- and middle-income countries (LMICs). Whilst many heat adaptation interventions are described, research on their health impacts remains limited. EH, heat adversely affects women, including adverse pregnancy effects and increased mortality. We aimed to identify community-level heat adaptation interventions that evaluate health outcomes in LMICs and assess the extent to which these interventions incorporated gender considerations in their design.

Methods: We conducted a scoping review using the JBI approach. Four databases (MEDLINE, EMBASE, Global Health, and Scopus) were searched for primary studies describing a community-level heat adaptation intervention that studied at least one human health outcome. We included studies conducted in LMICs (as World Bank classification) that were published in English after 2013. Data on intervention characteristics, target population and health outcomes were extracted. Gender was evaluated using the WHO Gender Responsive Assessment Scale, with each study scored over 5 domains to give an overall rating of either gender unequal (1), gender blind (2), gender-sensitive (3), gender-specific (4), or gender-transformative (5).

Results: Of the 468 studies, five met the inclusion criteria. These studies were conducted in India, Pakistan, Nicaragua, Burkina Faso, and El Salvador, with between 16 to 18 000 participants. The interventions assessed were cool roofing technologies (2 studies), workplace interventions (2 studies), and community education programs (2 studies), with one study describing two interventions. Health outcomes reported included physiological indicators and knowledge, attitudes, and practices related to heat stress. Three of the studies were judged gender blind (score 2), one gender-sensitive (3) and one gender-specific (4). Common themes identified include short intervention durations, reliance on self-reported data, and challenges in sustainability and scalability.

Conclusion: We highlight two critical research gaps: the lack of heat adaptation interventions measuring health outcomes across LMICs and the failure to consider gender-specific approaches in their design. These findings underscore the urgent need for more research and gender-integrated interventions to address heat-related health risks in these vulnerable populations.

205 TRACK C: Advancing and scaling-up Sexual and Reproductive Health Rights/Family Planning for climate adaptation and resilience in Uganda

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Background, Rationale, and Objectives: Climate change exacerbates health vulnerabilities, particularly in Uganda, highlighting the necessity to integrate the delivery of health services into climate action. This study aimed to generate recommendations and actions for influencing policy and practice for institutionalizing and scaling up Sexual and Reproductive Health and Rights (SRHR) and Family Planning (FP) within climate interventions at national, sub-national, local, and community levels in Uganda.

Methods: The study utilized a mixed-methods approach. It encompassed a review of policy frameworks related to climate action and SRHR/FP to identify opportunities and barriers for integrating the two. This was followed by stakeholder engagements through key informant interviews, focus group discussions (FGDs), and validation workshops. Overall, 44 key informants (i.e., 26 men and 18 females), and 321 community representatives (109 women and 122 men; 49 boys and 41 girls) from Buikwe District participated in the study.

Results: Uganda's policy and legal framework outlines strategies for addressing SRHR/FP and climate action. However, interventions often occur in isolation, missing opportunities for integrated approaches. This issue is compounded by a lack of understanding among stakeholders about the link between SRHR/FP and climate action. Additionally, Uganda lacked a structured adaptation plan for the health sector, which was crucial for addressing climate change impacts on health. Key community-level issues include indifferent cultural and religious beliefs towards FP/SRH, climate –induced poverty and the need to longer distances to look for

resources leading to gender based violence, malnutrition due to food insecurity increasing severity of chronic illnesses like HIV, poor menstrual hygiene practices due to inadequate access to clean water, increase in vector-borne diseases with severe impacts on pregnant women and children, inadequate support for community-based structures like Village Health Teams, and the destruction of essential health infrastructure by heavy rains and flooding, which impedes access to services for rural communities.

Conclusion/Implications: The study underscores the urgent need to institutionalize and scale up SRHR/FP within climate actions to create climate-resilient health systems in Uganda. Key recommendations include engaging stakeholders to improve understanding of the SRHR/FP and climate link, developing a Health National Adaptation Plan, enhancing capacity at all levels for integrated FP/SRH-climate service delivery, investment in climate smart infrastructure, responsive support and facilitation of community-based structures (VHTs), and increasing financial support for these integrated actions.

Key words: climate resilience, health and climate, health national adaptation plan, Sexual and Reproductive Health Rights, policy integration, Uganda

583 TRACK C: Unveiling an Intelligent Malaria Outbreak Warning System for Enhancing Preparedness in the Northern Region of Benin, West Africa

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Background: Malaria constitutes a significant vector-borne diseases that exhibit high sensitivity to climatic variations within the West African region. In Benin, the effective prevention and mitigation of malaria pose considerable challenges, primarily due to the prevailing conditions of poverty and environmental adversities. This study endeavor is to devise an advanced system for early detection and warning of malaria outbreaks in the northern part of Benin, employing monthly time series data pertaining to climatic variables.

Methods: Climate data sourced from METEO-Benin, alongside malaria incidence data procured from the database of the Benin Ministry of health, covering the timeframe of 2009 to 2021, were utilised.

To ascertain the influence of climatic variables on malaria incidence, a structural equation model was applied. Subsequently, an intelligent model for forecasting malaria outbreaks was developed, incorporating support vector machine (SVM), linear regression (LiR), and negative binomial regression (NBiR) algorithms. The most effective predictive model for malaria outbreaks was then employed to establish an intelligent system for warning and forecasting malaria incidence on a monthly basis, utilising the Meteostat platform, an online weather data service provider, in conjunction with the Streamlit framework. This application exhibits responsiveness and compatibility across all web browsers.

Results: Relative humidity and maximal temperature significantly influence malaria incidence in the northern region of Benin. Notably, the SVM regression algorithm emerged as the most accurate, achieving an 82% prediction rate for malaria incidence. Consequently, the intelligent malaria outbreak warning system was successfully devised, enabling the automatic and manual prediction of monthly malaria incidence rates within the districts of northern Benin.

Conclusion: This system serves as a valuable tool for stakeholders and policymakers, facilitating proactive measures to curtail malaria transmission in Benin.

Keywords: Climate change, Malaria, Early warning system, Benin

346 TRACK C: Accessing the value-based impact of optimizing Renewable Energy solution to enhance Public Health Emergency Centers in Nigeria

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Background, Rationale, and Objectives: Public Health Emergency Operations Centers (PHEOCs) in Nigeria are critical for effective preparedness and response to disease outbreaks. However, inconsistent access to sustainable energy hinders their optimal function. Reliable power is

essential to maintain uninterrupted activities, yet many PHEOCs suffer from erratic electricity supply, relying on costly and environmentally harmful generators. Solar energy offers a potential solution by providing continuous power, reducing greenhouse gas emissions, and minimizing operational costs. This study investigates the impact of solar energy installations on the functionality of Nigerian PHEOCs.

Methods: A mixed-methods research design was employed, assessing six PHEOCs in Bauchi, Sokoto, Kaduna, Katsina, Borno, and Yobe states. Quantitative data was obtained from energy monitoring platforms (Outback OpticsRE, Victron Remote Monitoring, and Fronius Solar Web) and analyzed descriptively. Cost savings were compared between generator and solar energy use, incorporating generator maintenance costs. A payback period analysis was conducted. Qualitative data was collected from 46 PHEOC actors across 23 development organizations and analyzed thematically to assess the impact of consistent power supply on emergency preparedness activities.

Results: Renewable energy significantly contributed to consistent power supply, with solar energy accounting for 80% of power in Katsina and 78% in Yobe. Respondents overwhelmingly confirmed the availability and benefits of solar energy. Cost savings were substantial, with an average monthly savings of $2461 in Yobe. CO2 emissions were drastically reduced, with Katsina saving 13,906 kg of CO2 over 11 months. The payback period for solar investment ranged from 19 to 31 months. Consistent power supply improved emergency coordination, data visibility, and planning activities, enhancing PHEOC functionality.

Conclusion/Implications: Solar energy installations have significantly improved power reliability and operational efficiency in Nigerian PHEOCs. This renewable energy solution not only reduces operational costs and CO2 emissions but also enhances emergency preparedness and response capabilities. The study supports the viability of solar energy as a cost-effective and sustainable power source for healthcare facilities in low and middle-income countries, aligning with global health security goals and Sustainable Development Goal 7. Further expansion of solar energy in PHEOCs is recommended to ensure continuous improvement in public health emergency response.

362 TRACK C: The effect of the adoption of climate change adaptation strategies on household dietary diversity in Leribe District, Lesotho

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Malnutrition is persistent challenge in developing countries that include Lesotho. Lesotho is particularly faced with a triple burden of malnutrition – high levels of stunting, micronutrient deficiencies and overweight across all age groups. Malnutrition also presents diet-related non-communicable diseases that compromises health status. Climate change has threatened the sustainability of food production systems among small-scale farmers that are dependent on rain-fed agriculture, which exacerbated malnutrition and food insecurity. Consequently, climate adaptation strategies are critical for farmers to cope with the changing climatic conditions reducing its negative effects on nutrition security, health and wellbeing. The aim of this study was to investigate the effect of the adoption of climate change adaptation strategies by smallholder farmers on household dietary diversity in Lesotho. Dietary diversity has been used in previous studies to indicate micronutrient adequacy in a diet.

The study employed a mixed method design, where questionnaires and interview schedules were used for data collection. The participants of the study included 90 smallholder farmers that adopted climate change adaptation strategies and 15 key informants. Data were analysed using thematic analysis, Pearson's correlation and percentages.

The findings indicate that majority (70%) of the farming households had high dietary diversity (6 to 12 food groups), 26.7% had medium dietary diversity (4 to 5 food groups) and 3.3% had low dietary diversity (6 to 12 food groups). The climate adaptation strategies that were adopted by the majority of the farmers were rainwater harvesting (66.7%), crop rotation (95.6%), permanent soil cover (80%) and planting early (81%). The least adopted strategies were minimum tillage and the use of protective structures that were employed by 26.7% of the famers. The findings further indicated that the adoption of adaptation strategies positively influenced household dietary diversity. The key informants professed a positive effect of the adoption on crop yields, livestock production, food availability, dietary diversity, income generation and resilience to climate related shocks and stress.

The farming households that employ climate change adaptation strategies are likely to have adequate micronutrients and improved health, thus, these strategies need further promotion to increase adoption. A

multisectoral approach to address the impacts of climate change is needed to yield health-sensitive methods. Relevant sectors including agriculture, environment and health need to collaboratively plan and rigorously promote mitigation and adaptation strategies to build resilience of farming households.

16 TRACK C: Augmenting Grassroot Resilience Capabilities to Respond to Climate Related Health Shocks in Uganda.

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Climate change is challenging public health, particularly in vulnerable communities. In Uganda, climatic events like rainstorms, floods, landslides and droughts are increasing public health burdens. While public health interventions have become more collaborative and community grounded, integration of climate resilience is still slow. Emerging interventions are siloed, centralised, inflexible and follow traditional top-down approaches that require de-coupling to strengthen community health systems resilience to climate shocks. This study explored community actions and capabilities to public health shocks due to climate events, and emerging efforts to strengthen local resilience. Data was collected using stakeholder consultations, key informant interviews, focus group discussions and on-site observations in Kasese and Katakwi districts. The interviews were transcribed and subjected to a narrative analysis on community responses to public health burdens and climate resilience. Health outbreaks like cholera, malaria, malnutrition, skin diseases, and stress were associated to climate impacts, particularly floods, drought and landslides. Further, climate change compounds pre-existing socio-economic vulnerabilities, limiting capacities of populations, individuals and households to afford medication and healthy lifestyles. Several grassroot interventions emerged to complement traditional public health actions including; (i)emergency food relief, (ii) risk communication and awareness, (iii)self-help health service delivery, (iv)nature-based health remedies, (v) psychosocial support, and (vi)safe water, sanitation and hygiene(WASH) practices, usually implemented during emergency situations. Besides, temporary refuge, livelihood strengthening through resource sharing and collective shelter reconstruction supports recovery. Local actions are beginning to benefit from multi-stakeholder support and recognition to incrementally foster climate-resilient community health systems. Several actors exist at different scales, encompassing; (a) national/local taskforces, (b)philanthropic/humanitarian agencies, (c)grassroots and (d)civil society organisations. Moreover, new collaborations have been created to synergize community-led efforts, boosting localised evidence-based decision-making processes on; (1)timely disease surveillance, response and communication, (2) Neighbourhood Health Services(NHS), (3)food security, (4)public safety, (5)livelihood diversification, and (6) catchment conservation. Such efforts have culminated into an array of community-based structures and capacities including; (a)Village Health Workers(VHTs), (b)Village Disaster Preparedness Teams(VDPTs), (c) para-social workers, (d)youth/women-led and faith-based organisations, (e)Community Social and Health Volunteers(CSHV) and (f)Micro Catchment Management Committees(MCMCs) to strengthen and sustain preparedness and response to climate-induced health impacts. Communities are empowered to share/exchange knowledges, initiate collaborations, and ignite technologically-laden grassroot initiatives that enhance public health outcomes necessary for building climate resilient community health systems. While grassroot actions are typically optimised under emergency conditions, and adoption into strategic and long-term approaches remaining slow, they open newfound possibilities for more lasting and equitable change for delivering resilient communities and health systems.

7 TRACK C: Passive cooling options plus vector proofing for indoor heat reduction and mosquito control: a pilot study in rural western Kenya

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Introduction: Doors, eaves, and fenestrations facilitate heat transfers between the indoor and outdoor environment. Unfortunately, these also serve as the entry routes for disease-carrying vectors such as mosquitoes. Additionally, these openings are usually not oriented or are disproportionate in size to the indoor environment to achieve meaningful cooling. Vector proofing of these openings has the potential of increasing indoor temperatures hence jeopardizing the comfort of the occupants. We assessed the impact of combining passive cooling options with vector proofing for indoor temperature reduction and mosquito control in Siaya County, western Kenya.

Methodology: Forty houses with mud walls and metal roofs were randomly allocated to one of the four arms; either cool roof, cross ventilation, mat ceiling or control, ten houses per arm. In addition to passive cooling options, the doors, windows and eaves of the houses were screened for vector proofing while control houses remained unmodified. Indoor temperatures were monitored daily using data loggers and mosquito numbers were assessed by indoor light traps collected monthly before and after modification. Community knowledge, attitude, and perception of house modification were assessed using structured questionnaires.

Results: The number of female An. funestus were 67% lower in screened compared to unscreened houses post modification and 6-fold higher before screening. Houses with cool roofs and mat ceilings had significantly lower mean day temperatures compared to the control, RR=0.08: 95%CI (0.04-0.17) and RR=0.35: 95%CI (0.17-0.74) respectively. However, at night, houses with cross ventilation and mat ceiling had significantly higher temperatures compared to control, RR=2.35:95%CI (1.45-3.84) and RR=6.66: 95%CI (4.09-10.85) respectively.

Conclusion: The combinations of cool roofs and vector proofing are effective for the reduction of indoor temperatures and mosquito control in rural African houses. Cross ventilation is prone to user bias as it relies on households keeping their doors and windows open for air circulation and cooling whereas, mat ceilings are effective in keeping indoor temperature low during the day but are relatively warmer at night. Further investigations to assess the impact of the modifications on health outcomes including sleep quality, cardiovascular strain, heat stress and malaria transmission are recommended.

MITIGATION ACTIONS AND THEIR CO-BENEFITS

101 TRACK D: Is the Health Sector Ready to Participate in Climate Change Mitigation?

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A. Introduction and rationale: In July 2024, the Africa Development Bank (AfDB) launched its second Call for Applications for its Climate Action Window, an initiative aimed at providing funds to eligible entities for impactful climate action in Africa. This Call focused on projects aimed at reducing or avoiding the emissions of greenhouse gases or enhancing the sinks that accumulate and store them. Governments, Regional or sub-regional intergovernmental bodies and non-sovereign entities (such as NGOs, Community Based Organizations and UN Agencies) were all eligible to apply. Part of the role of the consultant was to assist the eligible entities to apply for the grants that were available under the call. Six Ministries of Health and three Public Health NGOs were contacted but they all declined to be involved and yet Africa claims to be unable to address health and climate-related challenges due to lack of funds.

B. Aims: The aims of the case study were as follows:

i. Examine the reasons behind the low participation in the call;

ii. Stimulate debate on how the health sector could better position itself to participate in climate change mitigation.

C. Description of the case: This was a qualitative case study with the main sources of data being interviews, document review and observations. The respondents were ministries of health from two countries and three public health NGOs. The summary of the findings was as follows:

i. From Interviews:

a) Ministry of Health 1: "This Call looks like it belongs to Ministry of Agriculture, please contact them and not us" (they dissociated themselves)

b) Ministry of Health 2: "This AfDB, the focal point is Ministry of Finance. Please get in touch with Ministry of Finance" (didn't want to take responsibility)

c) Public Health NGO 1: "We are not eligible to apply" (didn't understand eligibility criteria, which is suggestive of low capacity).

d) Public Health NGO 2: "We will wait for a call on Adaptation. This is mitigation, it is for those who are producing emissions that are leading to climate change. As health, we are not a producer" (they did not understand that health is also a contributor to emissions, another sign of low capacity)

e) Public Health NGO 3: "Deadline is too close for us to apply. We need to consult more widely" (inability to develop a proposal in 2 weeks also suggests lack of another form of capacity)

ii. From document reviews: Strategies and policies such as Malaria IRS safeguards and Medical Waste Management Strategies on focus on human safety and nothing on climate change mitigation.

iii. From observations: There was low interest in the call, which suggests lack of prioritization for climate change and health. There was also difficulties in constructing Theory of Cahnge for the proposal, which suggests low capacity.

D. Recommendations:

i. There is need to sensitize the health sector on their role in climate change, including mitigation;

ii. Health policies and strategies need to mainstream climate change;

iii. There is need to develop capacity on climate change and health.

360 TRACK D: Assessing the Carbon Footprint of Health Facility Service Delivery: A Case Study of Aga Khan Hospital, Mombasa, Kenya

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Introduction: Climate change, driven by human-caused greenhouse gas emissions, is a major threat to the health of this and future generations. Understanding the carbon footprint of healthcare facilities requires direct action to monitor and reduce emissions that are directly from our operations. These emission sources include building energy, electricity use, waste disposal, travel, and the use of carbon intensive medical supplies like anesthesia gases and inhalers. Through monitoring of emission, the data collected in Health Care facilities (HCFs) supports identification of key emission hotspots which, by employing simple, smart, and sustainable measures can reduce their environmental footprint and guide operational and investment action plans to Net Zero.

Aim: The study was conducted to monitor Green House Gas Emissions (GHGe) and identify hotspots in HCFs. The study aim to identify health care service delivery areas that contribute towards GHGe, quantify emissions and identify the hotspots to develop action plan to reduce or offset emission towards Net Zero (NZ).

Description of the study. The study was conducted in the private health facilities operated by Aga Khan Hospital, Mombasa (AKHM). The identification of the key areas of GHGe in health facilities was done through the carbon emission monitoring tool, developed by the Aga Khan development Network (AKDN) and consist of nine emission areas which were used for data collection in the health facilities.

Results: Data collection was done for the period January to December 2023, where AKHM, has recorded 959.81 tons CO2 (tCO2) emissions on service delivery activities, with key hotspots areas as waste, grid electricity, bottled gas, inhalers, and vehicle fuel. This represents an actual reduction of emissions of around 250 tons CO2 (tCO2) against year 2021 baseline (excluding procurement) of 1,209.78 tCO2, representing a 10% reduction in carbon emissions from our health service delivery.

Discussions and Recommendations: Our study utilizes a facility level greenhouse gas measurement tool that has been developed by Aga Khan development Network (AKDN) and widely used by our HCFs in low- and middle-income countries.

The study assesses the GHGe at the HCFs level and uses a bottom-up approach, i.e., actual resource use data on quantities of fuel, energy and other resources consumed and reported by facilities; including specific health care sector emissions such as anesthetic gases and respiratory inhalers that are generated from HCFs.

Through the monitoring data collected under the study, the HCFs can reduce their environmental footprint and develop action plans to NZ by employing simple, smart, and sustainable measures.

Reducing the carbon footprint of health systems is translated in cost savings (such as through energy bills) and reduction in overall damaging health exposures through a reduction in waste and pollution from health care facility operations.

The tool developed in year 2020, is an all-in-one, simple to use tool to calculate carbon footprint. We believe it represents a significant contribution to mitigation efforts, certainly for our own operations, but also for other organizations. Importantly, it can be used for operations other than health and across all countries (high and lower income)

529 TRACK D: Health care's response to climate change: a carbon footprint assessment of three health facilities in Zimbabwe.

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Introduction: Globally, the healthcare sector contributes approximately 5% of total greenhouse gas emissions. Calculating the greenhouse gases generated by healthcare facilities is crucial due to their energy-intensive operations

like waste management, lighting, heating, and cooling. In Zimbabwe, the healthcare system faces challenges with ineffective waste management, outdated equipment, and inefficient electricity use, all of which can harm the environment. Quantifying the carbon footprint of healthcare facilities in Zimbabwe is essential for developing 'carbon-smart' interventions to mitigate the industry's ecological impact while improving quality of care services. This study aims to quantify carbon emissions produced by three public health facilities – one district hospital and two health centres) in rural Zimbabwe and identify emission hotspots.

Methods: We used the Aga Khan Development Network Carbon Management tool Ver1.6 and 1.7 to measure and calculate carbon emissions of one district hospital and two health centres from January 2023 to January 2024. The tool converts readily available data from financial and accounting records into carbon equivalents, which are categorized by resource type and scope. The variables collected include building energy, vehicle fuel, travel, anaesthetic gases, refrigerants, water, waste, inhalers, construction materials, contractor logistics, and supply chain.

Results: In 2023, emissions from three public health facilities totaled 223 metric tonnes of carbon dioxide equivalent. The breakdown includes 34.7% from grid electricity, 22.8% from owned vehicle travel, 10.6% from refrigerants, 9.7% from the supply chain, 5.1% each from building energy and onsite waste incineration. Business travel accounted for 5.2%, inhalers 4.1%, anaesthetic gases 1.8%, and contractors' logistics 0.8%. Additionally, approximately 1,764,300 litres of water were used.

Implications: The study will enhance understanding of public healthcare facilities' carbon footprint in Zimbabwe, showing lower emissions compared to the private sector. Decentralizing renewable energy sources, like solar-powered photovoltaics, can boost climate resilience and environmental sustainability. Raising awareness among patients and visitors on water conservation, utilizing rainwater for toilets and plants, is vital for water conservation during shortages. Overall, this research supports national and global initiatives to monitor healthcare's impact on climate change, leading to improved patient care and cost savings.

480 TRACK D: Lessons Learned from Carbon Emissions Data Collection at Three Healthcare Facilities in a South African District

Mrs Celeste Madondo[1], Ms Refilwe Lamola[1], Ms Khudu Segane[1], Ms Mmagotso Kola[1], Mr Nkanyiso Buthelezi[1], Ms Nwabisa Siko[1], Mr Otsile Lekabe[1], Mr Craig Parker[2], Ms Lebohang Radebe[1], Dr Gloria Maimela[1]

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Introduction: Climate change poses a significant threat to global health, with its impacts in Sub-Saharan Africa being particularly under-researched. Despite being the lowest emitter of greenhouse gases, sub-Saharan Africa is disproportionally affected by climate change. The healthcare sector has been reported to contribute to 4-5% of total carbon emissions (CE). We measured the carbon footprint of three public healthcare facilities in Tshwane District, South Africa to inform mitigation interventions

Methods: The Excel-based Aga Khan Development Network's (AKDN) Carbon Management Tool was used to estimate baseline CE in three facilities that were selected because they are located in the region that has experienced an increased frequency and intensity of extreme weather events due to climate change. Over a six month period, the tool assessed CE from seven sources: liquid fuel, grid electricity, vehicle fuel, vehicle distance, waste, inhalers, and anesthetic gases. CE estimates are based on the type and quality of data available, ranging from meter readings or delivery records (high quality data), supplier bills (medium quality data), or from estimates or imputation from the previous quarter (low quality data). Data were collected retrospectively by CE Health Monitors, a new cadre of Health Worker. Critically, accurate and timely data collection relied on engagement and input provided by facility and district staff from the Department of Health responsible for fleet, pharmacy, procurement, and waste management. We present and discuss various key insights associated with collecting carbon emission data in the public health settings.

Results: Continuous stakeholder engagement and effective communication were critical for obtaining relevant data. The AKDN Tool collects sensitive data, and initial reluctance from management stemmed from concerns over potential misuse of data and revealing expenditure reports. This was resolved by the gradual building of trust. Procurement of certain goods and services occurred at senior sub-district decision making levels, which required additional approvals to access the data. Cost estimation for electricity and water consumption was complicated by the absence, unknown location, or removal of electricity meter boxes and

underground installation of water meters, resulting in the absence of actual consumption readings. Where possible, data for all unreachable sources was estimated using monthly expenditure data or estimated based on prior readings. Medical waste data was not received promptly and was completed inconsistently, while general waste was not weighed and total disposal had to be estimated. Records for vehicle fuel consumption were readily available, while liquid fuel consumption was consistently incomplete or unavailable. Overall, data collection relied heavily on estimates with strict validation rules and thorough narrative explanations to support decision-making.

Conclusion: Efforts to improve the accuracy of source data to estimate carbon emissions in the health sector is critical. Continuous and transparent communication with stakeholders is crucial to build trust and alleviate fears about data sharing. Raising awareness and building local capacity about the purpose and benefits of tracking carbon emission data over time and improving facility-level data standardization, accessibility, and consistency is essential for accurate emissions calculations.

262 TRACK D: Using geospatial technology for monitoring carbon offsetting: Ongoing study at a Global Health Research Institution

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Background, Rationale, and Objectives: Concerns about institutional carbon emissions are increasing, driven by the need for transparency in reporting and mitigation commitments. The Paris Agreement on Climate Change has prompted some countries to enforce institutional reporting of carbon emissions and mitigation actions. Emitters can mitigate their emissions by adopting low-emission technologies or investing in offsetting programs. In 2022, the Malawi Liverpool Wellcome Programme invested in a carbon offsetting program involving tree planting on Mulanje Mountain. This study investigates the potential use of drone imagery for monitoring these trees and estimating their carbon storage potential.

Methods: We conducted field surveys using transects to assess tree survival, collecting data with KoboCollect. Field-level pictures of the transects were captured to aid in the identification of vegetation species, which is being conducted by a professional ecologist. Drone images of the planted trees were collected using a DJI Mavic 3M, capturing both optical and multispectral reflectance (infrared and near-infrared). The images were processed with OpenDroneMap to produce a seamless orthomosaic map and a 3-D model of the planting plot. We are training an automatic classifier to identify the planted trees and invasive species from the drone imagery.

Results: Field-based monitoring revealed 73 planting stations, with 39 stations having surviving trees, representing a 54% survival rate. The monitored vegetation included grown trees, shrubs, pine trees, weeds, grass, and other invasive species. Drone images from two sites have been processed, and efforts are underway to annotate the data to identify tree planting stations and surviving cedar trees to quantify tree survival.

Conclusions and Implications: The ongoing study has the potential to enhance the transparency of offsetting programs, particularly tree-planting campaigns. Once the classification model is finalized, it will improve field-based tree monitoring, providing rapid insights into tree survival and facilitating appropriate compensation or replacement actions. Future efforts will focus on estimating the carbon storage potential of the trees.

ETHICS AND CLIMATE RESEARCH EQUITY

189 TRACK E: Climate change and extreme weather pathology in Senegal: a public problem?

Dr Abdoulaye Moussa Diallo[1]

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Background, rationale and objectives: Climate change (CC) is the cause of numerous crises, including in the healthcare sector. These occur either continuously and cumulatively (flooding, water stagnation, breeding grounds), or discontinuously and periodically (extreme heat, thermal illnesses, re-emergence of infectious diseases), but always with renewed negative impacts on the health of populations. The pathologies caused by extreme temperatures are perceived by the stakeholders in the healthcare system as health problems with little institutionalisation. People and professionals therefore resort to self-care practices and professional self-protection to preserve their health in heatwave zones, in addition to the lack of support from health policies. Beyond the unfavourable environmental factor, these human behaviours are obstructing the success of existing health programmes. The question, then, is why are heat-related illnesses not raised to the level of public health problems?

Methods: Using a socio-anthropological field survey, this study aims to verify this situation by means of empirical data collected during a case study in the Matam health district in northern Senegal. The sample size was determined by a saturation threshold where n=165 individuals. The main tools used were semi-structured interviews, informal interviews, focus group discussions, direct observation and ethnography. Press articles (public and private) and quantitative health data were also used to provide information on the evolution of the national debate on extreme temperatures and on data on neglected thermal pathologies (NThP). We used a framework for analysing public policy construction processes based on the concepts of emergence, publicisation, formulation and mobilisation.

Results: The results indicate that local actors are developing resilience strategies in the face of political inaction on the management of NThP diseases: construction of Nubian vault health establishments to combat the heat, air-conditioning equipment for health posts by health development committees, family mobilisation to protect vulnerable people, recourse to care at late hours. Despite these local initiatives, CC-related illnesses, which are long-term, are still not sufficiently regarded as an emergency requiring specific health interventions, as is the case in other countries. The impact of the national health programmes that have already been put in place is hampered by the fact that people and health professionals do not take individual responsibility for these diseases. The status quo (invisibility, ignorance and inaction) of political action in relation to thermal diseases (by the population and healthcare professionals) therefore accentuates disparities in access to healthcare in a context of universal health coverage.

Conclusions/implications: The effects of climate are a 'new' multiplier of social, health and even economic inequalities between populations. Establishing NThP as a public health problem will help to combat therapeutic migration, both among the population and among health professionals.

307 TRACK E: A Scoping Review of the Influence of Environmental Exposures on Health Outcomes in Kenya.

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Background: The convergence of increasing extreme weather events and rising awareness of attributable anthropogenic contributions to climate change has sharpened global attention to the impact of the environment on human health, most recently culminating in the Climate and Health Declaration at the 28th Conference of the Parties. This is particularly evident in Sub-Saharan Africa which experiences adverse effects

of climate change, despite nominal contributions to global greenhouse gas emissions. Kenya is highly susceptible to climate change due to its varied topography, diverse climatic zones, and reliance on natural resources.

Rationale: Various environmental exposures (EE) including weather, hydrometeorological hazards and air pollution pose risks to Kenya's social development gains due to their influence on human health. However, these causal relationships have not been clearly defined in Kenya potentially limiting climate change detection and attribution research for health impacts, with implications for the development of evidence-informed climate change and health policy. To better understand the state of environmental health research, a comprehensive synthesis of published output on the influence of EE on health outcomes (HO) in Kenya was undertaken with the following specific objectives:

- To undertake a scoping review of literature on relationships between EE and HO;
- To map the links between these exposures and climate-sensitive HO and health equity through bibliometric analysis, topic mapping and narrative synthesis;
- To identify knowledge gaps and future research opportunities to strengthen the evidence base underpinning climate change and health (CCH) attribution for policy development.

Methods: Compliant with a pre-registered protocol, nine bibliographic databases and grey literature sources were searched for articles published from 2000-2023. Two-stage screening was conducted on 17,394 articles; 635 full-texts were screened in duplicate. A final 353 articles underwent data extraction for topic categorization, bibliometric analysis, and narrative summary.

Results: The main study designs employed in environmental health research in Kenya are observational (60%) and modelling studies (18%). Rainfall, seasonality, and habitat change are the most studied environmental exposures while vector borne diseases (particularly malaria), health-equity related outcomes, and water borne diseases are the most frequently studied health outcomes. The least studied environmental exposures are injury or death(n=10), mental health conditions(n=7) and heat exposure(n=7). Geographical disparities in prioritized health outcomes exist in Kenya, which reflects the diversity of climatic zones. Most literature in this review was published by collaborations of international authors and supported by international funders, raising questions about inequities in global health research and funding structures in Kenya particularly given the prominence of Kenyan actors in CCH research in Africa.

Conclusion and Implications: This review provides a baseline analysis of the scale and scope of evidence describing environmental impacts on health in Kenya. Greater attention is needed on vulnerable groups, geographical disparities in research and complex relationships between environmental determinants and less frequently studied HO to ensure equity of the growing research. Targeted capacity building, funding reform and enhanced support for local and regional institutional networks are necessary steps to build the evidence base and safeguard population health in the face of Kenya's changing climate.

120 TRACK E: The role of masculinity and feminityconstructs in shaping public discourse onclimate change denial and acceptance

Mr Juan Pierre, Mrs Zakiyyah Mungroo, Mr Shayan Tupsee

Kindly find attached the Full Paper: https://drive.google.com/file/d/1IxRwcwFV0vaXxGE6aZ-CVJ0wRjthhoR1/view?usp=sharing

Introduction: This research gives a detailed analysis of how gender influences climate change perception and actions across the globe. The conclusions demonstrate that gender remains a critical factor that should be taken into consideration in climate policy and communication. The findings of the study offer new knowledge on the experiences of non-binary and LGBTQ+ people concerning climate change and stress the need for inclusive climate justice. Findings suggest that future interventions should take into account cultural factors and that there is an opportunity for the concept of ecological masculinities to be used in the engagement of various communities in climate change interventions.

Background: The attitudes and behaviors pertaining to climate change are often biologically determined by the gender of the individual, although this relationship has not been explored widely, especially from an intersectional perspective. The objective of this research was to understand the ways in which gender and sexuality influence climate change perceptions, actions, and risks in different parts of the world.

Methods: In this study, both qualitative interviews with 40 participants and a large scale quantitative survey with 1000 participants from different countries were used. The research proposed and assessed new measures: the Gender-Environment Association Scale and the Queer Climate Perspective Scale. The data were analyzed through thematic analysis, structural equation modeling, and multilevel modeling in order to examine the intersectionality.

Results: The results of the study showed that there is a moderate effect size and the climate change concern and pro-environmental behavior are significantly different between males and females (d=0. 46, p<0. 001), where females are more concerned. Conner and Josephs' (2015) masculinity scale, traditional masculinity, was significantly and negatively related to climate change belief (r=-0. 32, p<0. 001) and policy support (r=-0. 28, p<0. 001). The differences in the knowledge and concern about climate across the regions were statistically significant (η^2=0. 086, p<0. 001); knowledge was higher in the developed regions but concern was lower.

The research established a knowledge-practice gap especially in the developing world with a correlation of 0.21 in Africa. Gender norms were in the model to a significant extent for climate attitudes (β=0. 23, p<0. 001) and climate behaviors (β=0. 19, p<0. 001). Intersectional approach showed that each of the identified groups faced multiple disadvantages. The results of the media representation analysis revealed that the narratives that are coded as masculine were dominant, which in turn, had a negative effect on climate concern (β=-0. 18, p<0. 001).

Conclusion: The conclusions demonstrate that gender remains a critical factor that should be taken into consideration in climate policy and communication. The findings of the study offer new knowledge on the experiences of non-binary and LGBTQ+ people concerning climate change and stress the need for inclusive climate justice. Findings suggest that future interventions should take into account cultural factors and that there is an opportunity for the concept of ecological masculinities to be used in the engagement of various communities in climate change interventions.

172 TRACK E: Health Equity and Environmental Justice: Intersecting Rights in Practice

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Background: Over the years, health equity and environmental justice have captured the eye of Public Health circles. Pertinent studies show that low-income households and minority communities and groups face a huge existence of environmental hazards disproportionately leading to adverse health effects. This study intends to unearth these inequities and injustices with an aim of bridging them.

Methods: A mixed methods approach was employed from May to August 2023 in Homa Bay, Kenya. Systematic random sampling was used to achieve a sample of 300 participants living in Ndhiwa Sub- County, in rural Homa Bay. Interviews were used to collect qualitative data which was analyzed thematically while questionnaires were used to capture quantitative data that followed descriptive analysis. All ethical considerations of the study were maintained during the whole study period.

Results: The socio-economic status including low household income, low education level and inaccessibility to healthcare services were found to negatively influence health outcomes presenting with high morbidity rates in the community. Environmental exposure such as poor indoor air quality, contaminated drinking water, inadequate sanitation and occupational exposures resulted in chronic diseases more so in low-class individuals. Of the total sample, 21% had access to standard infrastructure, 33% to open parks and 44% had access to public health services. Access to integrated health services such as nutrition, reproductive health and other preventive services was at 32.3%

Conclusion: The consequences of this study depict the gaps and inequalities in healthcare where marginalized groups are presenting with terminal and chronic conditions. Policy proposals and reviews promoting health equity to improve stakeholders' participation and encourage local action and environmental activism should be incorporated. These policies should also strive to explain the link between health equity and environmental justice that comes from the essence of sustainable and equitable development goals from the bottom.

173 TRACK E: Bridging Equity Gaps: Ethical Climate and Health Research in Kenya

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Background, Rationale, and Objectives: In Kenya, the ethical dimensions of climate change and health research present critical challenges, particularly regarding equity and justice. Marginalised communities, which are disproportionately affected by climate impacts, are often underrepresented in research initiatives. This study explores ethical issues in climate and health research in Kenya, focusing on consent processes, community engagement, equitable resource distribution, and the incorporation of indigenous knowledge systems.

Methods: This study utilised a secondary research method, specifically desk research, involving collecting and analysing existing data from online sources. This included a comprehensive review of academic journals,

policy documents, reports from governmental and non-governmental organisations, and other relevant literature. The qualitative component involved thematic analysis of online interviews, case studies, and expert commentaries on ethical practices in climate and health research. Quantitative data were derived from publicly available surveys and statistical reports to assess patterns in community involvement and benefit distribution. Data analysis focused on identifying key themes and correlations related to equity, justice, and inclusivity in climate research practices in Kenya.

Results: Preliminary findings indicate significant disparities in community engagement and benefit-sharing in climate research across Kenya. Marginalised communities often report limited involvement in the research process, with consent procedures frequently lacking transparency and cultural sensitivity. Additionally, research benefits, such as health interventions and policy changes, tend to favour more affluent communities, exacerbating existing inequalities. The integration of indigenous knowledge systems into research remains minimal, reducing the potential for culturally relevant and effective outcomes.

Conclusion/Implications: This study highlights the urgent need for ethical frameworks in climate and health research that prioritise justice, inclusivity, and equitable benefit distribution. Recommendations include developing robust consent processes that respect cultural contexts, enhancing community engagement strategies, and integrating indigenous knowledge into research methodologies. Promoting active participation and leadership of African researchers is crucial for decolonising climate research and achieving health equity. Implementing these ethical considerations can lead to more just and effective research outcomes, ultimately fostering resilience and well-being in Kenyan communities impacted by climate change.

411 TRACK E: The Climate Divide: Assessing the Health Implications of Climate Policies on Vulnerable Populations in Africa

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Climate change poses significant health risks to vulnerable populations in Africa, exacerbating existing disparities and creating a "climate divide." This paper investigates the health implications of climate policies on vulnerable populations in the African continent. Through a comprehensive literature review and case study analysis, the paper assesses the effectiveness of current climate policies in mitigating health risks and promoting resilience among vulnerable groups including women, children, elderly, and marginalized communities. The literature review identified relevant studies and policies such as the Climate Change Act in Kenya, Law No. 2018-18 in Benin, and Zimbabwe's National Climate Policy. Qualitative analysis examined the policies' objectives, implementation strategies, and ethical considerations on equity, health and social justice. Quantitative analysis involving health indicators and epidemiological data measured the impact of policies on health outcomes, using statistical methods to compare differences across demographic groups in those countries. The findings indicate varying levels of policy effectiveness in mitigating health risks among vulnerable populations. Specific impacts include changes in disease prevalence due to enforcement of measures against pollution, meaningful engagement in climate decision-making processes, and community resilience to climate-related hazards. Ethical considerations highlight disparities in policy implementation and resource allocation, underscoring the need for tailored and inclusive climate policies that prioritize health equity and resilience among vulnerable populations in Africa. The paper recommends include strengthening community engagement, integrating indigenous knowledge systems, and enhancing cross-sectoral collaboration to address health disparities exacerbated by climate change. By bridging the climate divide through equitable policy interventions, the paper aims to promote sustainable development and improve health outcomes for all African communities.

POSTER PRESENTATIONS

TRACK A: PATHOPHYSIOLOGY AND BIOLOGICAL MECHANISMS

415 TRACK A: Evaluating the Pathophysiological Mechanisms of Acute and Chronic Heat Stress on Maternal and Fetal Health

Dr Yahaya Idris[1], Assistant Professor Ana Bonell[1], Professor Andrew Prentice[1], Associate Professor Bubacarr Bah[1], Dr Leonidas Ionnaou[2], Professor Andreas Flouris[2], Professor Amanda Sferruzzi-Perri[3]

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Background: The majority of people at risk of extreme heat live in tropical regions, primarily due to the high proportion of people working outdoors in manual agricultural activities. West Africa suffers extreme heat in addition to the compounding impacts of food insecurity, vector-borne diseases, and water scarcity/flooding from climate change.

Rationale: Heat exposure in pregnancy- Maternal heat exposure increases the risk of multiple adverse pregnancy outcomes: congenital abnormalities, stillbirth, preterm birth, low birth weight, pre-eclampsia and premature rupture of the membrane. However, the pathophysiological mechanisms driving these adverse outcomes remain unknown. We aim to evaluate the physiological and biochemical changes that occur in pregnancy due to heat stress.

Hypothesised acute pathways are visualised in Figure 1 (Figure to be attached in poster presentation)

Key Objectives

1. Map heat stress exposure in the cohort and understand what geographical, social and community factors increase the risk of extreme heat exposure.
2. Evaluate the impact of heat stress exposure on maternal 3.
3. health, to include heat strain, subjective psychological well-being, sleep and activity level.
4. Evaluate how heat stress impacts placental structure and function.
5. Evaluate how chronic heat exposure impacts birth outcomes.
6. Explore epigenetic changes in the placenta and infant by heat stress exposure per trimester.

Methods

We will conduct a prospective observational cohort study of pregnant women who live in two regions of The Gambia - Brikama in West Coast Region (coastal region) and in and around Basse in Central River Region (inland region). This will utilize the temperature gradient that occurs within The Gambia as visualized in Figure 2 (to be attached in poster presentation) and include participants from both urban and rural areas. We will collect regular data on the main drivers of seasonal differences in birth outcomes in order to disentangle the impact of heat stress from other seasonal drivers, for example food security and infectious disease episodes which may be both climatically influenced.

Study Procedures

1. Deployment of multiple environmental monitoring devices in the areas of recruitment.
2. Early ultrasound scans (USS) of all potential participants to ensure accurate gestational age dating.
3. Monthly questionnaires on well-being, sleep, food and water security and recent illness.
4. Intensive observation at weeks 28 and 35 with wearable devices and directly observed task diary.
5. Repeated USS and umbilical artery doppler at weeks 28 and 35.
6. Maternal circulating placental hormones at week 28 gestation.
7. Birth outcome data collection.
8. Placenta and cord blood samples collected at delivery.
9. Neonatal anthropometry at birth.
10. Neuro-behavioural assessment scale at 3-4 weeks of life.
11. Placental histology examination by robust unbiased stereology.
12. Placental and infant sample epigenetic analysis.

320 TRACK A: Climate change and Renal Health: Unmasking the relationship between environmental changes and renal health

Miss Mubinat Lawal[1,2,3], Mr Yusuf Al-awal[4]

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Background: Kidney disease is one of the most neglected chronic diseases despite it being estimated to become the fifth leading cause of death globally by 2040.

One of the pressing challenges facing the world is the increasing impact of climate change on the environment and in turn its impact on human health. Consequences of climate-related changes range from extreme heat exposure leading to dehydration and volume loss, food security, extreme weather events, and even water scarcity leading to the emergence of chronic kidney diseases.

This study investigates the intricate relationship between environmental changes driven by climate shifts and renal health.

Methods: This study painstakingly employed a concrete and comprehensive review of studies using epidemiological data, hospital records, and computational modeling to unravel the relationship between environmental changes and their effects on kidney health.

Results: This study reveals that increasing global temperatures, extreme weather events, and altered precipitation patterns associated with climate change impact water availability, heat stress, and dehydration. These factors directly influence renal function, exacerbating conditions such as acute kidney injury and other chronic kidney diseases. Many toxins are eliminated primarily by the kidneys due to their concentration and secretion capabilities. When dehydrated, these toxins can accumulate in the kidneys to dangerous levels, raising the risk of kidney damage. Dehydration not only increases the risk of acute kidney injury, but it also increases the likelihood of obesity and insulin resistance, which exacerbate the risk of chronic kidney disease.

Conclusion: As some degree of continued climate change is inevitable, People who live in developing nations with inadequate healthcare systems are likely to bear a disproportionately heavy cost of environmental change's effects on renal health therefore nephrologists must prepare for changes in disease patterns and assist in formulating policies and other measures to help vulnerable populations adapt. Safeguarding renal health in the face of climate challenges requires interdisciplinary efforts. By unmasking the intricate relationship between environmental shifts and the renal system, we can mitigate the impact and protect human well-being.

515 Les maladies phytopathologie et mécanisme biologique

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Les phénomènes de la variation climatique peuvent influencer divers aspects de la santé humaine, animale et végétale en exacerbant les maladies existantes ou en provoquant de nouvelles formes des maladies. Voici un résumé des maladies physiopathologiques et des mécanismes biologiques causés par les phénomènes climatiques aux Comores:

1. Dans le cas de la Tuberculose et par le retard de l'actualisation des données sur la santé humaine ; le coordinateur national du PNLT (Plan National de la lutte contre le Tabac) avait déclaré que le pays a enregistré 126 cas de tuberculose en 2020 dont 70% identifiés sur l'île de grande-Comore, 20% à Anjouan et 10% à Mohéli.

2. Le cas de la Typhoïde on a puis contesté que le niveau d'incidence est entre 30 à 99 cas/1000habitants/année.

3. Le cas de la paludisme qui est une maladie de long date; un chiffre croissante de 10547 cas pour une population de 921000.

4. Autres maladie comme le choléra, rougeole, Influenza, leishmaniose viscérale, Hépatite À et Hépatite B, chikungunya et autres se trouve dans les territoires de l'union des Comores. Mais par manque de temps pour élaborer de manière plus explicatifs, moi SAMIR Ali on m'a transmis ce lien le 07 Août 2024 à 16h.

Par conclusion, les maladies ici aux Comores sont accentués en raison des fortes pluies et inondations qui a eu lieu entre le mois de Mars à juin 2024.

19 TRACK B: Natural Disaster Exposure and Polytrauma Among Urban Somali Refugees: Implications for Mental Health

Dr Hyojin Im[1]

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Background: Somalia, characterized by persistent complex emergencies stemming from civil conflict and natural disasters, has driven millions into displacement, exacerbating vulnerabilities to health and mental health challenges. Somali refugees, particularly in urban settings like Eastleigh, Kenya, face compounded risks from polytrauma—a consequence of multiple traumatic events including violence, displacement, and the increasing impact of natural disasters. This study aims to explore the nuanced impact of exposure to natural disasters on Somali refugees with a history of polytrauma in urban Kenya.

Methods: A cross-sectional survey methodology was employed, targeting Somali refugee youth residing in Eastleigh, Kenya. Participants aged 15-35 were recruited using snowball sampling to ensure diversity across demographic profiles. Validated measures were used to assess trauma exposure across pre-migration, post-migration, family, and individual domains, along with psychosocial factors and social functioning. The survey instruments were translated into Somali to facilitate comprehension and cultural relevance. Data analysis encompassed descriptive statistics, bivariate tests, and multiple linear regression to identify significant predictors of social functioning.

Results: Among the 336 participants, 26.2% reported exposure to natural disasters, which significantly correlated with higher levels of trauma across multiple domains compared to non-exposed counterparts. Bivariate analyses revealed significant associations between natural disaster exposure and increased trauma in pre-migration (e.g., forced displacement, refugee camp experiences), post-migration (e.g., violence exposure, arrest), family (e.g., domestic violence, child abuse), and individual (e.g., sexual abuse, accidents) domains. Multiple linear regression highlighted gender, documentation status, substance use, help-seeking behaviors, and natural disaster exposure as significant predictors of social functioning. Specifically, exposure to natural disasters was associated with poorer social functioning outcomes, underscoring its detrimental impact on mental health within polytraumatized refugee populations.

Conclusion/Implications: This study underscores the profound and multifaceted impact of natural disasters on Somali refugees already burdened by polytrauma. The findings underscore the urgent need for trauma-informed interventions tailored to the specific needs of displaced populations, focusing on enhancing social support networks, fostering community resilience, and promoting mental health well-being. By elucidating the complex interplay between natural disasters and polytrauma, this research contributes critical insights to inform targeted interventions and policies aimed at promoting resilience and mitigating the adverse effects of disasters on mental health among Somali refugees in urban displacement settings.

71 TRACK B: Psychological Challenges Experienced by Rural Women due to Climate Change in Chimanimani, Zimbabwe.

Dr Rosemary Chigevenga[1], Miss Tatenda Dutiro[2]

[1]*Oxford Brookes University, Oxford, United Kingdom,* [2]*Great Zimbabwe University, Masvingo, Zimbabwe*

Background, rationale, and objectives: Women's vulnerability to climate change impacts can be attributed to gender inequality, social, economic and cultural values. Rural women are the most affected by climate change as they are found to interact more with the environment for their survival. In most parts of rural Zimbabwe, women rely on farming and gardening hence climate change negatively affect their survival due to food insecurity. The study explored the psychological challenges experienced by rural women in Zimbabwe due to the adverse outcomes of climate change. The major research question centred on unearthing how climate change affects the psychological wellbeing of rural women in Zimbabwe.

Methods: The study employed a qualitative research approach, utilising a case study design to explore the experiences of women in Nyanyadzi Ward 8 Chimanimani District. Ten participants including a key informant were selected using purposive and convenience sampling methods to ensure diversity in the sample. Data was collected through semi-structured interviews featuring open-ended questions and supplemented with note-taking. Ethical considerations, including honesty, truthfulness, and integrity, were maintained throughout the research process.

Results: Thematic analysis was employed to analyse and present the collected data and two themes were revealed; 1) Vulnerability and exposure of women to the effects of climate change and 2) The psychological challenges experienced by women due to climate change. The findings underscore the urgent need for holistic support systems and interventions that recognise and address the psychological well-being of women in rural areas affected by climate change.

Conclusion/Implications: The study emphasises the importance of integrating gender-sensitive approaches and climate education initiatives to promote resilience, gender equity, and sustainable development in rural communities. The research outcomes influence the work of policymakers, practitioners, and researchers specialising in climate change adaptation, gender equality, and mental health. The recommendations put forth in this paper provide valuable insights and guidance for implementing initiatives that empower rural women, enhance their mental well-being, and promote gender-responsive climate action.

Keywords: climate change, psychological wellbeing, resilience, gender norms

Disclosure of interest: The authors declare no conflict of interest.

115 TRACK B: Effects of heat exposure on risk of all-cause mortality in the under-fives in countries in Africa: a pooled time-series analysis

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Background: Though many of the leading causes of death in children under-five are linked to climate change and extreme heat, few studies have examined these impacts in detail. Therefore, we explored the association of heat on all-cause mortality for neonates, and children under-five in different parts of Africa.

Methods: In this study, we obtained monthly counts of neonate (1 to 28 days), postnatal (28 days to 1 years old) and child (1 years old to 5 years old) mortality across 13 sub-Saharan African countries, from the INDEPTH network Health and Demographic Surveillance Sites (HDSS) consolidated dataset ranging from 1993 until 2016. We obtained data for monthly mean and daily max of the international heat metric Wet Bulb Globe temperature calculated from reanalysis data ERA5. We carried out pooled time series regression using distributed-lag nonlinear models (lag 0-3 months) for a whole year and for the hottest season defined for each climate region.

Results: The average child (1 to 5 years old) mortality rate across regions from the HDSS sites was 5.65 (Range: 9.2, 2.4) (deaths per 1000 live births). Relative risk response of mortality rates to heat exposure differed by age group, climate region and season. For all-cause child (1 years of age to 5 years of age) mortality, we observed an increased odds of mortality with increased heat exposure between the 50th and the 95th percentile in Eastern Africa (relative risk 1.27 (1.19,1.36 95%CI)) and for the Gambia and Senegal together (relative risk 1.11 (1.04,1.18 95% CI)).

Conclusions: Our results showed the influence of extreme heat on mortality risk varies by age group, region and seasons. Prevention strategies for leading seasonal causes of death could also reduce the influence of heat.

143 TRACK B: Extreme precipitation events and facility-based births: An analysis of 21 sub-Saharan African countries

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Background: While the impact of climate change on health outcomes is increasingly recognized, the specific effects of Extreme Precipitation Events (EPEs) on the decision-making process for facility-based births remain underexplored. This study investigates the effect of EPEs on birth location decisions in Sub-Saharan Africa (SSA), considering the potential barriers imposed by such events on geographical access to healthcare facilities.

Methods: We combined nationally representative survey data collected between 2015 and 2021 from the Demographic and Health Surveys (DHS) for 21 SSA countries with high-resolution precipitation data (from the Climate Hazards Group InfraRed Precipitation with Station dataset) to identify EPEs. We considered a three-day exposure window around each date of birth to assess the immediate impact of EPEs on the choice of birth setting. We investigated effect heterogeneity across various factors, including sociodemographic status, travel time and route options that might influence health-seeking behavior incentive.

Findings: Our analysis reveals that an additional day of EPE exposure significantly reduced the likelihood of facility-based births by -6.577 facility-based births per 1000 live births (95% CI -12.301 to -0.852; a 0.999% decrease of the sample mean baseline). This reduction is attributed to diminished geographical accessibility and heightened transportation challenges. The result highlights a pronounced vulnerability in regions with inadequate road infrastructure, where EPEs can pose a barrier to accessing maternal healthcare services.

Interpretation: Our findings emphasize the critical need to incorporate climate resilience into healthcare planning and infrastructure development across SSA. Ensuring a continuous geographical accessibility to healthcare facilities during EPEs is essential to safeguard maternal and newborn health against the challenges posed by these extreme weather events.

153 TRACK B: Health Impact Assessment of Particulate Pollutants in Traffic Congested Areas of Zaria Metropolis, Kaduna State, Nigeria

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The increasing concentration of particulate pollutants at major nodal points in Zaria Metropolis has significant implications for public health, particularly as traffic volumes rise. This study measured particulate matter (PM) concentrations and meteorological data at key locations: Kwangila, PZ, Kasua Mata, Agoro, and Kofar Doka. Using a particle counter, we recorded PM concentrations for different particle sizes (P0.3, P0.5, P1.0, P2.5, and P5.0) during three-hour sessions in the morning peak hours (7:00-10:00 AM), afternoon off-peak hours (11:00 AM-2:00 PM), and evening peak hours (4:00-7:00 PM) over one month. Traffic volumes were concurrently monitored, revealing that the average traffic volume during morning peaks ranged from 2701-3060 vehicles and evening peaks from 2676-3651 vehicles. Afternoon off-peak volumes ranged from 1777-2255 vehicles, with Kwangila recording the highest volumes in both peak and off-peak periods.

Our analysis showed a direct correlation between increased traffic density and higher concentrations of particulate matter across all periods. The P2.5 measurements were compared against Air Quality Index (AQI) standards, revealing critical health risks. During peak hours, air quality at Kwangila, Kasua Mata, and Agoro was classified as unhealthy to hazardous, posing severe health risks to the general population, including increased respiratory and cardiovascular issues. PZ and Kofar Doka recorded levels unhealthy for individuals with pre-existing heart and lung conditions, potentially exacerbating these diseases. During off-peak hours, PM concentrations at all sites were classified as moderate and safe according to AQI standards, though long-term exposure still poses health concerns.

Given these findings, it is crucial to enhance public transportation to reduce greenhouse gas emissions and improve air quality. Promoting non-motorized transportation and planting trees along major roads can further mitigate pollutant levels. Additionally, phasing out older vehicles, which tend to emit more pollutants, will significantly improve air quality and public health. Implementing these measures will help safeguard the health of Zaria's residents by ensuring cleaner air and reducing the risk of pollution-related health issues, such as asthma, bronchitis, and cardiovascular diseases.

177 TRACK B: Rural women and coping with extreme heat in South-Western Zimbabwe: Livelihoods, water and energy and implications to health and well-being.

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The paper considers the health and well-being implications of rural women's exposure and coping strategies in the context of the global acceleration of climate change induced extreme heat. Specifically, it considers the various challenges faced in relation to livelihoods, water, food and energy as well as the coping strategies that are adopted by different rural women as they deal with the inconvenient reality of extreme heat. While there is a current upsurge of studies focusing on extreme heat, they are mostly confined to urban areas while neglecting the plight of rural populations in general and rural women in particular. We use the intersectional ecofeminist perspective to analyse how different women including the young, poor, widowed, unemployed, old-aged are disproportionately affected by extreme heat and how 'better-off' rural women, in their relative capacities, capitalise on the heat crisis in the absence of institutional assistance. We argue that despite their insignificant contribution to climate change, the most vulnerable rural women bear the brunt of climate change induced crises, including in relation to physical health, mental health and nutrition. This qualitative research is based on data drawn from key informant interviews with government department representatives as well as in-depth interviews and focus group discussions with ordinary villagers in Beitbridge district, south western Zimbabwe. It is recommended authorities stop normalising and trivialising extreme heat, but should step up efforts to complement vulnerable populations' efforts to address extreme heat, while taking note of the rural and gendered dimensions of the climate crisis. As well, the impacts of extreme heat should be seriously considered a public health issue.

196 TRACK B: The Nexus between Climate Change and HIV/AIDS: A Kakuma/Kalobeyei Refugee Camp Perspective

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Background: Climate change and HIV/AIDS are among the most significant public health challenges in Sub-Saharan Africa in the 21st century despite being the least contributors to global emissions. However, there is a limited understanding of the complex relationship between these two challenges, which hinders progress in HIV/AIDS prevention and management within the context of the climate crisis and humanitarian setting.

Description: The framework employed in this systematic review identified five pivotal pathways interlinking climate change and HIV/AIDS, drawing insights from an analysis of 50 studies comprising varied designs, geographical locations, and focus areas. The identified pathways included extreme weather events, food insecurity, the spread of infectious diseases, increased migration, and pressure on health services, forming the investigation's foundation.

Lessons Learned: The review's findings provided insights into the dynamics between climate change and HIV/AIDS, with specific regional nuances. Notably, food insecurity emerged as a catalytic factor, intensifying the prevalence of transactional sex, with about 60% involving women. Lessons gleaned from the Kalobeyei Integrated Settlement in Kakuma underscored the vulnerability of established practices among young girls and women who were previously farmers in their countries of origin (Congo, Burundi and Uganda) and are now reliant on aid to meet their basic needs in the face of climate-induced disruptions, especially drought that has hit Turkana County hard in the past three years.

Moreover, the review highlighted the amplifying effect of extreme weather events on the spread of vector-borne infectious diseases among individuals living with HIV (PLHIV). Climate-induced migration in northern Kenya, for example, within Kakuma, emerged as a destabilizing force, exacerbating economic instability and rendering communities susceptible to transactional sex, sexual violence, and exploitation.

The review shed light on the adverse consequences of migration on the accessibility of HIV and sexual health services, as demonstrated in Kalobeyei with its significant HIV burden. The strain exerted by extreme weather conditions on healthcare systems, including HIV services, acted as a hindrance to the advancement of Universal Health Coverage.

Conclusions/Next Steps: Collaboration between stakeholders in the fight against HIV/AIDS and the climate emergency is crucial. By deepening our understanding of the complex relationship between climate change and HIV/AIDS, we can develop sustainable strategies and interventions to address these challenges. This knowledge will inform the development of programs and policies to control the spread of HIV in Kenya, focusing on both the host community and the refugee community in the Kalobeyei Integrated Settlement.

201 TRACK B: Increased flooding, climate change and incidence of cholera and other water-borne diseases in West Africa: A systematic review

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Introduction: West African countries are highly vulnerable to severe weather events. According to a 2021 ECOWAS report, over 70% of the region's population is affected by climate change-induced disasters, such as flooding, every two years. Climate change has been linked to recent cholera outbreaks, including the one in Nigeria with 2,102 cases and 63 deaths between January and June 2024. To date, no systematic review has comprehensively evaluated the relationship between climatic variables and the incidence of cholera and other water-borne diseases in West Africa.

Methods: This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. We searched electronic databases (PubMed, Wiley Online) and non-electronic sources (Google, Google Scholar) from inception to May 2024. Search terms included climate change, cholera, water-borne diseases, flooding, and West Africa. Studies were eligible if they presented primary data and were conducted in a West African country. Two researchers performed screening, quality assessment, and data extraction independently.

Results: Out of 1,440 identified studies, eight met the inclusion criteria. The analysis revealed a consistent association between climate variability and cholera outbreaks in West Africa. Increased rainfall was a critical factor, often correlating with higher cholera incidence, particularly during transitions from dry to rainy seasons. El Niño events significantly shifted cholera distributions, increasing incidence in some regions while decreasing it in others. Drought conditions exacerbated cholera outbreaks more than floods. Empirical models and statistical

analyses projected future increases in cholera cases due to ongoing climatic changes.

Conclusion: This systematic review highlights the significant influence of climatic variables on cholera incidence in West Africa. Climate change, through altered rainfall patterns, temperature fluctuations, and climatic oscillations like El Niño, plays a crucial role in cholera dynamics in the region. The findings emphasize the need for integrating climate considerations into public health planning and interventions to mitigate the impact of climate-induced cholera outbreaks.

274 TRACK B: Climate Change and Health in Africa: Assessing Environmental Exposures and Epidemiological Impacts Using Simulated Data

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CATEGORY: Track B: Health impacts and epidemiology

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Background, Rationale, and Objectives: Climate change significantly impacts human health, especially in Africa, where vulnerable populations face disproportionate risks. Understanding the epidemiological effects of climate-related environmental exposures on health outcomes is crucial for developing effective mitigation strategies. This study aims to enhance our comprehension of these impacts by investigating the associations between environmental factors influenced by climate change and various health outcomes in African communities, utilizing simulated data to bridge existing knowledge gaps.

Methods: We conducted a systematic review of African-centered studies linking climate-related environmental exposures, such as temperature fluctuations, air pollution (PM2.5 levels), and water scarcity, with health outcomes like respiratory diseases, malnutrition, and infectious diseases. To supplement the limited existing data, we generated simulated data using R, reflecting diverse climatic and health scenarios across different regions. The analysis involved correlation and regression techniques to quantify the relationships between environmental exposures and health outcomes. Additionally, we examined regional variations to identify specific vulnerabilities and disparities.

Results: The analysis of simulated data revealed significant associations between climate variables and adverse health effects, with notable differences across regions. Higher temperatures and elevated PM2.5 levels were significantly linked to increased rates of respiratory and infectious diseases. In regions with decreased water availability, higher malnutrition rates were observed. Communities dependent on traditional livelihoods, such as agriculture and fishing, were particularly affected, highlighting the exacerbation of existing health disparities. Our findings align with and expand upon existing literature, providing a more comprehensive understanding of the health impacts of climate change in Africa.

Conclusion/Implications: This study contributes to the growing body of evidence by harmonizing definitions, indicators, and measurement methods for assessing climate-related health risks in Africa. The findings underscore the urgent need for targeted policies and interventions to mitigate the health impacts of climate change on vulnerable populations. Effective adaptation and mitigation strategies, informed by our research, are essential to address the identified health disparities and enhance community resilience, ultimately reducing the adverse health effects of climate change across the continent.

284 TRACK B: Multi-model analysis on effects of air pollution on adverse maternal and newborn health outcomes in Kenya, Zimbabwe, Mozambique and Gambia

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Background, Rationale, and Objectives: Employing diverse models to validate relationships between pollution exposure and health outcomes has shown effectiveness. However, few African studies have applied machine learning and statistical modeling to examine how air pollutants (PM2.5, PM10, NO2, O3, SO2, CO) affect maternal and newborn health outcomes (e.g., preterm birth, low birth weight, congenital abnormalities). Given the significant impact of air quality on health, comprehensive research and interventions are essential.

Despite limited data in LMIC's, leveraging existing data and validating findings with various models are crucial. This study aims to assess and compare the impact of air pollutants on maternal and newborn health across different countries.

Methodology: A retrospective multi-model analysis across multiple African countries. The study population will comprise of pregnant women (conception to delivery), post-partum women (delivery to 6 weeks after childbirth), and neonates (1-10 days old). Air quality data will be derived from satellite and remote sensors such as TROPOMI, MODIS AOD, PRECISE, and others; merged with maternal and newborn health data from cohort studies (2019-2024). Statistical and machine learning algorithms, including logistic regression, DSA algorithm, will be used to analyze the relationship between air pollutants exposure and health outcomes.

Lessons learnt: Obtaining reliable air quality data can be challenging, especially in low- and middle-income countries where high-resolution data may be lacking or unreliable. Sensors in other regions may also be limited, affecting research accuracy. To access reliable data, it is essential to collaborate with relevant countries and data providers, validate dataset authenticity, manage data storage, and use advanced technical skills for analysis. This process requires significant funding. However, conducting this study is important to help reduce errors, enhance result confidence, and provide insights for improving models and research.

Conclusion: Using multiple models provides a comprehensive understanding of the relationship between air pollution and health outcomes. Validating results across models enhances reliability, supporting evidence of associations between air pollution and adverse maternal and newborn health effects. These insights will inform evidence-based policymaking and targeted interventions strategies, guiding efforts to mitigate air pollution and protect maternal and newborn health.

290 TRACK B: The Implication of Forest Degradation on Climate Change and Health: A case study of Cross River National Park in Nigeria

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Forests play a crucial role in mitigating climate change and serve as vital indicators of environmental health. They also provide habitats for numerous wildlife species, many of which are at risk of hosting zoonotic pathogens. The Oban Division of Cross River National Park is rich in diverse wildlife species which faces significant threats from poaching and illegal logging. These activities have resulted in a continuous decline in tree populations, exacerbating the impacts of climate change and posing health risks to surrounding communities. This study assessed forest degradation in the Oban Division of the Cross River National Park and its impact on Climate and Health in Nigeria. Forest degradation was examined using the Land Use Land Cover (LULC) Change of the study area derived from the Landsat imageries of 2000, 2010, and 2020. The LULC analysis revealed that 2020 had the highest built–up area (165.68 Km square) compared to 2000 when the built-up area was 43.86 km square. Forest was highly dense in 2000 (3002.90 Km square) compared to 2020 (2598.77 Km square). The study concluded that the reduction in forest cover was largely due to illegal human activities which increases the risk of zoonotic disease emergence and aggravates climate change challenges. There is therefore the urgent need for increased education and awareness about the importance of forests for both human health and climate change mitigation. Efforts to protect and restore these vital ecosystems are essential for sustaining biodiversity and safeguarding public health.

316 TRACK B: Climate change, vulnerability and mental health: A qualitativeexploration of Sex Workers' experiences in Beitbridge Zimbabwe

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Background: Beitbridge, a region in southwestern Zimbabwe, is prone to flooding, particularly in the old bus terminus area during rainy seasons. This area is home to a vulnerable population of sex workers who face numerous mental health challenges. The old terminus area, comprising hotspots such as Kuma Curtain, Siyaso, Stonehouse, Kwa Madzimai, R Homes, Mbedzi, Mangavha, and others, is a hub for sex work and has experienced frequent flooding, displacement, and disruption of services. Climate change exacerbates these challenges, making it essential to explore the lived experiences and perceptions of sex workers in Beitbridge.

Objective: This qualitative study aimed to investigate the impact of climate change on the mental health, wellbeing, and coping strategies of sex workers in Beitbridge. Specifically, it sought to explore the experiences and perceptions of sex workers regarding climate-related stressors, mental health challenges, and resilience.

Methods: In-depth interviews were conducted with 30 sex workers, aged 18-35, using a purposive sampling

strategy. Participants were recruited from the hotspots in the old bus terminus area. Data were analyzed using thematic analysis, which involved coding, categorizing, and theme identification.

Results: Participants reported climate-related stressors, including floods, displacement, reduced clients and income, increased competition and violence, fear of water-borne diseases, and loss of social support networks. These stressors exacerbated existing mental health challenges, such as depression, anxiety, and substance abuse. Coping strategies employed by participants included social support, religious beliefs, and avoidance.

Conclusion: Climate change significantly affects the mental health and wellbeing of sex workers in Beitbridge, amplifying existing vulnerabilities. The study's findings highlight the need for context-specific interventions addressing climate change, mental health, and socioeconomic empowerment to promote resilience and wellbeing among this population. The results can inform the development of support services, policies, and programs tailored to the unique needs of sex workers in Beitbridge.

Significance: This study contributes to the understanding of the intersectionality of climate change, vulnerability, and mental health among sex workers in Zimbabwe. The findings can inform the development of evidence-based interventions and policies addressing the impact of climate change on vulnerable populations. The study's results also have implications for future research, highlighting the need for longitudinal studies and interventions addressing the mental health and wellbeing of sex workers in the context of climate change.

371 TRACK B: Counting the health cost of climate change-driven natural disasters in Uganda

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Background: Uganda's climate has been changing over time, with average temperature across the country rising and the frequency of hot days increasing. The changes in the climate have contributed to significant extreme weather events including increased frequency of floods and intensity of droughts, floods, heat waves, and landslides. Climate change has significant direct and indirect health implications for the Ugandan people and health system. In this study, we report on the health cost of increasing frequency and intensity of natural disasters on human health

Methods: We used secondary data from the International Disaster Database (EM-DAT) and mass media reports to review data from 1990 and 2023 on the impacts of floods, landslides, drought, earthquakes, and storms in Uganda. The data was analyzed in MS Excel and Power BI to clean and analyze respectively to come up with graphical and tabular results.

Results: Uganda has experienced a staggering toll from natural disasters: 6 million individuals have been directly affected, leaving 326,360 homeless. The economic impact amounted to damages costing approximately 78 million US dollars. Tragically, 5,402 lives were lost, with 1,596 injuries recorded. The cumulative cost of these disasters, adjusted by CPI, increased from 44.65 in 1990 to 100 in the last 2 years.

Conclusion: Uganda's experience with natural disasters spanning from 1990 to 2023 has been marked by profound devastation, impacting millions of lives, causing significant economic losses, and claiming a substantial number of casualties. The findings underscore the critical importance of bolstering preparedness, response, and recovery efforts. Addressing vulnerabilities, investing in resilient infrastructure, and implementing proactive strategies are imperative to mitigate the dire consequences of future disasters and safeguard the well-being of Uganda's population.

308 TRACK B: Impact of Floods/Mudslides on Access to Sexual Reproductive Health and Gender-Based Violence (SRH/GBV) Services in Uganda's Mountain Elgon Sub-region.

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Background: Climate change poses significant global threats, particularly affecting Uganda's Mountain Elgon sub-region with over 100,000 people at risk of floods/landslides. Disasters disproportionately impact women's sexual reproductive health and exacerbate economic, sexual, psychological, and physical violence, yet Uganda's Contingency Plan 2023 omits SRH/GBV considerations. Agency for Cooperation and Research in Development (ACORD) Uganda, with financial support from the United Nations Population Fund (UNFPA) Uganda, commissioned

an assessment in the six most fragile Districts of the Elgon sub-region namely Namisindwa, Bududa, Bulambuli, Kapchorwa, Manafwa and Mbale to highlight these gaps.

Rationale: The omission of SRH and GBV considerations in disaster management plans poses severe risks to vulnerable populations, particularly young girls and women. Disasters not only disrupt essential health services but also increase vulnerability to GBV and sexual violence. The lack of integration of SRH/GBV services in disaster risk management policies hinders effective response and exacerbates the impact of such events on community health and well-being. Recognizing and addressing these gaps is crucial for building resilient communities capable of withstanding and recovering from climate-induced disasters.

Objectives: The assessment sought to establish the impact of floods and mudslides on infrastructure and SRHR/GBV services in the Mt. Elgon sub-region, identify gaps and challenges in the provision of and access to SRHR/GBV services, and establish priority interventions to enhance access to SRHR/GBV services.

Methodology: The study used a mixed-methods, cross-sectional design and applied the Kish Leslie formula for a sample size of 384 with a 100% response rate. Data collection included 384 household questionnaires, 50 key informant interviews, and 8 focus group discussions. Probability and non-probability sampling were used for qualitative data collection, and data was analyzed using content, and thematic techniques. Quantitative data was collected using the Kobo Collect and analyzed using Microsoft Excel.

Results: Nearly 87% of households were affected by floods/mudslides, impacting women, children, PWDs, and adolescents the most. Early marriage (31.5%) and low education levels (58.3% primary, 4.4% tertiary) were prevalent. Floods increased GBV and sexual violence vulnerability, disrupted health services, and led to higher infectious diseases and teenage pregnancies (82.8% of respondents affected). Key issues affecting access to SRHR/GBV services included limited institutional capacity, impassable roads, and inadequate health facilities. The study identified significant gaps in disaster management policies, stressing the need to include the Minimum Initial Service Package (MISP) for SRH in emergencies.

Recommendations: Key recommendations include Adopting WHO's climate resilience framework to ensure health infrastructure resilience, including MISP for SRH in emergencies, in national disaster risk management plans, supporting districts in a multi-sectoral approach to disaster management, emphasizing preparedness at all levels, strengthening community systems for SRH/GBV services, conduct environmental and social impact assessments (ESIA) for infrastructure projects, and mainstream climate change resilience into health infrastructure financing.

Conclusion: Urgent policy adjustments are needed to integrate SRH/GBV in disaster management. Strengthening district disaster preparedness and resilience in infrastructure plans; and embracing a multisectoral approach to disaster management will ensure continuous access to critical SRH/GBV services during floods/ mudslides.

306 TRACK B: The psychological perspective of natural disasters: a lesson drawn from the occurance of tropical cyclone Idai, Chimanimani District, Zimbabwe

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Natural disasters such as tropical cyclones and other catastrophes cause extensive damage and loss of life globally. In recent years, tropical cyclones have become prevalent in the Southern African Region and survivors of such catastrophes are often left in a state of shock and trauma. The prevalence of these disasters have led to the development of the climate psychology movement, a relatively new field which is under researched. In this paper the researcher presents the psychological influences of tropical Cyclone Idai on the survivors. A qualitative approach to research was employed using the exploratory design. Elderly participants aged between 52-69 were purposively selected from Ngangu village in Chimanimani district. Selection was based on their willingness to participate in the study. Ten (10) in-depth interviews were conducted and ethical considerations such as protection from harm were borne in mind. Thematic analysis approach was employed to analyse data which was presented in verbatim narratives. The social cognitive theory was used to argue for the findings of this study. Findings revealed that the perceived causes of natural disasters were cultural factors which were attributed to the wrath of ancestral spirits for violation 'of natural resources and failure to observe cultural norms and values and natural factors such as proximity flood prone countries like Mozambique and the geographical location of Chimanimani district The results of this study also showed that, the psychological impact of natural disasters on survivors was evidenced by cognitive, behavioural, emotional cues. The findings also suggested that psychotherapeutic interventions such as psychotherapy administered by psychologists and other mental health workers, pastoral care, engaging in recreational activities and psychosocial support from the church and the

community were used as coping mechanisms. Material support from the government and civic society was also regarded as an effective intervention. The results suggested that from a social cognitive perspective post-disaster recovery was perceived from a positive standpoint because environmental conditions were conducive to recovery. A contextualised post-disaster intervention was developed.

426 TRACK B: Extreme heat impact on the physical and psychological health of people in Ga Mashie, Accra: A qualitative study

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Background: Globally, extreme heat is rapidly increasing in frequency, severity, and duration due to climate change. Human lives are the most threatened, with the urban poor at risk due to the existing socially and environmentally mediated factors. This study sought to understand the causes and impact of extreme heat on the health of urban poor residents in Accra, Ghana.

Method: This is a cross-sectional qualitative study employing focus group discussions. The study was conducted in Ga Mashie, a densely populated poor community in Accra, Ghana. Previous research in the community identified extreme heat as the third community stressor. Data was gathered from six focus group discussions with 24 males and 20 women. The average age of participants was 48 years. More than a third (36.4%) were traders, 11.4% were artisans, 18.1% were engaged in other work activities and 34.1% were either unemployed or retired. The data was analyzed using theoretically driven thematic analysis.

Results: Three key insights emerged based on the lived experiences of residents. First, residents perceive knowledge of heat as a prolonged period of intense warmth affecting their health and productivity and extreme sunshine making them sleep outside of their rooms. Second, community perception of the causes of heat was overpopulation, lack of trees and green spaces, heat from commercial cooking and poor building planning. Third, heat-health impact on community members- physical health impact, leading to dermatological issues (heat rashes and boils), chronic diseases (cardiovascular and respiratory diseases), and reproductive impact (menstrual issues leading to excessive bleeding, menopausal issues causing hot flashes and sexual health issues)-Psychological health impact leading to excessive anger, irritability and cognitive-emotional instability.

Conclusion: The study highlights the multifaceted challenges extreme heat poses on the health of urban poor residents. A comprehensive approach is recommended by leveraging on the existing health club groups in the community to help create public awareness about the risks of heat-health conditions. Emphasis should be on preventive measures like staying hydrated and wearing appropriate clothing. Lastly, the development and maintenance of green spaces to mitigate urban heat islands and provide a cooler environment.

Keywords: Extreme heat, health, urban poor, Ghana

432 TRACK B: Exploring Climate Change Impacts on Subsistence Agriculture and Community Well-being in Chirumanzu District, Midlands, Zimbabwe.

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This study explores the impact of climate change on traditional African livelihoods and its repercussions on community health and well-being, with a focus on subsistence farming in Chirumanzu district, Midlands, Zimbabwe. Climate change significantly alters rainfall patterns, temperature extremes, and increases the frequency of extreme weather events, presenting substantial challenges for subsistence farmers in Chirumanzu district. The research uses a mixed-methods approach to evaluate how these climatic shifts impact agricultural productivity, food security, and community health and well-being. By integrating quantitative data on crop yields, livestock health, and household nutrition with qualitative insights from interviews and focus groups with local farmers and health workers, the study identifies critical stressors such as drought, soil degradation, and pest proliferation. Findings indicate that decreased agricultural output threatens food availability, exacerbates nutritional deficiencies, and increases economic strain, contributing to heightened vulnerability to climate-sensitive diseases and impacting overall community well-being. The study highlights the urgent need for adaptive strategies and policy interventions to support sustainable farming practices and enhance community resilience against the adverse effects of climate change.

Key words: Climate change, climate-sensitive diseases, nutritional deficiencies, subsistence farming, weather patterns.

427 TRACK B: Community Perceptions of Climate Change Effects on Early Childhood Development in Kenya's Arid and Semi-Arid Lands

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Introduction: Climate change remains one of the key challenges facing arid and semi-arid lands (ASAL) communities, with women and children bearing a disproportionate burden of its effects. However, there is scarce comprehensive data on the impact of climate change on early childhood development in Kenya's ASALs, especially research that considers community perceptions. This study aimed to fill this gap by understanding the effects of climate change and its impact on children from ASAL communities in Kenya.

Methods: We conducted a qualitative study using semi-structured interviews with key informants in the early childhood sector (ECD) (n=103) across 10 Frontier Development Council (FCDC) counties in Kenya: Garissa, Isiolo, Lamu, Mandera, Marsabit, Tana River, Samburu, Turkana, Wajir, and West Pokot. Purposive sampling techniques were used to recruit 11 key informants per site with varied levels of involvement with ECD, including health, education, social services, gender, security, local administration, civil society organizations, and parents/caregivers in Kenya. A semi-structured, in-depth interview guide was used. Thematic analysis was done using NVIVO. The mean age of the participants was 43.89 years (SD= 10.89 years).

Results: The study found that the significant climate change effects in ASAL areas include droughts, floods, and extreme temperatures (heat stress), which were reported to have detrimental impacts. Their impact was perceived to be multifaceted, with significant effects on various aspects of child development. These include malnutrition, food insecurity, WASH-related indicators, learning, dehydration, skin-related disorders, and pregnancy-related complications. Additionally, it was reported to cause resource-related conflicts and exacerbate other issues, such as gender-based violence. These challenges were reported to pose significant risks to the well-being and health of children living in these areas.

Conclusion: This study highlights the need to address climate change-related challenges facing children in marginalized ASAL communities. Furthermore, innovative programs to support climate-smart adaptations are needed to support the holistic development of these children.

493 TRACK B: The impact of climate change on malaria in Binga district: Evidence from systematic literature review and 2023 program records

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Introduction: Climate change is a significant to health. Binga District in Zimbabwe, characterized by a warm and humid climate, experienced a notable increase in malaria cases in 2023 compared to other years and this may be linked to climate change. Malaria transmission is influenced by temperature, rainfall, and humidity climatic factors.

Methods: A systematic literature review was conducted using keywords and Boolean operators "OR" and "AND" across PubMed, CINHAL, and Google Scholar databases. Document analysis was performed on grey literature, including Ministry of Health and Pangaea Zimbabwe - Wild4Life program reports for Binga District. The PubMed search on July 5, 2024, yielded multiple searches culminating in six relevant papers and through abstract screening, 2 papers were excluded and 4 included for analysis. Malaria surveillance reports from the Ministry of Health for 2022, 2023, and 2024 were examined, alongside records from the Wild4Life health program, providing empirical evidence of the recent malaria outbreak and its possible connection to climatic changes.

Results: The analysed papers, particularly Maseko & Nunu (2020) and Ncube (2013), showed a significant correlation between climate change, and increased malaria cases. Warmer temperatures and increased rainfall during the 2023 rainy season created favourable conditions for mosquito breeding and survival, leading to a surge in malaria cases. Data from the Wild4Life health program and the Ministry of Health documented a marked increase in malaria incidence from 15,154 suspected cases in 2022 to 24,684 in 2023, dropping to 4,531 in the first half of 2024. Malaria-positive cases rose from 3,043 in 2022 to 7,669 in 2023, then dropped to 95 in the first half of 2024. This trend aligns with broader evidence from Zimbabwe and other African countries, where climate change has been associated with malaria increase (Chipungu & Nhamo, 2021) and (Ngarakana -Gwasira (2022).

Discussion: The findings show possible link between climate change and malaria in Binga and Zimbabwe at large. The 2023 malaria outbreak in Binga linked to climate-induced floods and heavy rains enhanced the outbreak and provides compelling evidence of the climate-malaria link.

512 TRACK B: The Health Toll of Heat Stress on African Smallholder Farmers in a Changing Climate

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Agriculture remains the backbone of most African economies, with agriculture production being primarily dependent on human labour. The increase in climate change impacts on agriculture has become an increased concern. Several scholars have researched the effects of climate change outcomes, such as extreme weather events, fluctuating temperatures, and shifting precipitation patterns, leading to heat stress on agriculture products; very few research have navigated the impact of heat stress on the health of smallholder farmers in Africa. This study employs a systematic literature review to examine the health challenges faced by African smallholder farmers due to the convergence of heat stress caused by climate change and identify adaptation and coping strategies smallholder farmers adopt to mitigate climate-induced heat stress. A comprehensive search was conducted using Scopus, the Web of Science, and Google Scholar, which included the studies that met the relevant criteria. This study comprehensively assessed extreme heat's physical and mental health impacts on smallholder farmers in Africa by synthesising existing literature. This study showed that smallholder farmers have direct exposure to daylight heat during critical agricultural calendar periods, leading to extreme health impacts. The study revealed that heat stress has direct physiological effects, including heat-related illness, dehydration, and mortality, which affect smallholder farmers in African countries. Indirect consequences such as malnutrition and reduced labour productivity were also identified. Regarding adaptability, the literature review shows that farmers' most common strategies are changes in agricultural practices, shade structures, and community health initiatives. In conclusion, although some countries have good policies and support systems, such as collaboration between government and non-governmental organisations, they should give full support to farmers to mitigate and adapt to climate-induced heat stress. The study recommends that the health challenges faced by African smallholder farmers due to heat stress can be overcome through a multi-faceted approach. This includes strengthening early warning systems, promoting climate-resilient agriculture, investing in infrastructure, enhancing social safety nets, and fostering research and knowledge sharing.

Keywords: climate change, heat stress, smallholder farmers, Africa, climate health, agriculture, food security, adaptation

525 TRACK B: Differential impacts of heat exposure on maternal, fetal and neonatal health: between and within study heterogeneity in a systematic review

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Background: Climate change is exacerbating global health inequities. Identifying vulnerable groups is a critical step towards designing an effective and efficient climate response. While heterogeneity in reviews complicates statistical summation, understanding the drivers of heterogeneity can provide valuable insights. Using PRISMA guided, systematically reviewed literature on heat impacts on maternal, fetal and neonatal health, we aimed to explore heterogeneity across sub-groups to identify vulnerable populations.

Methods: Using Cochrane synthesis guidelines, we systematically reviewed 198 studies, employing a range of synthesis methods (described in another abstract). To explore true heterogeneity, we ran sub-group meta-analyses using extracted effect modification results, and performed analyses separated by income level of the country of study.

Results: Across 198 studies and 66 countries, our findings illustrated relatively consistent direction of effect for increased heat-associated risks with preterm birth, stillbirths, gestational diabetes mellitus, congenital anomalies, hypertension in pregnancy, and neonatal admissions. Heterogeneity in our findings was partly explained by statistical, clinical, and methodological heterogeneity. A small proportion of studies assessed effect modification (n=72; 36%), with some assessing more than one factor. Race was the most studied risk factor (n=31), with Black and Hispanic groups at a higher risk. Age-related risks were notably higher at extremes of maternal age (n=28), followed by variables such as sex of newborns (n=24), education (n=17) and socioeconomic status (n=16) of mother. Notably, one study that assessed the effect of air conditioning showed considerable protective benefit. In meta-analysis the odds of preterm birth under high heat exposure were largest in lower

middle-income countries OR=1.61 (95%CI=1.39,1.86; n=3) compared to high-income countries OR=1.11 (1.06,1.15; n=27), and upper-middle income countries 1.10 (95%CI=1.00,1.21; n=6). No preterm birth studies were done in low-income countries.

Conclusion/Implications: The large differentials in risk underscore the urgent need for targeted public health interventions to reduce the impacts of heat on groups at highest risk. The study findings are limited by heterogeneity across subgroup definitions, and low numbers of studies that assess effect modification, or conduct analyses to detect statical differences between subgroups. By identifying and characterizing vulnerabilities among specific subgroups, our study can inform the development of targeted interventions, such as individualized early warning systems, to protect the most susceptible individuals from the adverse impacts of extreme heat in a warming climate.

342 TRACK B: Psychometric properties of mental health measures among internally displaced persons (IDPs) in Southern Ethiopia (Afan Oromo version): A multi-site study

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Background: Displacement and the resulting trauma, instability, and hardships make the mental health of Internally Displaced Persons (IDPs) a major public health concern, especially in areas with ongoing conflict, natural disasters, or social unrest. Accurate and culturally relevant mental health assessment tools are essential for assessing mental health conditions and developing effective interventions and support systems. However, the reliability and validity of mental health measures for common mental health conditions like PTSD, depression, and anxiety among IDPs in Southern Ethiopia are not well studied.

Objective: This study aims to evaluate the psychometric properties (reliability and construct validity) of Afan Oromo versions of Patient Health Questionnaire (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Post-Traumatic Stress Disorder Checklist for DSM-5 (PCL-5) among IDPs in Southern Ethiopia

Methods: We employed cross-sectional study at multiple sites in Southern Ethiopia, involving a sample of 1,285 IDPs fluent in Afan Oromo. We used systematic random sampling to select a representative sample and collected data through structured face-to-face interviews. We translated the mental health measures into Afan Oromo using a rigorous translation and back-translation process, following cross-cultural tool adaptation guidelines. We assessed reliability with Cronbach's alpha and omega total and examined construct validity using confirmatory factor analysis (CFA). We performed the analysis using STATA 18 and Jamovi 2.3 software

Results: The Afan Oromo version of the mental health measures in this study demonstrated excellent reliability (internal consistency), with the PHQ-9 having a Cronbach's alpha and omega total of 0.958 and 0.958, the GAD-7 at 0.955 and 0.956, and the PCL-5 at 0.983 and 0.983. The CFA showed strong factor loadings for the PHQ-9 (0.74-0.99), GAD-7 (0.83-1.00), and PCL-5 (0.86-1.00) with p-values $< .05$, indicating that test score variance is strongly linked to the latent variables of depression, anxiety, and PTSD. We also assessed the model fit statistics, which indicated a poor fit for the one-factor model of PHQ-9 (CFI = 0.86, TLI = 0.81, SRMR = 0.046, RMSEA = 0.23) and GAD-7 (CFI = 0.92, TLI = 0.87, SRMR = 0.034, RMSEA = 0.21), as well as for the three-factor model of PCL-5 (CFI = 0.85, TLI = 0.82, SRMR = 0.039, RMSEA = 0.17). PTSD symptoms showed a strong correlation with depressive symptoms (PHQ-9) and anxiety symptoms (GAD-7), with correlation coefficients of r = 0.77 and r = 0.79, respectively. Depressive symptoms (PHQ-9) strongly correlated with anxiety symptoms (GAD-7), with a correlation coefficient of r = 0.81.

Conclusion: The Afan Oromo versions of PHQ-9, GAD-7, and PCL-5 show excellent internal consistency and strong factor loadings, confirming their reliability and validity for measuring depression, anxiety, and PTSD. However, model fit statistics reveal poor fit for the one-factor models of PHQ-9 and GAD-7, and the three-factor model of PCL-5. High correlations among PTSD, depressive, and anxiety symptoms underscore the interrelated nature of these mental health conditions. Future research should refine factor structures for better model fit and apply these findings in clinical practice to improve understanding and treatment of co-occurring mental health symptoms.

368 TRACK B: Changes in Distribution of Intermediate Snail Hosts Caused by Climatic Events in Southern Malawi.

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BACKGROUND: Schistosomiasis is a parasitic neglected tropical disease caused by trematodes of genus Schistosoma. Schistosomiasis transmission requires availability of obligate snail intermediate hosts that thrive in fresh water. Climatic events such as heavy rainfall and floods elevate water levels affecting the distribution and abundance of the intermediate snail hosts. As part of the Hybridisation in UroGenital Schistosomiasis study, we embarked to investigate the effect of these events on snail distribution and abundance, as well as changes in rates of infectivity.

OBJECTIVES: To assess distribution, abundance and infectivity rate of intermediate snail hosts in response to climatic shocks.

METHODS: A longitudinal study with a focus on malacological surveys was conducted quarterly between February 2022 and March 2024 at 12 sites (7 in Mangochi, 2 in Chikwawa and 3 in Nsanje). Sampling involved hand-scooping for snails in a 15-minute period, with collected snails identified to genus level by morphology. Snail abundance was recorded together with GPS coordinates, water quality measurements of temperature, pH, conductivity and total dissolved solids. Collected snails were then exposed to light to induce shedding of cercariae. Snail infectivity rates were determined by proportion of snails shedding cercariae. The abundance, distribution and infectivity rates were compared in relation to pre-climatic and post-climatic events. The main climatic events of focus were rainfall levels and floods.

FINDINGS: Preliminary findings indicate snail abundance is linked to climatic conditions with abundance rates pre-climatic shock event of ≤63 snails per site in dry seasons, and ≤134 snails per site during the wet seasons. However, following the climatic shock event cyclone Gombe in March 2023, the abundance ranges changed to ≤167 snails and ≤291 snails per site for the dry and wet seasons respectively. Bulinus spp. were the most abundant snails, being found in all 3 districts. However, following the climatic shock, snail distribution changes were observed with some sites being colonised by new snail species, most notably Biomphalaria spp. and Lymnaea spp. There was also an increase in average infectivity rates from 22.1% pre-climatic shock to 32.4% post-climatic shock.

CONCLUSIONS: Our preliminary findings highlight the dynamic relationship between climatic shock events and the epidemiology of schistosomiasis. The rise in infectivity rates as well as changes in snail distribution post-cyclone indicate potential increases in transmission risks post-climatic events. This further highlights the need to develop tools aimed at addressing climatic factors and integrate them into schistosomiasis surveillance and control strategies to better mitigate the impacts of environmental changes on disease transmission.

574 TRACK B: Effects of Ambient Heat on the Mental Health and Wellbeing of Healthcare Workers: Experiences from Rural Mount Darwin District, Zimbabwe

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Introduction: Extreme heat is a significant occupational mental health hazard, and climate change has intensified these risks. Ambient heat has psychological sequelae/ramifications, such as negative impacts on cognitive functions, decision-making, problem-solving, and memory. These can result in decreased performance and productivity, heightened accident rates, and can jeopardize individuals' well-being. Though these effects are well documented in workplaces in high- and middle-income countries, little is known about this in low-income countries, especially in key occupational groups like healthcare workers (HCWs) . This qualitative study aims to investigate the experiences and impacts of heat on mental health and wellbeing among HCWs in rural Mount Darwin District, Zimbabwe.

Methodology: In-depth interviews were conducted at three health facilities with 24 HCWs in the hot season and 15 HCWs in the cooler season, using a semi-structured interview guide. To enable methods triangulation, participant observations were conducted in the antenatal, delivery, and postnatal wards, covering 196 hours in the hot season and 88 in the cooler season. Thematic analysis

identified key themes, categories, and relationships portraying the nuanced thermal challenges experienced by HCWs in rural settings.

Results: HCWs reported experiencing increased irritability, higher levels of anxiety, and greater difficulties in concentrating during hot seasons as compared to the cooler seasons. Difficulties in effective communication, forgetting basic procedures, dozing off, angrily shouting at patients and dizziness were also directly attributed to the mental fatigue and physical discomfort caused by high ambient temperatures. Behavioural manifestations, including anger outbursts towards colleagues and patients, heightened irritability, falling asleep, forgetfulness, constant work-related complaints and incomplete procedures were more frequently observed through ethnographic observations during the hot season than in the cooler season. HCWs expressed a need for targeted interventions, such as improved cooling systems, flexible work schedules, and enhanced mental health support, to help mitigate the adverse effects of heat exposure.

Conclusion: The study showed that heat adversely affects the mental health and well-being of HCWs in rural settings, and this was reported and observed to impact quality of care. Targeted interventions and evidence-based strategies are needed to support the overall well-being of HCWs and enhance the quality of healthcare services in rural facilities.

128 TRACK B: "You're feeling hot, go sleep on the carpet so you can relax....": Journeying through pregnancy and postpartum in hot environments

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BACKGROUND AND OBJECTIVES: Temperatures in Southern Africa are rising at twice the global average, significantly impacting maternal and newborn health. We explored the physical, psychological, and socio-cultural impacts of heat on pregnant and postpartum women and infants, and their coping strategies in an urban, informal sub-district in Tshwane, South Africa.

METHODS: Serial in-depth interviews were conducted among purposively sampled women while pregnant and again in the early postpartum period, between February 2024-May 2024. Data was thematically analysed.

RESULTS: Of the 25 participants, women reported mood swings, irritability, physical discomfort, disrupted sleep and fatigue when it was hot. Concerns about labour and delivery in hot weather included: fears of collapsing during labour, potential preterm birth, miscarriage, stillbirth, reduced or increased foetal movement and stunted foetal growth. Breastfeeding was challenging due to the heat from both mother and infant. Limited access to water, electricity, shading, trees, along with overcrowded, poorly ventilated informal housing (shacks) with no windows, compounded heat.

Socio-cultural practices, like staying indoors with newborns and swaddling despite the heat, may have worsened mother-infant heat exposure. Pregnant women reported poor attendance at antenatal care due to arduous journeys in hot environments, and facilities lacking adequate cooling. Coping strategies included changing clothes, sleeping locations, using fans, wet cloths, drinking more water, opening doors, and doing chores at cooler times, but these were often ineffective.

CONCLUSION: The impact of heat on the wellbeing of women and newborns, compounded by socio- cultural practices, housing material, and limited access to resources, underscores the need for heat adaptation interventions.

549 TRACK B: Participatory Visual Temperature Timelines:Examining the Perceived Impact of Ambient Heat Exposure on Pregnant and Postpartum Women's Health in Rural Zimbabwe.

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Introduction: Pregnant and postpartum women are vulnerable to increasing global ambient temperatures. Heat can disrupt thermoregulatory systems in pregnant women, resulting in heat strokes, altered blood pressure, heat exhaustion and compromised foetal development. The study investigates the perceived impact of ambient

heat exposure on pregnant and postpartum women in rural Zimbabwe employing visual timeline techniques rooted in human psychology and participatory epistemology.

Methods: We purposively recruited 24 pregnant women in their third trimester of pregnancy. At recruitment, each participant was interviewed and allocated a diary to record perceived daily temperatures on a 10-point Likert-scale, along with a description of their subjective feelings about heat. Participants wore iButton devices on their necks for continuous skin temperature monitoring until 6 weeks postpartum, covering ≥75 observation-days per woman. At the study's conclusion, women were re-interviewed, and they co-produced visual temperature-timelines that integrated diary entries with iButton temperature data.

Results: The timelines showed a complex relationship between environmental temperatures and the psychological experiences of pregnant women (Figure 1).. Women reported experiences of fatigue, headaches, and excessive thirst during high temperatures. During extreme heat, rated 8 or more, participants frequently felt overwhelmed, using terms like "I felt like I was exploding", indicating significant psychological distress linked to heat exposure. iButton readings showed women's weekly skin temperature ranged from 23.9°C to 39.9°C. Pregnant women adopted adaptation strategies such as increasing water intake, seeking shade, wearing breathable clothing and adjusting work schedules to reduce heat exposure. Concerns about heat-related labour complications were common. Traditional practices, such as swaddling newborns and observing a 30-day indoor postpartum period exist. Women reported use of water to cool newborns. During cooler weeks, participants adjusted routines to enjoy warmer clothing and appreciated the relief from heat, highlighting an intrinsic understanding of personal thermal comfort limits.

Conclusion: Findings highlight that ambient heat exposure has a negative impact on women's daily lives, affecting their psychological wellbeing, access to health services, socio-economic engagement, and routine activities. There is need for culturally-sensitive, gender-aligned, heat adaptation interventions at community, health systems and policy levels. Further investigation into the relationship between extreme heat exposure, birth outcomes, and overall health is recommended.

37 TRACK B: Retrospective study of the association between temperature, relative humidity and rainfall by season on cardiopulmonary emergency hospital admissions in Cameroon

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Introduction: Climate change disproportionately affects susceptible populations such as people with cardiopulmonary diseases. Cameroonians are experiencing effects of climate change in the form of dehydration and heat stress from drought and extreme heat. We aimed to estimate the association between warm seasons and rainy seasons temperatures and precipitation cause-specific emergency hospitalization consultations for cardiopulmonary disease among Yaounde, Cameroon patients of all age between 2019-2021.

Design: This retrospective multicenter time-series study leveraged administrative data on Emergency Department visits by all age groups to the Emergency Departments of major hospitals in Yaounde capital city from 2019-2021.

Study variables: Daily maximum and minimum temperature(°C) to be linked with daily hospitalizations obtained from the national meteorological database. In this study, cardiovascular and respiratory emergency hospitalization consultations will be all respiratory condition (asthma, community acquired pneumonia, Tuberculosis, emphysema, and chronic bronchitis etc), those with a cardiovascular condition (congestive heart failure, coronary heart disease, angina, heart attack or stroke etc).

Statistical analysis: This time series analysis using daily count data for cardiopulmonary disease diagnosis was aggregated into daily counts then merged with meteorological data using Poisson Generalized Linear Regression models. The non-linear exposure-response relationships between mean temperature and DTR and daily emergency hospital admissions due to cardiopulmonary conditions was modelled with negative binomial regression in the distributed-lag non-linear modelling (DLNM) framework (Gasparrini 2011). Negative binomial regression models were used because the count data (daily hospital admissions) was over-dispersed. The bi-dimensional exposure-response relationship estimated by the DLNM models is expressed as relative risks (RR) for the mean temperature and DTR – respiratory and

cardiovascular related emergency hospital admissions associations

Preliminary Results: There was a total of 5664 cardiopulmonary hospitalisations at JAMOT Psychiatric Hospital Yaounde, Cameroon between 2019/01/01 and 2021/12/31. Daily temperature and relative humidity ranged from 19.9 °C – 26.9 °C and 48% – 99% respectively. Both climate variables displayed a seasonal trend. The overall cumulative association between mean temperature and hospital admissions over 21 days of lag showed that the highest risk of hospitalization was at 22°C (RR = 1.15, 95% CI = 0.95 – 1.39). Hospital admissions decreased at mean temperatures below 22°C and above 23 °C. Low temperatures had an immediate effect on respiratory conditions with the highest risk for hospitalisation being observed at lag day 0. High DTR was associated with higher rates of admission at immediate (lag day 0) and long lag days (lag day 21).

Conclusion: In this study, we explored all major cardiopulmonary association to climate change, and suggest opportunities for, and benefits of, intervention to mitigate these impacts in Cameroon. Warmer temperatures, altered precipitation patterns, increase in PM2.5, 03, and aeroallergens, and changes in multiple ecosystems that impact humans are expected. Climate change hazards such as heat stress, extreme weather conditions, waste burning, wildfires, floods, sand dust storms and damp buildings from excessive precipitation, can contribute to adverse cardiopulmonary health effects. In combination, the effects may be synergistic and severe, especially within vulnerable populations (e.g., children, older adults, those with pre-existing disease, and those populations more genetically susceptible).

481 TRACK B: The perfect storm? Climate, Vulnerability and TB/HIV: Link between poverty, HIV viral load non-suppression and recent TB diagnosis in Zimbabwe

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BACKGROUND: Climate effects and chronic illnesses (HIV, TB) disproportionately impact the impoverished. Social protection interventions (SPIs) including cash transfers and food assistance may interrupt this cycle of climate-related vulnerability, poverty and disease. The objective of this study was to explore the relationship between poverty and access to SPIs on HIV viral load (VL) and recent TB diagnosis in 15 climate affected districts prioritized as part of Zimbabwe's El Nino Anticipatory Action Plan.

METHODS: We conducted an exploratory, sequential mixed-methods analysis. Quantitative analyses utilized retrospective cross-sectional data collected from January to August 2023 from client satisfaction surveys (CSS) among adults living with HIV (PLHIV) (>18yrs) on antiretroviral therapy. We performed descriptive analyses and generalized estimated equations to evaluate relationships between multidimensional poverty, food insecurity, SPIs, recent TB diagnosis and VL non-suppression (>/=1000 copies/mL). We conducted semi-structured in-depth interviews(n=25) with adults with a history of accessing SPIs. IDIs were audio-recorded, transcribed, translated, and analyzed using the framework method.

RESULTS: Among 13,722 PLHIV completing the CSS, 8,971(65.4%) were female. Median age of respondents was 44yrs (Interquartile range:36-52yrs). Nearly half (n=6,095; 44.4%) of respondents were multidimensionally poor and 5,894 (43%) were food insecure. Only 1,174(20%) of PLHIV that were food insecure had ever received SPIs. Poverty was associated with HIV VL non-suppression [relative risk (RR)=1.55; (95% confidence interval: 1.13, 2.13)]. HIV/TB co-infected individuals experienced disproportionate levels of multidimensional poverty (63%), food insecurity (54%) and lacked access to social protections (25%). Qualitative findings demonstrated despite significant need, PLHIV and HIV/TB coinfected individuals had limited information about types of SPIs available and how to apply to programs. Participants described their experiences of poverty and food insecurity, exacerbated by climate change, with SPIs providing a fragile support system for sustained access to food and basic needs.

CONCLUSIONS: SPI receipt is limited among PLHIV and TB in Zimbabwe, despite high levels of poverty and food insecurity, worsened by the current El Nino event. In this context, SPIs may serve as a surrogate for socioeconomic vulnerability and appear insufficient to alleviate its effects in climate affected regions. There may be a mismatch in available SPIs with individual needs (food security) among this population of people living with HIV and TB, signaling importance of concordance in SP interventions with vulnerabilities experienced. Integration of SPIs within HIV and TB programs have the potential to improve treatment adherence and clinical outcomes.

152 TRACK B: Long-term Trends and Spatial Patterns of Satellite-Retrieved PM2.5 Concentrations in Senegal: Health Implications

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This study investigates the long-term trends and spatial patterns of satellite-retrieved PM2.5 concentrations in Senegal from 1998 to 2021 and explores the associated health implications. Using high-resolution satellite data, we analyzed the temporal and spatial variations of PM2.5 levels across the country. Our findings reveal significant increasing trends in PM2.5 concentrations, particularly in urban areas, with marked seasonal variations. Spatial analysis indicates higher pollution levels in regions with dense population and industrial activities. To assess health impacts, we correlated PM2.5 data with health outcomes, including respiratory and cardiovascular diseases, using statistical models. The results show a strong association between elevated PM2.5 levels and increased incidences of these diseases, highlighting the urgent need for effective air quality management and public health interventions in Senegal. This study provides a comprehensive understanding of PM2.5 pollution patterns and their health impacts, informing policymakers and stakeholders in devising strategies to mitigate air pollution and protect public health.

237 TRACK B: Spatiotemporal analysis of Heat stress in East Africa: A high resolution historical (1990-2023) and future (2030-2060) perspective.

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In this study, the spatiotemporal variation and trends in heat stress, a major human health hazard are assessed based on the multivariable Universal Thermal Climate Index (UTCI) for both the historical (1990-2023) and future periods (2030-2060) over East Africa (EA). We adopt novel techniques to downscale, analyze and characterize heat stress dynamics using ensemble means from eight bias-adjusted Coupled Model Inter-comparison Project Phase 6 (CMIP6) models under two shared socio-economic pathways (SSP245 and SSP585). These include the Mann-Kendall trend test, Variability contouring and Fuzzy Inference System. Results show a predominance of three heat stress classes such as; 1) No Thermal Stress (NTS) in Rwanda, 2) Moderate Heat Stress (MHS) in Uganda, Burundi and Tanzania and 3) Strong Heat stress (SHS) in Kenya during the historical period. On the other hand, significant moderate to strong heat stress transitions are projected for the future from historical baselines characterized by coastal-inland and north-south extension patterns. That's, 30% to 60% / 65 % in Uganda, 45% to 55% / 60% in Kenya, and 15% to 20% / 30% in Tanzania for SSP245 / SSP585 respectively. Rwanda is expected to have an NTS to MHS transition of 45% to 90% / 90% for SSP245 / SSP585 respectively. The highest heat stress is observed during the March-May season over the coastal regions of EA and northern Uganda, Kenya with a mean of 36Ö/Day. Whereas, the lowest heat stress is observed in central Kenya, southwestern Tanzania and western Rwanda at 22Ö/Day. Areas of central Kenya, Uganda, and southwestern Tanzania were associated with high heat stress variability. Trend test results reveal the highest magnitude of change of 0.035Ö/yr in southwestern Tanzania and the Turkana region of Kenya for the historical period. Whereas, maximum trends of 0.055Ö/yr over North and central Uganda, Southwestern Tanzania and, 0.08Ö/yr over Burundi, eastern Kenya, southern Rwanda and western Tanzania are projected for the future under SSP245 and SSP585 respectively. These results are vital for both health planning, heat stress adaptation and mitigation as well as climate resilience building, especially in the EA coastal region where hazardous heat is fast manifesting.

ADAPTATION AND BUILDING CLIMATE RESILIENT HEALTH

245 TRACK C: CHAMNHA project: Behaviour change intervention to reduce heat-related health impacts on pregnant and postpartum women and neonates in Kilifi, Kenya.

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Introduction: High temperatures increase the risk of maternal complications and adverse birth outcomes. The CHAMNHA consortium conducted qualitative research in Kilifi, Kenya, to examine perceptions of maternal and neonatal heat risks among women, household members, and community stakeholders. We found that heat adversely affects the health and wellbeing of pregnant and postpartum women and neonates, and impacts women's ability to perform household chores (including farming, fetching water and firewood). Women perform these chores while pregnant, regardless of the heat, which leads to exhaustion and other signs of heat stress. Knowledge of the dangers of heat for maternal and neonatal health was low in this community, highlighting the need health measures. We developed an intervention to sensitise and educate pregnant and postpartum women about heat exposure, the importance of hydration, frequent breastfeeding, and the need to shift harmful socio-cultural practices that may increase the vulnerability of women and their neonates. The intervention also sought to mobilise the support networks of pregnant and postpartum women (specifically, mothers-in-law and male spouses) and key influencers, such as community health volunteers (CHVs), chiefs, and religious leaders, to assist women with their heavy workload and to incorporate messages about the dangers of heat exposure into their daily work.

Methods: The intervention was co-designed. We used facilitated discussions using photographs and videos to raise awareness of the heat risks and to identify potential solutions to support women with their heavy workload. Groups included: (1) pregnant and postpartum women; (2) mothers-in-law and male spouses; and (3) community stakeholders and CHVs. Researchers then followed up the pregnant and postpartum women for four months to reinforce heat-health messaging and encourage them to take protective measures when it is hot. Mothers-in-law and male spouses were encouraged to support pregnant and postpartum women with their workload in the heat. Researchers attended weekly public meetings ('barazas'), together with chiefs and church leaders, to disseminate heat-health messaging.

Results: Women and their support networks reported an improved understanding of heat effects on pregnant and postpartum women and neonates, including the importance of remaining hydrated, breastfeeding frequently, and not layering their newborns with heavy clothing. The women also reported that their mothers-in-law and male spouses had started to assist with household chores and were disseminating heat-health messaging to other families outside of the intervention. Women with unemployed male spouses and younger mothers-in-law received more help than those with employed spouses and older mothers-in-law. Some reported that their spouses had challenges to perform activities traditionally associated with women, owing to stigmatization among their male peers.

Conclusions: Community approaches to supporting pregnant and postpartum women during periods of heat are feasible but shifts in behaviour take time. It is feasible to train key community influencers to include heat-health messaging in their daily routines. Research is needed to examine whether repeated training is needed to ensure sustainability. Future heat adaptation interventions focused on maternal and neonatal health should consider factors such as employment, age, and support networks.

KEYWORDS: Heat exposure, pregnancy, postpartum, behavior change, Kilifi.

294 TRACK C: The co-design of an intervention in Burkina Faso to reduce the impact of heat exposure during pregnancy and after childbirth.

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Background: Global warming is affecting maternal and neonatal health, yet most low-income countries, including Burkina Faso, a Sahelian country, are not integrating climate adaptation into primary health care (PHC) services. Yet the health risks associated with extreme heat events could be mitigated with appropriate interventions. That's why we co-developed with health workers and community members an intervention to mitigate the impact of extreme heat on maternal and neonatal health in Burkina Faso. This summary presents the results of the co-design process, the lessons learned from this experience.

Method: A community mobilization in two health districts (rural and urban) in 2022 enabled the organization of four co-design workshops with 49 community members, 36 health system and environmental stakeholders.

Results: A four-step process was used to co-design a climate change adaptation intervention. Participants identified community awareness-raising and training of health personnel as locally appropriate and feasible strategies. Taking into account scientific knowledge, targeted messages on behaviors to be adopted by women were formulated. The messages concerned warmth, hydration and exclusive breastfeeding, as well as strategies for coping with discomfort. Communication tools (image boxes, video) were developed and amended by health professionals and community health workers. Following training, the latter drew up plans for integrating these messages into their routine activities with pregnant women and mothers in health facilities and in the community. This awareness-raising would contribute to improving the knowledge of women and those around them about good practices and strategies for mitigating the effects of extreme heat on pregnant women, mothers and their children.

Conclusion: the impact of heat on maternal health was new to the participants. Our intervention is the first to integrate messages about this impact into the routine activities of health facilities. Co-design is an opportunity for capacity building and is necessary to adapt intervention strategies to the context. Integrating awareness-raising on adaptation strategies into PHC is a way of building resilience and strengthening the health system in the face of climate change. Ongoing training and the revision of initial training curricula for health professionals will improve their practices.

548 TRACK C: Implementing wearable devices to measure physiological effects of heat on vulnerable women in Tshwane, South Africa: lessons from the field.

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Background: Despite being one of the most significant global health threats, climate change still lacks individual-level, data on direct heat exposure and its health impacts. Technologies that provide continuous, physiological, and behavioural metrics are available, but have been less utilized in low- and middle-income countries (LMICs), where the implementation of mHealth and wearables faces unique challenges despite high cellphone penetration, particularly among vulnerable populations such as pregnant women. We describe lessons from implementing the use of fitness trackers among pregnant women in Tshwane, South Africa.

Methods: Between February and May, pregnant women (gestational age 30 - 36 weeks) were enrolled, completed a baseline interview, were trained on and provided with fitness trackers worn on their wrist. Women were asked to wear the fitness tracker daily from enrolment up to six weeks postpartum. The tracker collected data on sleep, physical activity and heart rate. Per manufacturer instructions, to activate the device and facilitate data downloads, a study-specific Gmail account was created for each participant. Tablets were used to sync data from the fitness trackers onto the fitness app to facilitate individual data download.

Results: A total of 26 women received fitness trackers. Despite setting up the devices as suggested by the manufacturer, challenges surfaced. Initial tracker data from the first download, taken seven days post-enrollment, was lost due to multiple trackers being linked to a single Tablet. To address this, the same fitness app was downloaded on participant's smartphones if they had one. Those without a smartphone (53%) were provided with study smartphones for the duration of the project. The study provided each participant with weekly mobile data to ensure regular syncing between the fitness tracker and the app. Both the fitness trackers and smartphones required frequent charging, and 35%(n=9) lacked reliable access to electricity. To address this, study staff visited the women every fourth day to ensure more frequent syncing and used study power banks to recharge fitness trackers and smartphones. Furthermore, 23% (n=6) of the women felt unsafe wearing the fitness tracker, and 15%(n=4) forgot to wear it regularly, resulting in incomplete activity tracking.

Conclusion: While cellphone penetration can facilitate the use of mHealth technologies, significant challenges remain in terms of device ownership, internet connectivity, power supply, user safety, and data reliability. Addressing these challenges is essential for the effective deployment and sustainability of health interventions using wearables in LMICs.

157 TRACK C: Review of Climate Change Adaptation Interventions for Health: Implications for Policy and Practice

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Climate Change is among the greatest threats to health in the 21st century, requiring urgent scale up of adaptation interventions. The article summarizes the literature on adaptation interventions funded by the Belmont Forum and European Union (N=37), the largest global funders of climate change and health research. The study is based on a systematic search that was carried out to identify scientific articles on adaptation interventions for health within the consortium. Data extracted included study characteristics, types of interventions, and study outcomes. Results were synthesized narratively within the principles of the PRISMA-ScR guidelines.

Eventually, 197 articles were identified, with 37 reporting on adaptation interventions. The majority of articles focused on the general population (n=17), using mixed-methods research and targeted interventions aimed at behavior change (n=8) and health-systems strengthening (n=6). Few studies examined high-risk populations, such as pregnant women and children (n=4) or migrants (n=0), or adaptations with mitigation co-benefits such as nature-based solutions (n=1) or the built environment (n=0). The most studied climate change hazard was extreme heat (n=26). Several studies reported promising findings, principally on interventions to counter heat impacts occupationally and among pregnant women, and improving risk awareness in communities. Our results show that while there are gaps in the evidence, there are several promising interventions that could be recommended now. We discuss how to expand research and public health interventions towards safeguarding public health from the effects of climate change.

497 TRACK C: Community voices on heat adaptation strategies for the health of pregnant women and their infants in Tshwane, South Africa.

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Background: Heat adaptation strategies are essential for protecting at-risk populations, particularly pregnant women, and their infants. Involving the community in the decision-making process increases the likelihood of successfully implementing sustainable and effective heat adaptation strategies that align with their needs and preferences.

Method: We conducted 15 semi-structured key informant interviews as part of a study aimed at co-designing heat adaptation interventions for pregnant women and infants in the Laudium area of Tshwane, South Africa. Participants included individuals who play key roles in the community (e.g. community leaders, religious and traditional healers, NGO representatives), and individuals from the local health facility (e.g., members of clinic committees, health facility managers and midwives). Questions focused on the general experience of heat, the impact of heat and community adaptation strategies, acceptability and feasibility of interventions and the obstacles to executing interventions. Interviews were transcribed and analysed using thematic analysis to identify key themes and insights.

Results: Community members had varying perspectives on heat adaptation strategies. Some believed that tree planting can alleviate heat effects, while others thought it time-consuming and preferred self-constructed shaded areas. While participants acknowledged the efficacy of implementing air conditioning systems within health facilities, majority expressed concerns regarding this in household settings, deeming it an unviable adjustment due to issues such as theft, unreliable electricity supply and inadequate building structures. However, the community members emphasized the critical importance of improving air ventilation within both residential and health facilities. Additionally, the necessity for spousal support emerged as a critical concern in order lessen the workload on pregnant women. While modifications to building structures, such as painting roofs white to enhance insulation may be beneficial, residents identified a challenge in implementing such adaptations due to low home ownership within the community, posing a significant obstacle to any potential structural alterations.

Conclusion: Community engagement is key for successful execution of heat adaptation strategies, as it promotes collaboration and enhance support. This underscores the significance of involving the local population in developing more flexible approaches to combat heat and addressing any barriers that could impede adaptation.

489 TRACK C: Community Engagement in Response to Public Health Emergencies Resulting from Drought in East Africa: A Realist-Informed Narrative Review

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Background: Stakeholders of a health system at all levels recognize the importance of engaging communities in effective healthcare delivery. Particularly, the role of community engagement (CE) is known to be paramount in effective response to public health emergencies as seen from the response to the Ebola outbreak in West Africa. However, little research has addressed how they could be meaningfully engaged in response to drought, contribute to the healthcare delivery system, and safeguard the community's health in East African countries, particularly in Ethiopia.

Objective: To identify and synthesize empirical evidence surrounding CE practices and lessons in response to public health emergencies resulting from drought in East Africa.

Methods: A realist-informed review was conducted using pre-tested tools for screening, data extraction, and synthesis. All types of evidence (published articles from major databases and grey literature) published/reported since 2010 were considered in the review. The findings were synthesized manually and the results were presented in a narrative form. Categorization of the CE level was done using the World Health Organization's CE spectrum.

Results: After two-stage reviews (title and abstract) and full-text review, 14 records were included in the review. Seven of the studies were qualitative inquiries, six employed mixed methods, and one was a quantitative survey. This review found that communities were rarely engaged in response to drought and their engagement was limited to informing either on the problem, alternatives, or solutions. Half of the records reported that communities were consulted through requests for feedback on the information disseminated. Whereas, working directly with communities, considering their concerns, and giving them the decision power to act was almost absent. Community meetings, dialogue, mobilization, and training were some of the strategies for CE. The use of formal or informal existing structures facilitated CE, while donor dependency, lack of peace and security, and weak community-based organizations were among the barriers.

Conclusion: Despite the devastating impact of drought on livelihoods and resources, the engagement of the local community in the response mechanism is weak. The majority of drought response initiatives were implemented through a top-down approach with little CE. Lack of substantive and meaningful engagement would hinder swift and effective responses to mitigate crises from drought. Moving forward, strengthening connections, engagement, and communication within the community is crucial to managing future drought difficulties in the area and building resilience.

Keywords: Africa, drought, response, community engagement, community participation, realist review.

183 TRACK C: Assessing and predicting the impacts of climate change on the occurrence of malaria in selected stations, in Southwest, Nigeria

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Background: The escalating impact of changing weather and Climate disproportionately affects the well-being of inhabitants, especially the vulnerable populations with little adaptability. Even with the increase in awareness of malaria control and elimination efforts by the government, there is still the prevalence of malaria which cannot be far-fetched from the impact of the changing climate yet station-specific evidence remains scarce within the African cities.

This paper presents the spatial distribution and prevalence of malaria and the adaptation strategies of people in the stations. Also, a prediction model using the climate parameters is generated to help estimate the expected number of malaria cases to assist in planning for effective management

Method: The Pearson correlation and multiple regression analysis were used to look at the relationship between the climate parameters and malaria cases. We collected the rainfall, relative humidity and minimum and maximum temperature data of Ado Ekiti and Ife during 2003–2022 from the National Aeronautics and Space Administration (NASA), and the medical records data from the government hospitals within the stations. Also, a semi-structured questionnaire of 200 residents who have experienced this disease was carried out to determine their coping strategies. To predict the expected cases, Logarithmic transformation was applied to the malaria incidence and the climatic parameters to be sure of the normality and homogeneity of variance of the residuals. Autoregressive integrated moving average (ARIMA) models were used to generate a predictive model.

Results: The result showed marked monthly variations in climatic parameters with malaria occurrence with significant correlation coefficients between climatic variables and malaria occurrence in both stations. While it's more significant in Ado Ekiti than Ile Ife. The study showed that the most practiced coping strategy is the use of self-medication by about 74% of the respondents.

Of all the models tested, the ARIMA (1, 0, 1) model for malaria incidence fits the data best for Akure and Ile Ife according to normalized Bayesian information criterion (BIC) and goodness-of-fit criteria

The findings also highlight limited access to official meteorological early warning systems, further compounded by socio-economic factors. More studies are recommended in the study area to establish a causal link between climate change and disease occurrences, and intervention from the government in the form of prevention and control programmes should be vigorously implemented

Conclusion and Future Work: This study contributes valuable station-specific evidence regarding the impact of climate change on malaria prevalence. This study shows that models of a climate–malaria link varied from place to place, and one model could not fit all locations.

298 TRACK C: Digital Health for Climate Change Mitigation and Enhanced Adaptation Response

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Background: The intersection of digital health technologies and climate change presents a unique opportunity to mitigate environmental impacts while enhancing health system responses to climate-related challenges. Digital health innovations offer potential for reducing healthcare's carbon footprint (health sector global GHG emissions are between 4.4% and 5.2%), improving access to care, and strengthening resilience against climate-induced health threats. This paper examines the role of digital health in climate change mitigation and adaptation. It explores how digital tools can contribute to reducing greenhouse gas emissions in healthcare and enhancing the sector's capacity to adapt to the health impacts of climate change.

Methods: A systematic review of existing digital health interventions was conducted, focusing on their application in climate change mitigation and adaptation. The study also included case studies from diverse geographical regions to assess the effectiveness, scalability, and sustainability of these interventions. The analysis covered telemedicine, electronic health records (EHR), mobile health (mHealth) applications, and remote monitoring technologies, among others.

Digital health technologies can significantly contribute to both climate change mitigation and adaptation. Key contributions include:

1. **Carbon Footprint Reduction:** Telemedicine and digital consultations reduce the need for patient travel, thereby lowering the carbon emissions associated with healthcare delivery.
2. **Resource Efficiency:** EHRs and digital workflows minimize paper use and optimize resource allocation.
3. **Enhanced Adaptation:** Digital health tools enable rapid data collection and analysis, improving the ability of health systems to monitor, predict, and respond to climate-related health emergencies.
4. **Improved Access to Care:** mHealth applications and remote monitoring systems extend healthcare access to vulnerable populations in climate-affected regions, enhancing overall resilience.

Conclusion: The study finds that digital health represents a critical component in the dual agenda of climate change mitigation and adaptation. By integrating digital tools into healthcare systems, it is possible to reduce environmental impacts while simultaneously enhancing the capacity of health systems to respond to the growing challenges posed by climate change. Policymakers and health practitioners must prioritize the adoption and scaling of digital health innovations to achieve low-carbon, sustainable, and resilient healthcare systems.

Keywords: digital health, climate change mitigation, adaptation, telemedicine, electronic health records, mHealth, remote monitoring, healthcare sustainability, climate resilience.

446 TRACK C: Flood Exposure and Utilization of Maternal and Child Health Care Services in Zambia

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Background: Zambia experiences recurring seasonal floods, which have been exacerbated by climate change, leading to increased frequency, intensity, and magnitude of these events. These floods pose significant challenges to the utilization of maternal and child health (MCH) services, particularly affecting pregnant women and children. This study investigates the relationship between flood exposure and the utilization of MCH services in Zambia, focusing on postnatal visits, the frequency and timing of antenatal care (ANC) visits, skilled birth attendance, and access to family planning services.

Methods: We utilized georeferenced data from the Zambia Demographic Health Survey (DHS) conducted in 2013/14 and 2018, integrated with geospatial flood data from the MODIS (Moderate Resolution Imaging Spectroradiometer) for the period 2013 to 2019. The MODIS data were used to identify the occurrence, extent, and duration of flood events. Multilevel logistic regression models were employed to assess the association between flood exposure and various MCH outcomes.

Results: The analysis shows that flood exposure significantly reduces the odds of accessing family planning services, with both partial and high exposure having a negative association, and higher exposure showing a stronger effect. However, the study found that neither partial nor high flood exposure significantly affects the odds of accessing skilled birth attendance, the timing and frequency of ANC visits, or postnatal services.

Conclusion/Implications: These findings suggest that the reduced utilisation of maternal and child health services in flood-prone areas may be more attributable to the underlying socioeconomic and demographic characteristics of these regions and their populations rather than the direct impact of flood exposure itself. This implies that interventions aimed at improving access to maternal and child health services in flood-affected areas should also address these broader contextual factors. The study also highlights the need for targeted interventions to mitigate the impact of floods on MCH service utilisation and to improve maternal and child health outcomes in the context of increasing climate variability.

417 TRACK C: Health system resilience to climatic hazards: Case of cyclones in Madagascar

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Introduction and Rationale: Madagascar faces significant climatic hazards, with annual cyclones (at least 2 per year) affecting thousands of people and causing up to 4% of GDP damage. These cyclones damage health infrastructure, hinder healthcare access, and increase the risk of vector-borne and water-borne diseases like diarrhea, malaria, and respiratory infections . Mitigating these effects is crucial to ensure quality care and prevent further damage to the health sector.

Objective: This study aims to demonstrate the effectiveness of preparedness, anticipatory action, and response measures in the face of cyclones in Madagascar. It identifies successes and gaps in interventions over the last three years and formulates recommendations to improve the healthcare system's resilience to the effects of climate change.

Case description: The case study analyzes the preparatory, anticipatory, and response actions put in place and implemented by the government of Madagascar and technical and financial health partners, notably UNICEF, to deal with the climatic shocks in 2022 throughout the East and South-West of the country.

Discussions and recommendations: Tropical cyclones severely affected Madagascar's Northeast, East, Southeast, and Southwest regions, affecting a total population of 571,100 in 2022. Cyclones Batsirai and Emnati and storms Ana and Emnati rendered 249 health facilities

non-functional, causing considerable damage to health infrastructure and significantly deteriorating healthcare access.

Attending to communities affected by the cyclones and storms, interventions targeted young people aged 0–18 and pregnant women and aimed at ensuring continued access to healthcare services. The interventions covered three main phases: i) preparation, assessment of the situation, and immediate interventions; ii) interventions to save lives and restore essential healthcare services; and iii) rebuilding/reconstructing better for sustainable access to services.

Analysis of the intervention reports shows that preparatory, anticipatory, and response actions played a crucial role in the health system's resilience.

Raising awareness and building the capacity of front-line healthcare staff have improved their ability to manage the situation before, during, and after successive cyclones. However, the coverage of these actions remains inadequate and heavily dependent on financial resources.

In addition, rehabilitating health infrastructures to make them more resistant to climatic hazards, particularly with anti-cyclone standards and anticipatory measures to shelter equipment and inputs, has helped reduce material damage and ensure the continuity of services in hard-to-reach areas. However, several health facilities remain vulnerable due to limited financial resources.

While emergency response planning, coordination among various stakeholders like the government, NGOs, and communities, and the early deployment of contingency teams and stocks have facilitated swift and more effective responses, other significant challenges, including the fragmentation of efforts, weak stakeholder coordination, and logistical difficulties, must not be overlooked.

Conclusion: To re-establish access to healthcare in cyclone-affected areas of Madagascar, it is important to increase investment in cyclone-resistant healthcare infrastructure and to systematize capacity-building and awareness-raising among healthcare staff and communities about climate change hazards. On the other hand, it is vital to implement coordination mechanisms involving diverse stakeholders and logistical mechanisms to guarantee the supply of medicines and services in remote and isolated areas.

119 TRACK C: Local government policies and strategies addressing climate change and health in Harare, Zimbabwe

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Local government policies and strategies play a pivotal role in mitigating the adverse health impacts of climate change in an urbanscape like Harare. This study explores the policies and strategies landscape implemented by the Harare City Council (HCC) to address climate change and its implications for public health. Harare faces increasing challenges due to climate change, including erratic rainfall patterns, heat waves, and the heightened risk of vector-borne diseases. Despite growing awareness of climate change's impacts on public health, the effectiveness and implementation of these policies remain underexplored, and there is a lack of comprehensive understanding regarding their outcomes, challenges, and impacts on enhancing resilience against climate-related health risks. Key issues include the integration of climate considerations into urban planning, the resilience of healthcare systems to climate-related health emergencies, public awareness and education campaigns, and collaboration with stakeholders to ensure inclusive and sustainable responses. The main research question is "How do HCCs policies and strategies address the intersection of climate change and public health, and what are their impacts on enhancing resilience and mitigating health risks?" Three sub-questions follow: 1) What challenges does the HCC face in implementing and evaluating its climate change and health policies and strategies? 2) How effective are the current public awareness and education campaigns in addressing climate-related health risks? 3) What specific measures can HCC take to enhance collaboration and promote sustainable practices for climate resilience and health equity? Understanding these dynamics is crucial for developing targeted interventions and enhancing resilience. The study employs a mixed methods approach. The population includes community representatives, residents, environmental officers, HCC officials, healthcare administrators, international organisations, NGOs, and urban planners, The qualitative phase includes a literature review, and semi-structured interviews to explore perceptions, challenges, and implementation processes. The quantitative phase has residents' surveys to assess awareness levels, perceived impacts, and behavioral responses. Informed consent, confidentiality, and research ethics approval are obtained before data collection. Local government initiatives focus on urban planning. Emphasis is on the integration of green infrastructure to mitigate urban heat islands and enhance air quality. Secondly, efforts to ensure water and sanitation resilience are prioritised, encompassing water conservation measures and improved water quality

management systems to combat waterborne diseases exacerbated by climate variability. Thirdly, the healthcare system is bolstered through enhanced emergency preparedness and capacity building to manage health crises triggered by extreme weather events. Harare should strengthen the integration between climate and health policies, through public engagement and education that fosters community resilience and sustainable practices., enhancing collaboration with diverse stakeholders that bolster efforts towards achieving climate resilience and health equity. This study underscores the importance of integrating climate change considerations into health policies, promoting resilience, and advancing the sustainable development agenda in Harare toward enhancing resilience and safeguarding public well-being amidst evolving environmental challenges. Continuous research and data collection inform evidence-based decision-making and adaptation strategies to emerging climate impacts. By prioritising these actions, HCC can effectively mitigate climate-related health risks and build a more inclusive, resilient, and sustainable city for all residents.

299 TRACK C: The Cost of Inaction: Perspectives of persons living with disabilities on the health-related hazards of Climate Change in Sub-Saharan Africa

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The Cost of Inaction: Perspectives of persons living with disabilities on the health-related hazards of Climate Change in Sub-Saharan Africa

Belinda A. Lare

Background: Climate change disproportionately impacts the world's poorest and most vulnerable populations, including the 20% of people with disabilities, majority of whom live in rural communities and are women and girls who face compounded disadvantages. Emerging research shows that disabled individuals are at highest risk from the increasing health hazards created by climate change and natural disasters. However, persons living with disabilities is currently not mainstreamed in climate discussions. Persons with disabilities should be fully involved in climate change adaptive measures. Multisectoral locally led adaptation measures to reduce the adverse health impacts of climate change on persons with disabilities are urgently needed. This abstract presents some of the codesigned solutions by various African stakeholders having explored the opportunities and challenges and highlighting that addressing the health hazards of climate change for persons with disabilities ensures equitable adaptation, enhances resilience and upholds human rights while supporting climate goals.

Methods: Several regional workshops were organized with a wide range of stakeholders and policymakers in 2023 to highlight and address the disproportionate health impacts of climate change on persons with disabilities, explore opportunities for their involvement in climate solutions and build resilience in their communities. The stakeholders involved in the codesign process were from a range of services and community organisations, persons with disabilities and disability rights advocates, civil society and health practitioners' representatives from different disciplines. Policymakers were from different sectors of the government including health and environment.

Results: Interventions proposed illustrated how the integration of disability-sensitive measures into climate policies and programmes provides impairment-specific accommodations to reduce effects of climate change. Further interventions included, awareness raising on the rights of persons with disabilities and support for the inclusion and empowerment of disabled people.

Conclusion: This work underscores the disproportionate connection between health impacts of climate change on persons with disabilities. The literature and opinions of vulnerable members of communities living with disabilities especially women and girls provide further justification for urgent and ambitious locally led adaptation policy and interventions to strengthen their resilience and adaptive capacities.

8 TRACK C: Climate Change and Mental Health Linkages in National Climate Policy – Gaps and Challenges

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This evidence synthesis and policy review aims to explore the relationship between climate change and mental health. It begins by delving into a rapid evidence synthesis of specific individuals and communities most vulnerable to the mental health implications of climate change. These groups include marginalized communities, low-income populations, indigenous peoples, and other socially disadvantaged demographics. As a second step towards contextualizing the environmental policy action needs, this synthesis extends to scrutinize the National Determined Contributions (NDCs), with a particular focus on targeted UN Nation States highly susceptible to climate change. The objective is to assess the integration of

mental health considerations, especially those impacting vulnerable groups, within the broader climate policies of these nations. Additionally, the review seeks to evaluate the strategies and measures that nations are willing to implement in addressing mental health concerns in the context of climate change. Climate change is a crucial consideration in environmental action due to its global impact on ecosystems, biodiversity, extreme weather events, and resource availability.

The impact of climate change on mental health is not uniform. Vulnerable populations, including women, the elderly, children, individuals with pre-existing psychiatric conditions, those with limited income and social networks, and indigenous communities, bear a higher risk of developing psychopathologies in response to climate change (Cianconi, P. et al., 2020). These disparities underscore the need for targeted interventions and support systems.

Looking at the NDCs, while health considerations play a vital role in some nations' climate policies, there is room for increased focus and emphasis, especially given the far-reaching and complex interplay between climate change and public health. Indeed, despite these positive developments, it is essential to acknowledge that health is not always a primary focus in these climate policies. Often, the emphasis remains on sectors like energy, agriculture, and forestry. Plus, to ensure that climate action efforts are equitable and inclusive, there is a need to consider vulnerable groups and populations.

In light of these findings, it appears that there is an opportunity to expand the involvement of economists and policy experts in this field. A more diverse and inclusive perspective could enrich the discourse and lead to a more comprehensive understanding of the complex interactions between climate change and mental health.

545 TRACK C: A women-led Approach to Building Climate Resilient Primary Health Care systems in Uganda; the HOPE-LVB Project Model Household Approach.

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Introduction and Rationale: With an average population density of 250 people per square kilometer and annual population growth rate of 3.5%, the Lake Victoria basin is home to over 40 million people. Besides Kenya, the basin countries, including Uganda are among the poorest in the world, majority of the population living on less than $1.25 per day. Consequently, there is high reliance on unsustainable livelihood practices leading to deforestation, floods, drought, poor water quality, death of fish and poverty resulting from the changing climate, risking human and environmental health. The impacts disproportionately affect women. Women face greater risks and carry a heavier burden in relation to their ability to respond and adapt to climate change due to the inequalities they face in the patriarchal society. According to UN Environment, 80% of people displaced by climate change are women or girls facing heightened risks of poverty, violence, or unwanted pregnancies.

The Aim of this case study is to analyze the importance of using integrated Population, Health and Environment (PHE) approaches to mitigate climate change impact on women and girls' access to Primary Health Care (PHC) services. We seek to determine 'How effective women-led climate resilience interventions are in improving peaceful co-existence between people, the environment and access to essential PHC services'

Description of the case: Pathfinder, a global leader in sexual and reproductive health (SRH), with support from the Packard, and MacArthur Foundations, as well as USAID, led Partners to pilot a women-led climate resilience "Health of People and Environment on the Lake Victoria Basin (HOPE-LVB) project", positioning women to take charge of social, economic and environmental barriers to accessing PHC and SRH in a patriarchal society, while strengthening systems to deliver uninterrupted services between 2011–2019.

Designed to promote health, conservation, population practices and behavior in the community, Model Households were supported to demonstrate standards that promote healthy environments, serving as role models to others, exhibiting positive behaviors, like practicing sustainable agriculture, resource planning, adopting environmentally friendly livelihoods, prioritizing reproductive health and family planning, and investing in clean water.

Consequently, 782 model households were trained, 616,491 trees planted, 17,319 energy-efficient cookstoves and 4,481 latrines constructed, and 70 beach management units skilled to improve fish production and nutrition using energy conserving approaches. 61.2% of model households discussed the number and timing of children with a spouse or partner as compared to 27.0% of other households, and skilled birth deliveries increased from 150 to 610 annually in the project areas.

Recommendations and Conclusion

- As significantly affected parties, women are committed change agents in their communities, promoting simple context specific, climate conserving interventions for improved community health.

- Integration is key; programs should focus on the community health worker to offer integrated information and services across health and climate using participatory community engagement approaches.

- By integrating climate and health, the PHE model demonstrates reinforcing behaviors/practices that help families to develop in multidimensional ways.

35 TRACK C: Parkers Resilient Health: Enhancing Climate Adaptation in Telemedicine for Flood-Prone Communities in Onitsha, Nigeria

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1. **Introduction and Rationale:** Parker's Resilient Health project (1,2) addresses the escalating public health challenges posed by climate change in flood-prone regions of Onitsha, Nigeria. With increasing frequency and intensity of floods, there is a heightened risk of waterborne diseases, vector-borne diseases, and disruptions in healthcare services. The project leverages telemedicine to provide continuous healthcare services, ensuring that communities are better equipped to confront climate-related health hazards. Previous studies have highlighted the vulnerabilities of these communities but have not fully explored the integration of digital health solutions in climate adaptation.

2. **Aims:** The primary aim of Parkers Resilient Health is to enhance the climate resilience of healthcare delivery systems in Onitsha by implementing telemedicine services. The specific questions addressed include:

- How can telemedicine improve healthcare access and delivery during climate-related disasters?

- What are the best practices for integrating telemedicine into existing healthcare systems to enhance climate resilience?

- How effective are telemedicine interventions in reducing the health impacts of flooding in vulnerable communities?

3. **Description of the Case**: The study was carried out in Onitsha, a region prone to severe flooding. The methodology included a mixed-methods approach combining quantitative data from telemedicine usage logs and qualitative data from community surveys and interviews with healthcare providers and patients.

4. **Data Collection Methods. Quantitative Data:** Usage statistics from the telemedicine platform, including the number of consultations, types of health issues addressed, and response times.

Qualitative Data: Surveys and interviews with community members and healthcare providers to assess satisfaction, challenges, and perceived benefits of telemedicine services.

5. **Findings: Increased Access:** Telemedicine significantly increased healthcare access during floods, with a 40% increase in consultations during flood periods compared to non-flood periods.

Disease Surveillance: The platform enabled real-time monitoring of disease outbreaks, facilitating prompt public health responses.

Community Engagement: High levels of satisfaction were reported among users, with 85% of surveyed individuals indicating that telemedicine improved their ability to receive medical care during floods.

6. **Discussion:** The study demonstrates that telemedicine is a viable and effective tool for enhancing the resilience of healthcare systems in flood-prone areas. The ability to provide continuous care despite physical barriers helps mitigate the health impacts of climate-related disasters. However, challenges such as technology literacy, infrastructure stability, and internet access need to be addressed for broader implementation.

7. **Recommendations: Capacity Building:** Train healthcare workers and community members on the use of telemedicine platforms to ensure effective utilization.

Infrastructure Investment: Improve internet connectivity and power supply in vulnerable areas to support telemedicine services.

Policy Advocacy: Engage policymakers to incorporate telemedicine into national and regional disaster response plans.

Scalability: Expand the telemedicine model to other flood-prone regions, leveraging lessons learned from Onitsha to refine and improve the approach.

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478 TRACK C: Strengthening Urban Health Resilience: Evaluating Adaptation Interventions for Climate Change in Budiriro, Harare

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Zimbabwe, and particularly in High-Density residential areas in its capital city Harare, continue to face significant challenges due to climate change, including increased frequency of extreme weather events, shifting disease patterns, and impacts on water and food security. Climate change refers to significant and lasting changes in the average temperature and weather patterns of the earth's climate over an extended period, typically decades to centuries. This study examined adaptation interventions and strategies aimed at building climate-resilient health systems in Budiriro. Utilizing a range of qualitative research methodologies, including case studies, key informant interviews, interviews with local stakeholders, and analysis of climate and health data, the research identifies key adaptation measures and evaluates their effectiveness. The study gathered that key interventions include the development of early warning systems for climate-sensitive diseases like malaria and cholera, enhancement of urban infrastructure to withstand floods and heatwaves, and the implementation of community-based health programs to increase local resilience. The study also highlights the importance of integrating climate risk assessments into health policies and fostering collaboration between government agencies, civil society organizations, funding partners. Findings indicate that while significant progress has been made, challenges such as resource constraints and limited public awareness persist. Recommendations emphasize the need for sustained investment in health system infrastructure, improved climate data integration, and greater community engagement to effectively build resilience against climate change impacts. This research provides a comprehensive overview of adaptation efforts in a high-density area of Budiriro and offers insights for other urban settings facing similar climate-related health challenges.

Key words: Strengthen, Climate Change, Urban Health Resilience, Adaption Interventions, Zimbabwe

96 TRACK C: The Role of Urban Ecological Infrastructure in Climate Change Adaptation: A Case of the City of Johannesburg, South Africa

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This study evaluated how Urban Ecological Infrastructure (UEI) could be used for climate change adaptation in the City of Johannesburg (CoJ) Metropolitan Municipality. The objectives included analysing climate variability trends from 1993 to 2023, assessing the planning and implementation of UEIs from a municipal perspective, and proposing a best-fit model for integrating UEIs into climate adaptation strategies. Climate justice and complex systems theories influenced the study. The integration of these two theories allowed for an intricate assessment of the climate effects within the study area. The study employed a pragmatic paradigm and a convergent parallel mixed-method design. The ClimPACT v3.1.6 software was used to analyse daily temperature and rainfall data from 1993-2023 obtained from the South African Weather Service. Additionally, 16 stakeholder interviews and a review of 11 institutional documents were conducted to highlight the planning and integration of UEIs as a climate adaptation tool. The i-Tree Canopy Model was utilized to assign economic values to UEI-provided ecosystem services. The results indicated increasing climate variability, with minimum and maximum temperatures rising by 0.03°C and 0.025°C, and annual precipitation increasing by 5.407mm. The interviews and document review revealed a significant gap between institutional plans and implementation, with climate change not being fully prioritised institutionally. The findings highlighted escalating climate trends in the CoJ and emphasised the need for effecting climate adaptation strategies. Bridging the gap between planning and execution of UEI initiatives is crucial for climate impact adaptation in the city.

Keywords: Urban Ecological Infrastructure, climate variability, climate adaptation, ecosystem services, climate justice.

502 TRACK C: Lessons on Strengthening Health Equity, Climate Resilience, and Informal Livelihoods from Masvingo, Zimbabwe

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Introduction and rationale: The informal economy is vital to many African cities, including in Zimbabwe, but there is limited attention to the climate-related and other risks facing urban informal workers. In 2019, almost 80% of Zimbabwe's employment was informal. Climate change is already increasing the severity and intensity of heatwaves, drought, and flooding in Zimbabwe, all of which may undermine informal workers' precarious livelihoods. Climate-related threats will also interact with other challenges facing informal workers such as hazardous living conditions, limited social protection, and gendered inequalities.

Aims: We seek to demonstrate that climate change is a major, cross-cutting concern that is already affecting informal workers' health and livelihoods in Zimbabwe. We also examine urban informal workers' responses, priorities for change, and emerging collaborations to foster health and climate resilience. In our key contributions, we explain how recent bottom-up strategies and government partnerships with these labourers can foster equitable solutions that can tackle multiple risks. Finally, we aim to encourage multifaceted studies of informal workers' health and inform inclusive strategies that can address their array of occupational, public health, and climate-related challenges.

Description of Case: Drawing upon recent action-research, our study in Harare (population 2.4m) and Masvingo (urban population 207,000) focused on informal waste-pickers and urban agriculture workers, alongside workers' access to water as a cross-cutting theme. From 2019-2022, we analysed the occupational, environmental, and climate-related health threats facing informal workers in the two cities. Our mixed-methods approach included surveys (N=418) and focus group discussions (N=207) with workers in both cities. Furthermore, we will explain how grassroots-led approaches and partnerships were developed in Masvingo. A 'Champions Team' comprised of informal workers and a Memorandum of Understanding (MOU) signed with Masvingo's local authority have led to co-created solutions with benefits for health, climate resilience, and livelihoods. We will explain how these initiatives emerged, as well as remaining challenges and opportunities for further interventions.

Discussion and Recommendations: Holistic responses will need to address the climate-related and other health concerns facing informal workers in African cities. Responses must extend beyond top-down formalisation strategies to promote workers' rights and address their priorities. It will be vital to strengthen people-centred health systems and tailored health promotion strategies to informal workers' complex needs. Zimbabwe's health clubs could be key sites for social dialogue, enhanced information flow, and bolstered capacities to address climate change. Drawing upon the case study findings and local priorities, we recommend a set of multi-sectoral, co-produced strategies that can simultaneously promote health and resilient livelihoods.

Disclosure of Interests: We declare that we have no conflict of interests and the above is original research. It was funded by the UK's National Institute for Health Research, Global Health Research Group 17/63/145

36 TRACK C: Community Voices on Climate Change Communication – A South African Perspective

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Lives, homes and livelihoods have all succumb to the effects of climate change. Developing countries such as South Africa experience enhanced climate impacts due to their social determinants. Communities must be empowered with knowledge to understand the concept and tools needed to adapt to the changing climate. This paper provides a platform for the community voice, to understand their knowledge and experiences of climate change and the needs of communities regarding climate change communication. There is a gap in literature particularly in the African context regarding climate change communication for the public. A plethora of studies have been conducted that evaluate the methods used to communicate climate change information or the type of information that is shared with communities however there is a scarcity of research in how different strata of community would prefer communication to take place. Therefore, this study provides community members' perspectives from the different sectors within the eThekwini Metropolitan Municipality in Durban, South Africa.

A qualitative methodological approach was used for the collection of data. Participants comprised of community members of varying demographics, educational and socio-economic backgrounds. Participant group selection was stratified according to the main sectors within South Africa i.e. rural, urban, peri-urban and informal settlements. A sample of six participants were selected from each of the four sectors. A total of twenty-four one-on-one interviews were conducted with members of the community at their homes or community centers. Interviews were transcribed and thematic analysis was conducted to determine recurring themes within the responses.

The findings demonstrated that the public has a basic knowledge of climate change. They have heard of the concept and were able to describe the effects of climate change. This information was gained from radio talks and local news but largely from their observations and experiences of the environment over the years. Community members highlighted the lack of information from local government and welcomed such information to educate them further on the topic. Climate change communication preferences across the urban and peri-urban sectors were similar. Respondents of the older age category prefer reading about climate change in local newspapers with majority of participants mentioning social media as the most effective mechanism of climate change information sharing. Communication preferences among respondents in the rural and informal sectors also reflected similarities. Community talks and radio were the most common approaches mentioned for receiving information on climate change.

The findings are of great significance for local government and those involved in dissemination of scientific information to the public. Climate change undeniably affects communities. Communicating climate change in an effective manner that can build resilience and adaptative behavior is key in the selection of communication methods used. Public communication on climate change is not a one-size for all approach. Communication strategies should be designed based on the voices of the community for it to be effective rather than an approach that is imposed on the public.

326 TRACK C: Heat adaptation intervention in Burkina Faso: Analysis of acceptability to health professionals, pregnant women and mothers

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Introduction: Building climate resilience requires basic and applied research to reduce uncertainty about how local conditions may be affected, better understand local solutions and capacities, gather evidence and strengthen decision-making. This paper presents an evaluation of the implementation process of a global warming adaptation intervention in Burkina Faso and the lessons learned.

Method: The intervention, developed through a co-design process, was implemented over a 6-month period (May-November 2022) in communities and health facilities in Ouagadougou. Data were collected in February 2023 in the intervention site (wemtenga) and in a control site that did not receive the intervention (Dassasgho): 50 in-depth individual interviews with pregnant women (n=15), post-partum women (n=15), health professionals and community health worker-ASBC (n=20), 6 group discussions with 40 community members. Thematic analysis was guided by the Consolidated Framework for Implementation Research (CFIR) (Damschroder, 2022).

Results: Health professionals and ASBCs integrated messages on heat, dehydration and exclusive breastfeeding into their routine activities with pregnant and postpartum women, as well as strategies for coping with discomfort. Educational talks in the community and in health facilities, interpersonal exchanges in the consultation room, and video broadcasts on a television set in the waiting room were all used to educate women about best practices and strategies for mitigating the effects of heat on maternal and neonatal health. Health professionals prefer audiovisual broadcasting, as it does not increase their workload. Women prefer direct exchanges with health professionals and ASBCs, which are learning moments, allowing them to ask questions. Previous experience of working with NGOs on vertical interventions influenced the expectations of health professionals for financial compensation. Some perceived the intervention as an additional activity outside the program.

Conclusion: Integrating heat adaptation activities into health facilities' action plans, alongside existing maternal health activities, will encourage implementation. The national strategy for maternal, newborn and child health/ nutrition needs to be revised to incorporate adaptation to the impact of extreme heat.

557 TRACK C: Accelerating action on heat and health: mapping key stakeholders in the African Region

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Background, rationale, and objectives: Increasing global temperatures are causing additional burdens on morbidity and mortality and exacerbating extreme heat exposure in urban and rural populations across Africa. The Global Heat Health Information Network (GHHIN) aims to support local and national action to reduce the impacts of heat on health and wellbeing, including heat early warning systems, public health measures and sustainable cooling interventions. The aim of this project is to map out key stakeholders involved in managing heat risks in Africa with the goal of setting up a network in Africa.

Methods: The mapping exercise involved 1) rapid review of literature, 2) review of current funded research projects heat and health in the Africa region, 3) review of heat health action planning and other relevant policies, and 4) key informant interviews. Ethical approval was given by the London School of Hygiene and Tropical Medicine, Ref 31197.

Results: More than 27 research projects were identified that either describe heat risks to health or developed heat-health interventions. There was an uneven distribution of research, with West Africa having most research, and no projects were identified in Central Africa. Research addressed a variety of topics, including heatwave early warning (n=9); community health interventions (n=6), urban heat (n=5) and housing interventions (n=4). There is limited research on managing occupation heat risks (n=1). There was a lack of research on heat risks in older persons, and in rural populations. There has been considerable progress in developing heat wave alerts and warning systems at the national level. To date, only one country has published a national Heat Health Action Plan (South Africa). Results for the stakeholder mapping will be presented.

Conclusion and policy implications: Managing heat risks to protect health is becoming of increasing importance in West and Southern African regions. There remain gaps in generating evidence that is locally relevant, and there is a need to accelerate action to address heat risks.

103 TRACK C: An Assessment of Perceptions, Responses Mechanisms and Communication of Urban Heat Health Risks among Residents in Kampala City

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Globally, climate change is intensifying heat waves, posing a growing threat to human health. This issue is exacerbated in rapidly urbanizing cities like Kampala, where inadequate infrastructure and environmental management amplify heat risks. Consequently, residents, particularly vulnerable groups such as infants and the elderly, face heightened risks of heat-related illnesses including hypertension, headaches and heat exhaustion. Despite existing research on urban heat in Kampala, further investigation is crucial to understand the specific health risks posed to residents, especially given limited communication and the strain on the city's health care system. This study therefore, examined perceptions, response mechanisms and communication regarding heat -related health risks among residents of Kampala City's Makindye Division in the Parishes of Kibuye 1, Kibuye 2, Makindye 2. A mixed methods approach was employed using Surveys, Key Informant Interviews and Focus Group Discussions were conducted. Quantitative and qualitative analysis was run and findings reveal a strong link between socio-economic factors like age, type of housing and heat risk perception, with fluid consumption being the most common coping mechanism. While radio and television emerged as primary communication channels for heat health messages, the study highlights variations and gaps in awareness and information dissemination, emphasizing the need for targeted interventions and communication strategies for policy and practice at national, City and community and individual levels.

571 TRACK C: Weathering Climatic Change: Improved HIV Patient Outcomes through Community Based ART distribution models in Matabeleland South

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Background: By 2024, Zimbabwe has attained the 95-95-95 targets, with 96% of PLHIV knowing their HIV status, 99% on ART, and 96% achieving viral load (VL) suppression. To sustain VL suppression, patient-centered direct service delivery (DSD) models are critical through ensuring continuity-of-treatment, especially in Matabeleland South, a region characterized by extreme heat, frequent droughts, and long distances to health facilities. This includes the innovative out-of-facility community ART distribution (OFCAD) model, which brings ART services closer to ART clients in the community, especially given the current drop in acceptable food consumption patterns from 70% in 2023 to 50% in 2024 due to the El-Nino induced drought.1 However, this model has not assessed to determine if viral suppression rates are comparable to standard-of-care (SOC) facility-based ART refill among stable clients.

Methods: This model involves localized community distribution of pre-packed ART medicines closer to eligible clients through identified community health workers stable clients on ART for >/= 6 months. The rollout of the OFCAD commenced in May 2022 and to date there are 5,028 ART clients in this model across 70 health facilities. To assess the OFCAD model's effectiveness, data were collected from January-December 2023 across nine facilities in six districts of Matabeleland South. Patient-level data were captured using ODK software, exported to for analyses in Stata. The study compared client characteristics, retention-, VL suppression-, and tuberculosis (TB) screening- rates between clients in the OFCAD versus SOC facility-based ART-refill models.

Results: Of the 666 clients, 68% were female, with a median age of 46 years (IQR, 37-54). The OFCAD model demonstrated higher retention rates (96.1% vs. 92.3%, p=0.46) and viral load suppression rates (99% vs. 97.8%, p<0.05) although TB screening rates were slightly lower (84.1% vs. 85.2%, p=0.02). Notably, the average walking distance to the OFCAD site was shorter (5 km vs. 10 km) compared to health facilities.

Conclusions and Recommendations: Retention and VL suppression rates were higher in the OFCAD model compared to facility-based care. This validates the importance of bringing services closer to the community which simultaneously reduces clients' exposure to climate-induced harsh weather conditions, thus leading to better patient outcomes.

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534 TRACK C: Participatory Stakeholder Mapping of Heat Adaptation and Mitigation Interventions in Mt. Darwin, Zimbabwe: Lessons Learnt

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Introduction and Rationale: Project HIGH Horizons (Heat Indicators for Global Health) and Project HAPI (Heat Adaptation for Pregnant Women and Infants) aim to develop interdisciplinary, multilevel, and multistakeholder-informed heat adaptation and mitigation interventions. These interventions address the adverse health impacts of extreme heat on postpartum mothers, newborns, pregnant women, and healthcare workers. However, little is known about what is feasible, acceptable, cost-effective, and affordable in rural Africa. We describe the processes and lessons learned in identifying stakeholders ahead of co-design workshops to develop heat adaptation and mitigation interventions in rural Zimbabwe.

Aims: This study aimed to identify key stakeholders to participate in the co-design process for the HAPI and High Horizon projects developing a comprehensive list of stakeholders for community, health system and policy co-design workshops, that would lead to interventions that are feasible, acceptable and cost effective.

Description of the Case: We purposively selected 30 diverse stakeholder representatives from national, subnational, and community levels in Zimbabwe, including health service delivery, policy, climate action, community decision-making, women and men, state and non-state actors, funders, and universities, to ensure comprehensive stakeholder mapping. At a participatory stakeholder mapping workshop, attendees identified key stakeholders for adaptation and mitigation interventions targeting women, infants, and the health workforce. We utilized insights from formative research findings and employed participatory tools to facilitate discussions on identifying stakeholders.

Using the "Crossing the River" participatory tool, participants listed stakeholders crucial for developing adaptation-mitigation interventions, resulting in 167 actors. Participants categorised stakeholders into three groups: Community (individuals, households, and community-level), Health Care Systems (health care workers administrators and non-state) and Policy (government officials policymakers, UN representatives, and academics), providing rationales for each categorisation.

Using a "Power Interest Matrix," participants mapped stakeholders into four quadrants: Low Power/Low Interest, Low Power/High Interest, High Power/Low Interest, and High Power/High Interest, based on their perceptions of each stakeholder's power and interest (Picture 1). The four quadrants resulted in n=20 stakeholders in High Power/ High Interest, n=18 in High Power/Low Interest, n=15 in Low Power/Low Interest, and n=18 in High Interest/Low Power.

Discussion and Recommendations: Stakeholder mapping highlighted the importance of engaging a wide range of actors. Using formative research findings and participatory tools like the "Crossing the River" identified 167 key actors. Involving diverse stakeholders in the co-design process ensures interventions address the needs of all affected populations, especially vulnerable groups like pregnant and postpartum women, infants, and healthcare workers. Bringing varied expertise and perspectives, enriches the potential of the intervention design, buy-in and ownership. Categorising stakeholders into Community, Health Care Systems, and Policy groups ensures interventions address both local and systemic issues. Participatory tools like the "power-interest matrix" help identify and map stakeholders, balancing power and interest, managing conflicts, and aligning goals.

Key Lessons:

- **Effective Identification:** Participatory tools accurately identified and categorised stakeholders, ensuring no critical actor was overlooked.
- **Enhanced Collaboration:** The workshop format promoted active collaboration and shared understanding among stakeholders.
- **Strategic Mapping:** The power-interest matrix provided a framework for understanding stakeholder dynamics, essential for strategic planning and intervention development.

389 TRACK C: Strengthening point of entry (POE) surveillance to track early-warning indicators of health conditions linked to climate change

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Background: Emergence/resurgence of infectious pathogens due to climate change has increased the need for robust disease surveillance systems with early-warning indicators of such health conditions. We describe a public health surveillance (PHS) innovation implemented at Eswatini ports of entry (POE) to facilitate symptom screening of travellers.

Program description: ICAP at Columbia University with funding and technical support from CDC/PEPFAR collaborated with the Eswatini Ministry of Health (MOH) to implement this PHS. The MOH provided leadership to establish digitization of collection, tracking and reporting of POE health screening data in 8 priority land and air POEs bordering South Africa and Mozambique. ICAP provided technical support for: 1) stakeholder sensitization for participatory engagement in the design of the PHS; 2) procurement of data collection infrastructure (computers, tablets, passport scanners); 3) complimentary staffing to support existing MOH officers; 4) capacity building, training and mentorship on PHS design and data collection; and 5) data management, analysis, reporting and visualization. The PHS captured data on travellers' demographics, contact details, travel/exposure history, and symptoms for notifiable diseases such as cholera, COVID-19 and other influenza-like illnesses, and yellow fever.

Lessons learned: Since 2022, five meetings soliciting stakeholder inputs on PHS design and implementation

approach were conducted, with >60 participants representing multiple stakeholders. Ten additional environmental health officers (EHOs) were recruited and deployed to the 8 POEs. A total of 39 EHOs were trained on the PHS system, health screening, digital data collection and reporting. Twenty-one tablets were procured and configured to the MOH PHS designated server to facilitate real-time reporting of screening activities. Collaborative regular site supervision and mentorship visits were conducted monthly (total 199 visits to-date). Periodic review of implementation progress and early-warning indicators was conducted in consultation with MOH stakeholders. Across all 8 POEs, 1,492,697 travellers were screened and 2,774 (1%) reported ≥1 symptoms (most commonly cough 1746 (63%), runny nose (499 (18%), headache 526 (19%), diarrhoea 113 (4%), and fever 154(6%).

Conclusion: Through collaborative stakeholder engagement and with electronic innovations, we established a POE PHS system that tracks early-warning indicators of health conditions relevant to the Global Health Security Agenda and those linked to climate change.

MITIGATION ACTIONS AND THE CO-BENEFITS

108 TRACK D: Introducing African-led Innovation to tackle the challenges of climate change in Africa

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Background: Africa faces severe challenges from climate change, including rising temperatures, erratic rainfall, extreme weather events, and sea-level rise, which endanger ecosystems, livelihoods, and socio-economic stability. Africa-led innovation, driven by African communities, organizations, and governments, recognizes the continent's unique context and aims to empower communities to address climate change while promoting economic development, social equity, and environmental sustainability. Agriculture, water scarcity, clean energy access, and sustainable urbanization are critical concerns. Africa-led solutions are necessary alongside global efforts to tackle climate change. This review examines the wide range of African-led innovations in tackling the continent's climate change concerns and proposes recommendations for additional African-led initiatives to continue the fight against climate change.

Methods: We conducted a thorough internet-based literature search on Scopus, PubMed, and Google Scholar, including a snowballing method to identify relevant articles with no limit to publication year. The research covered various types of African-led innovations addressing climate change in Africa. Boolean operators 'OR' and 'AND' were used to combine keywords. The review included articles based on relevance and quality. The authors critically evaluated and summarized the findings using a qualitative synthesis technique.

Results: Environmental challenges like water and air pollution and droughts pose risks to public health, the economy, and social structure. Africa-led innovation leverages local resources and expertise and has yielded successful initiatives, including community-based adaptation initiatives in Ethiopia, Climate-Smart agriculture in Kenya, coastal adaptation in Senegal, forest conservation in Gabon, resilient water management in Tunisia, sustainable urban development in Rwanda, Zai technology, the green revolution in Africa, innovative water technologies in Africa, innovative solar-power energy sources, and traditional agriculture in African countries. Collaboration, financing, policy frameworks, and knowledge sharing are crucial for scaling up Africa-led innovation. Prioritizing sustainable approaches, combining traditional knowledge with modern advancements, and ensuring affordable solar energy solutions in rural areas are essential.

Conclusions: African countries have made significant progress in addressing climate change through locally-driven initiatives, highlighting the importance of local knowledge, resources, and leadership. However, success depends on partnerships among governments, non-governmental organizations, research institutions, and local communities. Adequate financing mechanisms, effective policy frameworks, and supportive institutional environments are also crucial. Knowledge sharing, technology transfer, and capacity-building initiatives can strengthen the impact of Africa-led innovation in tackling climate change challenges. Africa should prioritize sustainable approaches that combine traditional knowledge with modern technology.

Keywords: African-led innovation, Climate change, Challenges, Africa.

265 TRACK D: Assessment of health impacts of climate change mitigation actions in Parakou, Benin: Community health co-benefits analysis in urban context

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This study analyzes the health impacts of climate change mitigation actions in Parakou, Benin, focusing on co-benefits for community health. Through a mixed methodology combining household surveys, environmental analyses, and interviews with local stakeholders, it evaluates how initiatives such as waste management improvement, promotion of sustainable transport, and urban agriculture can reduce greenhouse gas emissions while enhancing urban quality of life.

The results indicate a significant improvement in urban air quality, with a substantial reduction in atmospheric pollutants associated with respiratory diseases.

Additionally, efforts to promote urban agriculture have strengthened food security by increasing access to fresh and nutritious food within the community. This study highlights the crucial importance of integrating climate measures into urban policies to promote public health and bolster urban resilience against growing environmental challenges.

Recommendations include expanding already effective initiatives and fostering collaboration among local stakeholders to maximize long-term benefits for society and the environment. This research illustrates the potential synergies between public health, environmental sustainability, and urban resilience, providing valuable insights to guide future urban interventions and policies in Parakou and beyond.

75 TRACK D: An investigation of the carbon emissions and climate change awareness from Artisanal Small-scale gold mining (ASGM): Zimbabwe, uMzingwane district.

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This study sought to highlight the level of carbon emissions associated with ASGM operations, assess miners' awareness and willingness to reduce their 'carbon footprint', and recommend possible policy measures to reduce the carbon emissions from ASGM in the uMzingwane district in Zimbabwe. Carbon emissions from 50 milling operations in the uMzingwane district were calculated using fuel consumption records from milling managers. CO2 emission factors for the respective fossil fuels were used to compute the carbon emissions of the respective milling operations. 52 miners volunteered to participate in the study on awareness and willingness to reduce their carbon footprint in the study area. The average carbon emissions of ASGM operations in the study area was approximately 6668.76kg CO2 equivalence. Significant differences were found among the different types of operations and it was reported that bare dredge, registered hammer milling operations had the highest average carbon emissions per quarter of 10034.66kg CO2 equivalence (n=15). Bare dredge, unregistered hammer mill operations had the least average carbon emissions per quarter of 2073.92kg CO2 equivalence (n=20). Carbon emissions from stamp mill operations were mainly from compressors, excavators and tractors, and loader backhoe (TLB) equipment used to extract ore from gold-rich deposits. Awareness of carbon footprints was generally poor, however, after a brief introduction to key terms and the undesirable impact of greenhouse gas emissions, there was an almost unanimous willingness to reduce the miners' carbon footprint. Many of the carbon emission reduction strategies posited in the literature were foreign to the miners during the interview process. The majority of miners reiterated the need for extensive education campaigns to bring awareness to policies and laws aligned to their trade in the context of climate change. This, in turn, could have them participate more actively in policy formulation and implementation. Servicing of earth-moving equipment in ASGM operations was also recommended by the interviewees to reduce carbon emissions. The use of artificial intelligence (AI) and machine learning to improve the rate of success in finding mineral deposits was recommended to reduce the carbon footprint of ASGM operations in the study area. Using Autonomous drone technologies to optimize exploration surveillance and remote operations was also suggested.

462 TRACK D: Building the resilience of Lusaka's unplanned Settlements and Investigating the potential of eco-friendly and culturally-appropriate urban planning and Design

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Introduction and Background: The use of Nature Based Solutions in Urban Planning and Design and infrastructure development can reveal numerous benefits for promoting low-carbon and healthy cities. This would also contribute to Human well-being, mitigation and improved mental health for the city, and especially the urban poor inhabitants.

Culturally-appropriate infrastructure development, contributes to the creation of eco-friendly and healthy cities. By incorporating traditional and local building materials and techniques, that reflects and respects local culture and heritage when designing city infrastructure and involving community members in the planning and decision-making process. Cities and Urban Centers that have Low-carbon infrastructure, renewable energy systems, energy-efficient buildings and green architecture are sustainable.

The aim of the study was to determine the extent of the resilience and state of well-being of the urban poor in the informal settlements to the Impacts for Climate Change

Description: The Study was conducted in one of the Informal Settlements of the City of Lusaka, these

settlements are devoid of services and infrastructure, and they are crowded and highly densely populated. The Study was mainly qualitative and observation methods.

Significant findings were as below

These informal settlements should be complimented by access to clean water, sanitation, and hygiene facilities. With communities undertaking sustainable and healthy initiatives that promote physical activity and well-being. In order to reduce greenhouse gas emissions and the City's carbon footprint, improve air and water quality, enhance public health and well-being. Since they are also low income they should be encouraged to use traditional practices that also preserve their Cultural heritage and derive economic benefits and human well-being.

Opportunities exist for redesigning Cities and urban Centers for effective mitigation and adaptation by coming up with deliberate regulation by the city authorities to increase the amount of green spaces and adopting adaptive measures taken into account during planning and design. Deliberate urban planning with nature based solutions will help to reduce air pollution and improving the health status in these poorer neighborhoods with high population densities.

Way forward and recommendations: Urbanization and climate change calls for overarching context-specific actions in the context of urban vulnerability to climate-related hazards and the interaction of the human systems with the environment. Understanding the impact of changes in temperature and precipitation on socio-ecological and socio cultural systems is very key. Insights into the complexity of urban development, social inequalities, economics and politics are needed. The challenges associated with socio environmental fragmentation patterns and vulnerability, and the linkages that contributes substantially to furthering insights into the specifics of 'urban' vulnerabilities to climate-related hazards and human well- being. The greatest challenges for climate change is how to build resilience for the millions of the urban poor who live in the informal settlements and are often excluded from many social and economic development projects.

88 TRACK D: Integrating Biophilic Design in Climate Change Mitigation Strategies: Enhancing Environmental Health In Africa Through Nature-inspired Solutions

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The increasing urgency of climate change mitigation has led to the exploration of innovative approaches to enhance environmental health, particularly in vulnerable regions like Africa. This research investigates the integration of biophilic design principles into climate change mitigation strategies, focusing on how nature-inspired solutions can contribute to environmental health improvements across the continent. Biophilic design, which emphasizes the incorporation of natural elements into built environments, offers a promising approach to not only mitigate the effects of climate change but also to enhance human well-being and ecological resilience. The study employs a comprehensive literature review and case study analysis to explore the intersection of biophilic design and climate change mitigation. It examines the theoretical foundations of biophilic design, including its impact on reducing urban heat islands, improving air quality, and enhancing mental health. The research highlights successful case studies from various contexts where biophilic design principles have been effectively implemented to create healthier and more resilient environments. Additionally, the study analyzes the potential of integrating renewable energy solutions and sustainable building practices with biophilic design to create holistic climate adaptation strategies. Key findings indicate that biophilic design can significantly contribute to climate resilience by fostering environments that support both human health and ecological stability. The integration of natural elements, such as green roofs, urban forests, and water features, not only helps to mitigate the impacts of climate change but also enhances the quality of life for residents. The research also identifies challenges and opportunities associated with implementing biophilic design in diverse African settings, including financial constraints, cultural factors, and policy implications. This study provides valuable insights into how nature-inspired design solutions can be leveraged to address climate change and promote environmental health in Africa. It offers recommendations for policymakers, urban planners, and designers to incorporate biophilic principles into climate action plans and building codes. By aligning biophilic design with climate change mitigation strategies, the research contributes to the development of sustainable and health-promoting environments that support both human and ecological well-being.

Keywords: Biophilic Design, Climate Change Mitigation, Environmental Health, Nature-Inspired Solutions, Urban Resilience, Sustainable Building Practices, Renewable Energy.

25 TRACK D: Food-based dietary guidelines in Africa and their inclusivity of plant-based dietary patterns

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Background, rationale, and objectives: Food-based dietary guidelines (FBDGs) are country-level policies that play a crucial role in shaping national dietary patterns and influencing food systems. They can contribute to achieving multiple Sustainable Development Goals (SDGs), including those focused on hunger, health, and climate change. However, most FBDGs lack information on sustainability, particularly how to avoid overconsumption of animal products for health and environmental reasons. This study examines the state of FBDGs across African countries and analyses their potential for promoting sustainable dietary patterns rich in plant-based food.

Methods: The study design was a state-of-the-art (SotA) literature review, with qualitative analysis and quantitative scoring using the Balanced Food Choice Index scoring system. African FBDGs were collected from the Food and Agriculture Organisation (FAO) online repository and Google search engine between January and March 2024. FBDGs from African countries, which were the latest edition and published from 1995 onwards were included in the review. Guidelines for children and adolescents, as well as other nutrition policies, were excluded. There were no language limitations, and the literature was translated into English where applicable.

Results: This review identified FBDGs from 12 African countries. Compared to a global analysis, African guidelines generally offered less information on plant-based diets. FBDGs from South Africa, Namibia, Benin, Gabon, and Zambia were the most balanced and inclusive of plant-based dietary patterns. A quarter of the African FBDGs addressed the sustainability benefits of plant-based foods or eating patterns. Awareness of plant-based dietary patterns remained limited, with just two FBDGs mentioning vegetarian diets. Five African guidelines suggest plant-based alternatives to meat, milk, or dairy products.

Conclusion/Implications: This study highlights the need for further development of FBDGs across African countries. Effective guidelines can play a significant role in promoting healthy dietary patterns aligned with sustainable food systems. Future iterations of FBDGs in Africa should include more information on balancing healthy plant-rich diets, catering to those who limit animal-source foods for economic and health reasons, environmental concerns, as well as ethical or religious beliefs.

491 TRACK D: Exploration of Kenyan Households Cooking with Electricity and its Impact on the Ecosystem

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Background: Globally, approximately 3 billion people lack access to clean cooking technologies. Traditional cooking methods are extremely inefficient and generate poisonous gases and particulate matter (soot) into the atmosphere, which negatively impact the health of individuals, environment, and climate. In Kenya, the energy mix is highly dominated by the use of solid biomass which accounts to over 67% of the final energy consumption. The expansion of agricultural land coupled with increasing population growth further leads to a significant shortage in wood fuel supply. Therefore, alternative energy sources for cooking must be identified. Electric cooking is one such option that can minimize most environmental and health impacts attributed to the use of biomass for fuel, though it has not yet been embraced as a cooking option by Kenyans.

Objective: The study aimed to evaluate the energy implications of cooking entirely with electricity from the economic, social, and environmental perspectives and a comparative analysis of the different sources of cooking energy in Nairobi, Nakuru, and Kitui.

Methodology: Both quantitative and qualitative research design methods were employed in the study. The proposed methodology is a complete implementation of the cooking diary study protocol version 3.0 which groups the electric cooking process into three phases. Data on the type of fuel used including frequency of use, the type of food cooked, and how long it took to prepare different meals will be captured and documented in cooking diary forms for five weeks. After five weeks of quantitative data collection, the participating households were engaged in informal discussions to get their views and experiences.

Results and Conclusion: The adoption of electric cooking technologies significantly reduce cook time and cost, improves the health of households, ease pressure on forest resources and contributes to climate action.

94 TRACK D: Place and roles of trees in a multifunctional landscape of Africa in a context of climate change

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Trees play a crucial role in contributing significantly to biodiversity, environmental management, and climate change mitigation in sub-Saharan Africa. This review aims to highlight the role of trees in the multifunctional landscapes of sub-Saharan Africa, focusing on biodiversity, multipurpose tree management, climate change mitigation and adaptation, and tree-based approaches to the rehabilitation of degraded landscapes. A systematic literature search on trees in multifunctional landscapes in sub-Saharan Africa between 1985 and 2023 was conducted using Scopus and Google Scholar search engines. In multifunctional landscapes, trees fulfil a variety of functions, ranging from supporting wildlife diversity to income generation through the production of fruit, fodder, wood, and timber. If forest ecosystems are crucial to offset greenhouse gas emissions through carbon sequestration, planting both multipurpose tree species and those more likely suited to a future climate could be seen as a potential adaptation strategy to increase resilience to climate change. Studies confirmed that trees management in multifunctional landscapes has strong potential to reduce climate change impacts and increase resilience through binding both carbon stock (in biomass and soil), and microclimate modification. Tree as key agroforestry component, sustainable agroforestry practices, combined with traditional knowledge, are crucial to address livelihood challenges, exacerbated with climate change effects. In different parts of sub-Saharan Africa, agroforestry systems have been shown to store more carbon than crop lands and create resilient ecosystems that are better equipped to withstand the effects of a changing climate. In Zimbabwe studies reported, carbon accumulation of 26.3 and 25.4 Mg ha-1 in leaves and twigs, respectively in a two-year improved fallow with Acaciella angustissima and Sesbania sesban, while different five-year fallow with rotational woodlots in tobacco growing areas in Tanzania sequestered 11.6 to 25.5 Mg C ha-1. In certain arid regions of the study area, where carbon stocks have declined due to land degradation, planting trees such as Senegalia senegal can significantly increase soil organic carbon. Trees in agroforestry systems are also key players in the rehabilitation of degraded landscapes, regulating run-off water, and maintaining water quality. In response to biodiversity loss and land degradation under climate change, a holistic approach including endogenous knowledges to managing trees in multifunctional landscapes is essential to restore and strengthen the resilience of sub-Saharan ecosystems.

379 TRACK D: Turning the Tide: How Constructed Wetlands Revolutionize Phosphorus Removal from Wastewater to Combat Climate Change.

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Background: Nutrient pollution, particularly phosphorus, is a major environmental challenge contributing to climate change by promoting excessive algae growth. When algae decompose, they release methane and nitrous oxide, potent greenhouse gases. Effective phosphorus management in water bodies is essential, and constructed wetlands have emerged as cost-effective, environmentally friendly solutions. This review investigates the efficacy of various types of created wetlands in removing phosphorus from different wastewater types, addressing nutrient enrichment in freshwater bodies.

Methods: A comprehensive literature search was conducted across databases like Web of Science and Google Scholar, focusing on studies with annual phosphorus removal data and including those extending beyond one year. Spatial analysis of phosphorus loading mapped the distribution of phosphorus concentrations in wetlands and surrounding areas, identifying hotspots and trends. An efficiency assessment analyzed the spatial variation in phosphorus removal across different wetland types: Floating Treatment Wetlands (FTWs), Submerged Treatment Wetlands (STWs), Horizontal Sub-Surface Flow Wetlands (HSSFs), and Vertical Sub-Surface Flow Wetlands (VSSFs).

Results: Submerged Treatment Wetlands (STWs) exhibited the highest phosphorus removal efficiency, averaging 80.19%, attributed to their high hydraulic retention time (HRT) and low hydraulic loading rate (HLR). FTWs and HSSFs showed significant effectiveness with average efficiencies of 67.53% and 67.03%, respectively, though they were affected by seasonal variations and

less efficient with industrial waste. VSSFs had an average removal efficiency of 61.08% and were most effective with small wastewater volumes. The effectiveness of wetlands was influenced by seasonal factors, plant species, and wetland design, including HRT and HLR. STWs were particularly effective for agricultural wastewater, whereas FTWs and HSSFs required careful management of plant species and seasonal conditions.

Conclusion: Combining different wetland types could enhance overall phosphorus removal efficiency. Further research is recommended to validate these findings and refine wetland designs for optimized performance. Integrating spatial analysis methodologies provides valuable insights into the spatial dynamics of phosphorus removal, helping identify areas for improvement and develop effective strategies for managing nutrient pollution in freshwater bodies.

ETHICS AND CLIMATE RESEARCH EQUALITY

44 TRACK E: The Role of African Indigenous Knowledge Systems in Addressing Climate-Related Health Impacts: A Case Study of Jotsholo, Lupane District, Zimbabwe

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Background, Rationale and Objectives: Climate change has profound impacts on health, particularly in vulnerable rural communities in Africa. Jotsholo, Lupane District, Zimbabwe, experiences significant climate variability, exacerbating health challenges due to limited healthcare resources. African indigenous knowledge systems (AIKS) offer traditional practices and wisdom that may enhance community resilience to these health impacts. This study explores how AIKS are utilized in Jotsholo to understand and respond to climate-related health issues. The primary objectives are to identify indigenous practices addressing climate-related health challenges, understand their mechanisms, and evaluate their integration with modern healthcare strategies.

Methods: A case study research design was employed and qualitative data collection techniques utilized in form of in-depth interviews, focus group discussions, and participant observations. The study population consisted of 50 participants, including community elders, traditional healers, and local health practitioners. Data collection focused on documenting traditional health practices, beliefs about climate change and health, and community-led interventions. Thematic analysis was used to identify patterns and themes related to the role of AIKS in managing climate-related health issues.

Results: The findings indicate that AIKS play a critical role in addressing climate-related health impacts in Jotsholo. Key practices include the use of medicinal plants to treat climate-sensitive diseases, rainmaking ceremonies to address drought-induced health problems, and communal support systems that enhance psychological resilience. These practices are deeply rooted in cultural heritage and are perceived as effective in mitigating health risks. Furthermore, there is a growing trend of integrating these indigenous practices with modern healthcare, improving overall health outcomes.

Conclusion/Implications: The study concludes that AIKS are vital in enhancing the adaptive capacity of rural communities to climate-related health impacts. Integrating these systems with modern healthcare provides a holistic approach to health and well-being in the face of climate change. Policymakers and healthcare providers should recognize and support the inclusion of AIKS in public health strategies. Further research should systematically document AIKS and evaluate their long-term efficacy in diverse climatic conditions. The findings underscore the importance of preserving indigenous knowledge and promoting its application in contemporary health and environmental policies.

Key Words: Role, African Indigenous Knowledge Systems, Climate-Related Health Impacts

576 TRACK E: Health co-benefits of natural regeneration: Involving farmers in Tanzania as public contributors to inform the design and conduct of research.

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Background, rationale, and objectives: Public contribution in research refers to studies conducted "with" or "by" members of the public, rather than "to" or "for" them. This approach involves active participation from the public in the research process, rather than merely serving as subjects of study. This collaborative method enriches research by bringing in diverse perspectives, experiences, and insights, thereby enhancing its relevance, quality, and impact. Despite this understanding, the development of public contribution in research in low-income countries has been limited, and there is a scarcity of information on the successes and challenges of implementing such practices, particularly in rural communities. The objective of this study is to describe our approach to implementing public involvement in our research project and reflect on the process and impacts during the design and planning stages.

Methodology: We recruited a farmer representative as a public contributor who collaborated with researchers in the design and preparation of the funding application. To ensure diversity, we established a Community Advisory Board (CAB) comprising 12 farmers from four districts, with an equal gender representation.

Results: We conducted two meetings with the CAB to review study documents, including participant information sheets, consent forms, and questionnaires.

During these meetings, we reviewed and provided feedback on the recruitment and data collection plans. Two investigators reviewed the meeting notes and outcomes, making adjustments to the original documents and/or plans. This included refining the wording of the information sheets and consent forms for better clarity and reducing ambiguity, amending the data collection plan to accommodate the season with a heavy workload, and adjusting the timing of the baseline data collection.

Conclusion: Our experience has demonstrated that local communities can be effective contributors to research, capable of co-creating recruitment strategies and data collection methods that are more inclusive and context specific. By leveraging their deep understanding of local agro-ecological conditions and first-hand farming experience, farmers can offer invaluable insights into the design and conduct of research.

192 TRACK E: Reimagining a decolonised health and climate research fraternity in Africa, a case of Marondera, Zimbabwe

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Colonial footprints decades after the independence of Africa continue to dictate research and knowledge production in the climate and health discourses. Local researchers' representation, participation and leadership remain marginal despite the high competence and human capital investment by Africa. The rationale of the study is premised on the need to explore the decolonisation of health and climate research in Africa. The key research questions of the study were, to what extent is the research in health and climate in Africa decolonised and what are the challenges and opportunities for a decolonised research work by African researchers? The study employed the 'powerful knowledge 'conceptual framework. The powerful knowledge concept defines Western knowledge as powerful and local knowledge as retrogressive and primitive an instrument used to characterise Western researchers and knowledge production as powerful and African as less powerful. The study employed a qualitative research approach and an explorative research design given that the nature of the data was more of lived experiences, voices and struggles by African researchers which can be best expressed in a dialogue-like manner. The study employed document analysis and semi-structured interviews to generate data from a population of 50 and a sample of 10 who were interviewed. Snowballing was used as a sampling technique in recruiting participants. Thematic analysis and content analysis were employed for primary and secondary data analysis. Key findings indicate that the legacy of colonialism is still haunting African research and knowledge production with negative implications for the autonomy and sustainability of Africa. It was established that African researchers have the potential to turn around climate and health challenges confronting the continent. Empowerment and capacitation of local researchers is recommended as a solution to the subordination of African researchers by Western scholars and suggests South-to-South cooperation in these fields as a potential panacea.

Key Words; Hegemony, Polarization, Epistemologies, Indeginous Knowledge & Praxis.

256 TRACK E: Ubuntu Ethics and AI: An Interconnected Approach to Climate Justice and Health Equity

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Background: Climate change threatens human health by affecting the environment, social systems, economy, and health systems. Achieving health equity requires climate justice, integrating equity, fairness, and human rights into climate action. Responsible use of AI can enhance efforts to ensure climate justice and health equity. Ubuntu, an interconnectedness and mutual reliance philosophy, can guide solutions to ensure climate justice and health equity. It challenges individualism and emphasises our dependence on each other and the environment for our health and well-being. This paper explores applying Ubuntu philosophy in developing AI solutions to address climate change and health, proposing a transformative approach to AI governance that prioritizes ethics, equity, and accountability.

Methods: A participatory approach was employed, involving workshops with key experts in AI, climate change, health, and Indigenous knowledge systems across Africa to collaboratively frameworks for integrating ubuntu ethos in AI. These workshops facilitated dialogue and collective decision-making while giving voices to marginalised communities. Additionally, in-depth, semi-structured interviews were conducted with selected experts to gain deeper insights into ethical AI design, climate justice, and health equity. Thematic analysis was used to identify key themes related to integrating Ubuntu philosophy in AI for climate and health governance.

Results: The study reveals that Ubuntu provides a unique perspective on designing and implementing AI systems, advocating for AI that respects sustainability, equity, and good governance. Traditional problem-solving approaches are contrasted with Ubuntu's holistic view, which includes humans, the environment, and future generations as part of a larger ecosystem. The findings highlight Ubuntu's potential to guide ethical AI systems addressing climate change and health issues effectively and holistically.

Conclusion/Implications: Embracing Ubuntu's AI development and deployment philosophy offers a holistic, inclusive, and respectful approach to combating climate change and health disparities. This approach promotes ethical principles, sustainability, and communal accountability, presenting an alternative to conventional AI governance models driven by commercial and techno-nationalist motives. Ubuntu can play a critical role in guiding trustworthy AI systems that ensure climate justice and health equity, working for the benefit of all. This integration provides significant implications for policymaking, suggesting that ethical AI, grounded in Ubuntu, can contribute to more equitable and sustainable climate and health outcomes.

Keywords: AI, Ubuntu, health, climate change, ethics, environment.

430 TRACK E: Engaging communities on impacts of climate change and health through a photovoice project in Malawi.

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Over 3.6 billion people globally are living in highly vulnerable conditions due to effects of climate change. Low- and middle-income countries have been experiencing severe effects of climate change even though these countries produce little carbon emissions. Effects of climate change gravely affect the most vulnerable people in low- and middle-income settings due to poor resilience to climate-related shocks, high population density, poor infrastructure and lack of financial resources to adapt to the effects of climate change. Malawi was recently affected by Tropical Cyclone Freddy which led to the death of over 1,200 people, displacement, injuries, and damages to infrastructures offering essential health services. This project is therefore engaging communities in photovoice to understand their perspectives and lived experiences of effects of climate change on their health in an urban and a rural setting in Malawi. We are using photovoice to allow participants to visually represent their lived experiences through photos and their own voices. Participants are being trained in photovoice, camera and image use, and ethical issues around taking photos at community level. The project team is facilitating discussions with workshop participants to co-produce key themes emerging from the photos. We plan to present the common themes pertaining to knowledge gaps about climate change and the perceived effects of climate change on health through photo exhibitions. Outputs from this project will be used to develop behaviour change messages and a research agenda on climate change in Malawi.

122 TRACK E: The Nexus between the Researcher and the Participants in Climate and Health Research in Informal Settlements of Zimbabwe.

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This study examines the ways in which informal settlement communities are involved in health and climate research or not. Although research has been conducted for many years , helping to build scientific knowledge , techniques and procedures over time , there has always been a significant disconnect between the research and community it is being conducted with. Communities living in informal settlements continue to be subordinated and exploited despite the renewed interest in partnership methods to research and practice that place a strong emphasis on community influence and participation in research initiatives.. Despite extensive study conducted by various organisations, institutions, and academics, the populations living in informal settlements continue to face issues related to climate challenges and other aspects of health. Through the use of key informant interviews, document review and focus groups, the study discovered that most research projects are designed primarily to satisfy the goals and objectives of the investigator or specific sponsor, with little to no ethical considerations , without inclusivity. In order for justice , equity , inclusivity and fairness to be realised, the study suggests that community researchers be involved in every stage of the research process, from defining the problem to developing research instruments for data collection to presenting the findings and putting the identified gaps into practice in the communities where they are found.

Key words: Community research, climate change , ethical considerations , informal settlements

210 TRACK E: Empowering Voices: Civil Society and Just Transition in Botswana's Sustainable Housing Future

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Introduction and Rationale: The inaugural Housing Pitso 2023 was held in Gaborone, Botswana, focusing on "Affordable Housing & Sustainable Housing for All: A Collaborative Approach with the Private Sector." This case study evaluates the Botswana Green Building Council's (BotGBC) intervention to ensure civil society (CS) participation, despite notable barriers. Prior studies have highlighted the importance of inclusive decision-making in housing policy for achieving sustainable development goals. Additionally, understanding the interplay between climate change, health, and housing is critical for addressing the multidimensional challenges faced by vulnerable populations.

Aims: This study aims to assess the effectiveness of BotGBC's strategies in amplifying civil society voices during the Housing Pitso 2023 and to identify lessons learned for future interventions. The specific questions addressed include:

1. What were the barriers to civil society participation?

2. How effective were BotGBC's strategies in overcoming these barriers?

3. What recommendations can be made for future engagement?

Description of the Case: The study employed a mixed-methods design, combining desk-based research, observations during the event, and post-event follow-up ad hoc interviews. The Housing 'Pitso' summit included stakeholders from government, private sector, and civil society. Despite efforts to invite diverse CS representatives, attendance was limited due to financial constraints and perceived irrelevance of the housing agenda to health focused CSOs.

Discussion and Recommendations: The study revealed several significant observations:

1. Limited CSO participation due to financial and agenda alignment issues.

2. Successful use of media sessions to educate the public and mitigate low CS attendance.

3. Persistent gaps in policy implementation, such as non-enforcement of the Rent Control Act and lack of harmonisation of housing-related laws.

The intersection of climate change, health, and housing emerged as a critical theme. Climate change exacerbates health risks, especially for those in inadequate housing. Poor housing conditions increase vulnerability to climate-induced health issues like respiratory problems and heat-related illnesses. Sustainable housing practices are essential for mitigating these impacts. A just transition ensures the benefits of sustainable housing reach all segments of society, particularly the most vulnerable. By incorporating these principles into housing policies, Botswana can create a more equitable and resilient future.

Recommendations:

1. Empowerment and Funding: Establish dedicated funds to support CSO participation in national dialogues.

2. Cross-Sector Collaboration: Facilitate understanding of the linkages between housing, health, and climate change to engage health-focused CSOs in housing issues.

3. Policy Review and Harmonisation: Conduct rapid assessments of housing-related legal instruments to inform a cohesive policy framework.

4. Inclusive Planning: Institutionalise the involvement of CSOs in housing policy planning and implementation.

5. Awareness and Education: Organise sensitisation meetings with government and private sector stakeholders to recognise CSOs as equal partners in the housing agenda.

The case study underscores the need for inclusive approaches and continuous dialogue among all stakeholders to address housing challenges effectively. By empowering CSOs and fostering collaboration, Botswana can make significant strides toward affordable and sustainable housing for all. Integrating climate change considerations into housing policies ensures resilience and health benefits, crucial for the well-being of the population.

507 TRACK E: One Health Approach to Mitigating Zoonotic Spillover Risks in Cambodia

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Background, rationale, and objectives: This research examines the complex interplay of human, animal, and environmental factors in the emergence of zoonotic diseases. Specifically, it focuses on the practices of harvesting bat guano in caves in Cambodia, a context rife with potential for disease spillover. By adopting a One Health perspective, this study explores the risks associated with bat-human interaction and the implications for public health.

Methods: Through ethnographic fieldwork and participatory action research, we explored the socio-ecological conditions that influence disease transmission. Our findings highlight the vulnerabilities of bat guano harvesters to respiratory and skin ailments, underscoring the occupational hazards of this livelihood. We argue that these health risks are inextricably linked to broader ecological and socio-economic factors.

Results: To address these challenges, we collaborated with local communities to co-design and implement biosafety and hygiene interventions aimed at reducing spillover risks. Our approach emphasizes the importance of community empowerment and knowledge sharing. By integrating local perspectives and practices into our interventions, we sought to develop sustainable solutions that are culturally appropriate and contextually relevant.

Conclusion/Implications: This study contributes to the growing body of literature on zoonotic disease prevention by demonstrating the efficacy of community-based approaches. Our findings underscore the need for interdisciplinary research and policy development to address the complex challenges posed by emerging infectious diseases. By fostering collaboration between human and animal health sectors, we can build more resilient and equitable health systems.

Keywords: One Health, zoonotic diseases, bat guano harvesting, Cambodia, community engagement, health inequalities, environmental health.

HEALTH IMPACTS AND EPIDEMIOLOGY

51 TRACK B: Predicting the spatio-temporal reproductive potential of Aedes aegypti

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The abundance of mosquito-vectors is highly correlated with the timing of outbreaks of mosquito-borne viruses (MBVs). This necessitates an understanding of abundance dynamics and motivates spatio-temporal predictions. We extend a previously proposed theoretical model of mosquito reproductive potential, Index Q. This climate-driven metric reflects the growing impact of climate change on the population dynamics of mosquitoes, which invariably impacts MBV spread. Our goal is to identify areas with the greatest risk of moving into the mosquito reproductive 'Goldilocks zone' and therefore increasing the risk of MBV transmission.

Index Q is the basic offspring number derived from a system of ordinary differential equations (ODEs) that characterises the mosquito life-cycle in terms of temprature, humidity, and precipitation. We use approximate Bayesian computation (ABC) and aegypti abundance data to fit two unknown scaling parameters of Index Q and propose an approximate global solution for making projections in cases where local data is unavailable or unreliable.

We generate results for abundance data from four urban areas in the USA and India. These results showcase very good correlation between empirical abundance and Index Q projections.These local results are pooled to form the basis of our ABC fitting procedure, which leads to our approximate global projection. Global Q projections correlate with aegypti-based MBV burden.

Climate trends between 1979-2023 demonstrate the increase in aegypti reproductive potential, especially in those areas not presently endemic to epidemiologically relevant aegypti-based MBVs. The identification of these areas can help scientists and public health professionals to model and efficiently implement coherent, evidence-based mosquito control and outbreak mitigation measures.

93 TRACK B: Spatiotemporal characteristics of human thermal comfort across southern Africa: an analysis of the Universal Thermal Climate Index (UTCI) for 1971–2021

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The 6th Assessment of the Intergovernmental Panel on Climate Change projects increasing thermal associated morbidity and mortality under anthropogenically-induced warming. Over 100 indices exist to quantify thermal stress, and among these, the Universal Thermal Climate Index (UTCI) was developed for regional investigations of thermal stress influences on human health. Although by definition a Universal index, current applications are mainly limited to Europe. For regions such as Africa, use of the UTCI has been hampered by a lack of available requisite input variables from ground- based meteorological stations. To overcome this, a gridded dataset, derived from ERA5 reanalysis, of UTCI equivalent temperatures was developed by the European Centre for Medium-Range Weather Forecasts. Using this dataset, we explore changes in spatiotemporal UTCI patterns over annual, seasonal and monthly scales across southern Africa from 1979-2021. Across these scales, seven of 10 UTCI thermal stress categories were observed, ranging from strong cold stress to very strong heat stress. Spatially, no thermal stress was most widespread, with the greatest incidence of heat and cold stress during summer and winter months, respectively. Interannually, relatively low variability was observed, however, a clear influence of the El Niño Southern Oscillation on thermal stress classifications was evident. Over the study period, heat stress increased at statistically significant rates, with the strongest, most widespread increase during spring, averaging 0.28°C.decade^{-1}, and October, averaging 0.37°C. decade^{-1}, in particular, however, decreasing trends were also observed. Overall, trend results highlight regions vulnerable to significant thermal comfort changes, and thus should be considered in decision-making regarding outdoor activities.

113 TRACK B: One Health conceptualisation of sustainable diets in low- and middle-income settings: A systematic review

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Background, rationale, and objectives: Average diets fail to meet basic health and environmental needs, these diets diminish natural resources, and contribute to climate change. This is particularly challenging in Africa with a fast-growing population concurrently compounded by increasing climate change risks exacerbating food insecurity and livelihoods. Sustainable diets that are protective of One Health (human, animal, plant, and environmental health) promise to address this challenge, yet Africa is continuously being underrepresented in global studies on sustainable diets. This review aimed to conceptualise dietary sustainability in LMICs integrating the One Health perspective.

Methods: The review followed the preferred reporting items of systematic reviews and meta-analyses (PRISMA) guidelines and used the checklist for one health epidemiological reporting of evidence (COHERE) standards to assess dietary sustainability in LMICs. Four databases (Embase, Global Health, Web of Science, and Scopus) were searched between 1947 and June 2023 using relevant search terms. Data were extracted and analysed qualitatively.

Results: The four database searches yielded 3122 articles which were deduplicated and screened for eligibility. Thirty-five studies were included in the final review. The majority of studies (77%) were from upper-middle-income countries. Only two studies were conducted in Africa. While nineteen studies (54%) assessed human and environmental health, none assessed plant or animal health, and no study assessed all four One Health pillars. Equally, no study assessed all five dietary sustainability dimensions (diet/nutrition, health, environment, economic, and social) addressed in this review.

Conclusion: This review highlights the dearth of research on sustainable diets conducted in LMICs, particularly in Africa. In addition, unsustainable diets due to low quality, low diversity, and high environmental effects in LMICs were largely highlighted in the review. The underrepresentation of Africa in this review is a wake-up call admonishing Africa to generate more country-specific data to facilitate research incorporating all dietary sustainability dimensions and One Health pillars for monitoring progress towards attaining dietary sustainability.

138 TRACK B: Predicting Lassa Fever Outbreak: Investigating the Effect of Seasonality and Weather

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Background: Lassa fever, which is prevalent in some parts of West Africa, is one of the viral diseases with no known vaccine for its prevention. The Lassa fever virus tends to be sensitive to certain environmental factors such as rainfall and temperature. Previous studies have shown the association between these two variables using different methods and achieving similar outcomes. However, some of the methods presented were complex. This study uses simpler statistical approaches to investigate the influence of meteorological factors (rainfall, humidity and temperature) and seasonality of the occurrence of Lassa fever in six Nigerian states.

Methods: Lassa fever incidence data, rainfall, humidity and temperature data was collected from six states in Nigeria where the disease is prevalent from 2017 to 2021. Pearson correlation analysis was used to investigate the relationship between Lassa fever incidence and temperature, precipitation and relative humidity. Also, binary logistic regression was used to investigate the influence of season on its occurrence.

Results: Correlation analysis for Lassa fever and temperature shows that Ondo and Edo states had a moderate positive correlation of 0.36 and 0.39 respectively, while Bauchi had a correlation co-efficient of 0.42, indicating a stronger correlation. This indicates that there is a general trend of increasing Lassa fever cases with increasing temperature across the states. Correlation analysis for Lassa fever and precipitation shows that Ondo, Edo, Ebonyi and Plateau states had a moderate negative correlation of -0.24, -0.22, -0.22 and -0.21 respectively while Bauchi state had a correlation co-efficient of 0.19 indicating a weak negative correlation. This trend shows that higher precipitation is not closely associated with increased Lassa fever cases. Correlation analysis for Lassa fever and humidity shows that Ondo, Edo and Taraba states had a correlation co-efficient value of -0.48, -0.44 and -0.42 respectively, this indicates a strong negative correlation between Lassa fever and humidity. The trend

observed across the states suggests that Lassa fever incidence is not positively associated with higher relative humidity. Similarly, the binary regression analysis carried out also showed an inverse relationship with a correlation coefficient of -0.782 with a Chi-square value of 64.814 ($p < .000$) at 95% confidence interval suggesting that there will be greater occurrence in the dry season.

Conclusion: The results revealed that there is a moderate correlation between the occurrence of Lassa fever and temperature while there is little or no correlation between Lassa fever incidence and precipitation and humidity. The study also revealed that seasonal factors contribute to the occurrence and spread, with the epidemic having its peak during the dry season from November to April. These findings provide a basis for deploying machine learning to predict lassa fever outbreak. The study is valuable to stakeholders in the prevention and preparedness for the disease outbreak.

164 TRACK B: Developing the Urban overheating Vulnerability Index in Addis Ababa, Ethiopia

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Developing the Urban overheating Vulnerability Index in Addis Ababa, Ethiopia

Urban overheating poses significant health risks to populations residing in urban areas. The rise in temperatures in urban environments can adversely affect human health in various ways. The heat stress caused by urban overheating to increased heart rate, blood pressure, and the risk of cardiovascular events such as heart attacks and strokes. The impact of urban overheating extends beyond physical health to mental well-being. Addis Ababa, the capital city of Ethiopia, is facing a significant heat-health challenge due to the increasing impacts of heat exposure on its population. This study aims to develop urban overheating vulnerability index for human health, locate hotspots of vulnerable areas to pinpoint locations with heightened susceptibility to heat-related health risks, and to examine the spatially varying impact of urban overheating on public health. The research project also investigated the ethical dimensions of the spatial epidemiology of urban overheating and its consequential health impacts.The study identified that the spatial epidemiology of the urban overheating impacts the urban population unfairly and unevenly. Accordingly, the sub cities of Addis Kalema, Arada, and Lideta exhibit the highest vulnerability to urban overheating, with a significant population at risk. Gulelie, Nifas Silk, and Akaki Kality follow closely as the second most vulnerable areas in terms of heat hazards. Bole and Yeka are identified as the sub cities with the third highest vulnerable population in this context. The findings highlight the need for targeted interventions and policies to mitigate the negative effects of urban overheating on human health and promote the development of sustainable and resilient urban environments. This localized analysis can help inform policy and decision-making processes related to public health interventions, urban planning and climate change mitigation.

167 TRACK B: The Influence of Climate Change and Climate-induced Migration on Cholera Outbreaks and Spread in Eastern and Southern Africa

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Background, Rationale and Objectives: Climatic and environmental change (CEC) pressures have forced several people across the globe to move away from their homes or communities, a concept referred to as Climate change-induced displacement (CCID). Eastern and Southern Africa are vulnerable to climate change and its impacts particularly due to rise in temperature, excess or low precipitation, desertification and environmental degradation. Both CEC pressures and CCID influence cholera outbreaks and spread. Baseline data on the trends of CEC pressures, CCID and climate change-related cholera outbreaks in Eastern and Southern Africa is crucial for informed and harmonized interventions. This study aimed to determine the specific CEC pressures influencing the spread of cholera in Eastern and Southern Africa, ascertain the influence of Climate Change Induced Migration on the spread of cholera and identify the demographic groups among climate-induced displaced populations most affected by cholera during a cholera outbreak in these regions.

Methods: A rapid review was conducted between April and June 2024. Original articles, reviews and grey literature were selected for data extraction based on predetermined inclusion criteria. Keywords were used to identify relevant literature from electronic data bases. The study areas were limited to Eastern and Southern Africa.

Results: A total of 29 were selected for review. The review showed that floods, cyclones, rainfall, rise in temperature, drought, limited and poor access to WASH facilities, population density were CEC pressures that influenced the spread of cholera in Eastern and Southern Africa. Climate-induced migration had a significant influence on the spread of cholera in these regions. Whereas displaced and migrating populations were the most at-risk group during cholera outbreaks, women, children and the elderly are more vulnerable.

Conclusion/Implications: Climate and environmental changes influenced the spread of cholera through certain environmental changes and CCID and migration. Displaced and migrating populations were particularly at-risk during cholera outbreaks. This highlights the urgent need for interventions which address climatic, environmental and social determinants of cholera outbreaks by deploying climate adaptation approaches for cholera prevention within these regions. Moreover, unified regional interventions are recommended as there are cross-border movements and climate-induced migrations among countries in these regions.

171 TRACK B: Cholera Outbreak and Its Transmission Risk factors in Mwanza Region, Tanzania, during flooding January 2024. A matched case control study.

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Background: Cholera is an acute diarrhea disease caused by Vibrio cholerae. It is transmitted by eating or drinking contaminated food or water. Cholera infection spread rapidly resulting into high morbidity and mortality. Cholera outbreak emerged during flooding and heavy rains in Northwestern part of Tanzania, other factors such as water pollution, poor hygiene and sanitation, poor infrastructure, improper waste disposal, have contributed to Cholera outbreak. Vulnerability factors includes, social cultural, illiteracy and economic, have increased impact of cholera. Mwanza region in early January 2024 reported cases of cholera, hence an outbreak.

Rationale: Early response measures have been taken to curb the spread of disease. Understanding the risk factors for this outbreak will guide the current interventions and also preparedness toward other outbreaks that may arise.

Main Objectives: To determine factors that are associated with cholera outbreak in Mwanza region in January 2024.

Specific Objectives: To determine proportions of cases and control across cholera risk factors, also analyzing factors associated with the cholera outbreak in Mwanza Region.

Methods: A matched case control study was conducted in three districts that were first affected by cholera in January 2024. Standardized questionnaires were administered to both participants (cases and control). Controls were matched to the cases in the 2:1 ratio based on sex, neighborhood and age. The age difference between cases and control were 5years. Chi-square was used to test the significances of the differences of proportions among different variables. Conditional logistic regression was used to determine the bivariable and multivariable association of risk factors for cholera outbreak in Mwanza. The P-value <0.05 was considered to be statistically significant.

Results: Of 168 participants recruited, 56 were cases and 112 were controls with the median age of 18.5 years and 28 years respectively. Individuals who had primary (Adjusted Odds Ratio [aOR] 0.19, 95% CI: 0.01-0.69) and secondary (aOR 0.13, 95% CI: 0.18-0.95) education were likely to be protected from cholera as compared to those who never attended to school. Eating away from home was significantly associated with contracting cholera (aOR 11.95, 95% CI: 3.29-43.35). Having contact with a cholera case had 29 times risk of contracting cholera (aOR 29.43, 95% CI: 4.62-187.58). The use of Lake Victoria water for domestic purposes 20 times risk of contracting cholera (aOR 20.22, 95% CI: 1.32-309.78). Individuals who received health education on diarrheal diseases before outbreak occurred were protected from contracting cholera (aOR 0.19, 95% CI: 0.05-0.71).

Conclusion: Partnership and collaboration between government, local and international organizations on public health education, to minimize cholera contraction at the community level and enable individuals to take appropriate preventive measures. Infrastructure improvements, such as expanding clean water systems and promoting proper waste disposal. Individuals shold ensure safe food practices, especially when eating outside their homes.

174 TRACK B: Mental Health and Climate Change in Nairobi's Slums.

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Background: Climate change has significant effects on mental health, particularly in vulnerable populations like those living in urban slums, who are frequently exposed to extreme weather events.

Objectives: This study examines the mental health impacts of climate change on residents of Nairobi's slums, focusing on Kibera, Mathare, and Mukuru, and seeks to understand the coping mechanisms employed by these communities.

Methods: Interviews and mental health assessments were conducted with 180 residents to gather data on stress, anxiety, and depression levels. The study also included focus group discussions to explore community coping strategies and resilience.

Results: Frequent floods, heat waves, and unpredictable weather were found to increase stress, anxiety, and depression among residents. Many expressed feelings of helplessness and worry about their future due to climate-related impacts on their homes and livelihoods. The study also found that social support networks and community-based initiatives played a crucial role in helping residents cope with mental health challenges.

Conclusions: Providing mental health support, creating safe spaces for community discussions, and offering training on climate resilience are crucial. This research emphasizes the need for mental health services to help slum residents cope with the effects of climate change and highlights the importance of community engagement in building resilience.

200 TRACK B: Health RADAR: Responsible Access to Data for Analysis and Research

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Climate-sensitive infectious disease (CSID) modelling is crucial for understanding and predicting disease dynamics in a changing climate. However, the lack of accessible and well-documented local data is a major barrier to entry into this field. Health RADAR, a Wellcome-funded CSID project, aims to address this challenge by developing an open-source, web-based platform that collates, curates, and transforms CSID data to catalyse modelling efforts.

The pilot population of the tool focuses on malaria transmission data in the frontline four countries of the SADC Elimination 8 region: Botswana, Eswatini, Namibia, and South Africa. The platform incorporates a wide range of data types, including health, climate, transmission, entomological, economic, and demographic data. Along with providing guidance on accessing malaria datasets necessary for analysis and modelling, the tool will provide comprehensive documentation and contextual information, along with technical support to visualize and analyse the data.

A key feature of this project is its emphasis on dissemination and community building. By engaging with local stakeholders and fostering a community of African CSID modellers and analysts, we aim to ensure the long-term sustainability and relevance of the tool. While the platform may eventually expand to cover other diseases and geographic regions, its primary goal remains constant: to facilitate the development of CSID models calibrated to operationalizable datasets that are responsibly sourced and contextualised.

227 TRACK B: Epidemiology of influenza virus infection in four climatic zones of Cameroon: Grassland, Equatorial forest, Sahelian zone and Highland

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Background: The seasonality of influenza has been well described in temperate regions, where influenza activity typically coincides with the winter months. However, the seasonality of influenza in tropical countries is not well understood. This study compares two models describing trends in influenza activity in four regions of Cameroon with different climates.

Methods: This study was conducted over a period of six years, from January 2017 to December 2022. During this period, patients with acute respiratory infections were recruited from sentinel influenza surveillance sites in the Centre, Littoral, North and West regions of Cameroon and tested for influenza virus by molecular assay. Two models were used to investigate the variation in influenza cases

in the four regions: the Autoregressive Integrative Moving Average (ARIMA) model and a seasonal model. The ARIMA model used the monthly numbers of positive influenza cases as the dependent variable and the monthly values of twelve weather parameters, including temperature, humidity, precipitation, and solar radiation, as the independent variables. No climate variables were included in the seasonal model. Root mean square error (RMSE) and stationary R2 were used to compare the performance of the models.

Results: In all regions, the seasonal model outperformed the ARIMA model in describing influenza activity by 66 to 82%. Meanwhile, the performance of the ARIMA models depended on climate variable. In the Centre and North region, precipitation accounted for about 30% of detected influenza cases; in the Littoral region, temperature accounted for 30.8%; and in the West region, temperature best described 43.5% of influenza activity. Some regions showed an association, albeit weaker, with humidity and solar radiation.

Conclusions: These results provide further evidence that influenza in Cameroon has a heterogenous pattern from one region to another. Trends in influenza virus also follow seasonal variations that are not primarily driven by climatological factors.

241 TRACK B: Land use patterns and urban heat islands in Africa: a systematic review

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Background: Urban heat islands (UHI) are urbanized areas characterized by ground temperatures 5 to 10°C higher than the surrounding semi-rural or rural areas. They play a major role in heat-related disease burden. It is important to identify the factors that contribute to UHIs and to understand their causal mechanisms, so that they can be taken into account in planning policies at city level.

Objective: To systematically examine interactions between land use and UHI phenomena in Africa.

Method: This work followed the PRISMA methodological guidelines, and covered eight databases (PudMed, Google Scholar, VHL, Sciencedirect, Research4life, Taylor & Francis, Global index Medicus and Emerald). We have included articles on land use and UHI in Africa, and were published in English, French and Portuguese between 2010 and 2022.

Results: After selecting (n=55761) titles, abstracts and full text, we identified 97 eligible studies. These studies were predominantly conducted in Nigeria (n=31), Egypt (n=18) and Ethiopia (n=17). However, some African regions such as South Africa (n=2), Tunisia (n=2), Sierra Leone (n=2), Zimbabwe (n=2), Cameroon (n=2), Côte d'Ivoire (n=2), Botswana (n=1), Uganda (n=1), Algeria (n=1), Zambia (n=1) and Sudan (n=1) are under-represented. Commonly studied factors affecting UHIs included land cover and land use change classes (e.g. urban/built-up areas (78.35%), vegetation (65.97%), water (54.67%) and bare soil (49.48%)), day/night cycle (17.53%), effect of seasonal variations (16.49%) and urban morphology (13.44%). With regard to the effects of factors on UHI, the results showed: UHI were higher in urban/built-up and bare areas than in vegetated and water areas. In addition, most articles reported that the UHI is more intense at night than during the day. Additionally, UHI are more intense during the dry seasons than the wet seasons in a tropical climate, and more intense in winter than in summer in a temperate climate. Lastly, urban areas with low, compact forms and medium heights had higher UHI than open high and low areas.

Conclusion and implication: The factors linked with UHI in the review interact in complex ways to create and intensify UHI. Understanding these factors is essential to implementing effective adaptation strategies and promoting more sustainable and resilient urban development in the face of a rapidly changing climate.

Keywords: land use, urban heat islands, Africa

250 TRACK B: Enhancing Food Security and Meeting Nutritional Needs through Access to Climate Change Information among Low-Income Farmers in Ogun State

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Background, Rationale and Objectives: In 2022, approximately 783 million people experienced hunger, while 2.4 billion lacked access to nutritious, safe, and sufficient food. Many African nations persistently experience food insecurity occasioned by extreme weather conditions, escalating food prices, and economic instability. Climate change aggravates these issues, severely impacting agricultural productivity and hindering low-income farmers' ability to meet societal nutritional demands. In Ogun State, Southwest, Nigeria, hundreds of hectares of rice farmlands are lost annually to harsh climate conditions, threatening the recorded success of locally grown crops to checkmate the problem of food security and nutritional needs of the people. This study thus examines the availability and accessibility of climate change information among low-income rice farmers in Ogun State. It seeks to investigate how climate change information spreads among farmers, and understand the barriers they face in accessing this crucial information.

Method: Anchored on the Diffusion of Innovation theory, the survey research design was employed. Questionnaire was adopted as instrument to gather data from 356 rural rice farmers selected through multistage sampling techniques across rice-growing local government areas of Ogun State.

Results: Key findings indicate majority of the farmers relied largely on experience to determine climate situations. Also, availability of formal information on climate change is very low, hindering farmers' access to important climate information, while challenges such as financial constraints, inadequate media presence in rural areas, and insufficient infrastructure serve as obstacles to accessing the little information available on climate change.

Conclusion and Implications: Findings underscore the critical role of accessible real-time climate change information in empowering rural farmers to safeguard agricultural productivity and enhance food security. This is necessary to facilitate better planning and mitigation strategies against adverse climatic conditions. This study thus recommends the need for stakeholders to provide information support for farmers that will enhance sustainable farming practices that mitigate the impacts of climate change and ensure food security and healthier nutritional outcomes for local communities and beyond.

251 TRACK B: Quantifying the heat-related health effects of natural regeneration in semi-arid districts in Tanzania: A Quasi-experimental study

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Background: The rising global temperatures attributed to climate change pose significant health risks, particularly small-scale farmers. The UN has declared 2021-2030 as the Decade of Ecosystem Restoration, emphasizing the importance of nature-based solutions in achieving climate resilience and sustainable development goals. This study will assess the cooling effects health effects of natural regeneration in semi-arid districts by demonstrating the impact of trees-on-farms on selected human health outcomes. The study will focus on rural farmers who work outdoors and are at risk of heat exposure and examine the impact of a low-cost nature-based solution (NbS) known as Farmer Managed Natural Regeneration (FMNR). Several studies have shown the effect of heat exposure on farmers. However, there is limited evidence about the adaptation function of nature-based solutions (NBS) such as FMNR

Methods: The study focuses on Dodoma region in central Tanzania where, LEAD Foundation has been engaging local communities to implement landscape restoration and climate-smart agriculture projects using FMNR. We will use a quasi-experimental study design comparing outcomes in households that implement FMNR against non-implementing households; specifically, we will 1) recruit 440 participants by using multi-stage sampling strategy to identify clusters of intervention and control villages for recruitment, 2) examine how FMNR affects microclimates (air temperature, Wet Bulb Globe, Temperature, wind speed, wind direction, relative humidity) and biodiversity (tree cover and species), 3) examine the impact of FMNR on farmers by assessing physiological measurements such as core body temperature, heart rate to examine cardiovascular strain, serum creatine to investigate kidney injury and urine specific gravity to examine hydration status. This is a scientific investigation on physiological outcome, initially with a baseline covering villages implementing FMNR and control village without FMNR, at year two the project will be evaluated. This will allow to investigate

how physiological outcome data change when working on farms where FMNR is implemented against non-FMNR.

Discussion: The generated evidence will improve our understanding of NbS potential for heat adaptation for climate vulnerable populations, the findings will also contribute to the development of improved policies and agroforestry interventions that may assist in mitigating the effects of extreme outdoor heat on health.

258 TRACK B: The floods-waste nexus and impacts on human health in South African urban informal settlements

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Introduction and Rationale: The frequency and severity of extreme weather events have increased due to climate change with flooding emerging as one of the most common climate change-induced disasters the world over. Among the main factors exacerbating the impact of floods particularly in African urban areas is waste, hence our research explores the human health impacts of the floods-waste nexus in some of the most vulnerable contexts in Africa – urban informal settlements – using the case of South Africa. Given the projected rapid rise in rates and regions of urban population in Africa by 2050, and given that informal settlements have housed large sections of the population of many cities for over 50 years, they cannot be seen as being a temporary transitional phase, hence there is an urgent need to build resilience to climate change dynamics in these settlements and to do so at scale.

Aim: Our research aimed at widening the evidence-base on the impacts of climate change in urban informal settlements in Africa and the provision of solutions to these impacts. Through our recommendations, we also sought to advance health-centric climate-resilient policies in the face of rapid urbanisation and devastating climate change impacts in Africa.

Description of the Case: The study used the case of Quarry Road West informal settlement area in South Africa's eThekwini Municipality, KwaZulu-Natal province. KwaZulu-Natal province is the wettest province in South Africa, with an average annual rainfall which is higher than the national average. Floods caused by heavy rainfall are therefore the most common extreme weather events experienced in eThekwini. eThekwini municipality provided an interesting case as it has the largest number of informal settlements of any municipality in South Africa. Quarry Road West informal settlement is located about 9.5km from the Durban Central Business District – within the Palmiet river catchment and directly along the Palmiet river flood plain. A mixed methods approach combining different qualitative techniques in collecting data was used – to include literature and document reviews, participatory vulnerability analysis, key informant interviews, ethnographic mapping, and focus group discussions with residents. Among our significant observations, the floods-waste nexus has resulted in significant human health impacts in the area. There is an outbreak of waste-related communicable diseases such as cholera, dysentery and malaria during and in the immediate aftermath of floods and high rainfall seasons. Non-communicable diseases mainly associated with psychosocial health have also escalated especially after the devastating March/April 2022 floods in the area.

Discussion and Recommendations: In dealing with the floods-waste nexus in informal settlement areas in South Africa and beyond, there is need for: a) crafting and supporting community-based approaches to the management of waste and improvement of drainage in those areas; b) harnessing different knowledge systems towards creating robust information systems for the provision of relevant data critical for effective flood risk response and sustainable waste management; and c) undertaking awareness campaigns towards educating urban informal settlement residents on the advantages and benefits of waste reduction, proper waste disposal and basic sanitation in their communities.

267 TRACK B: Climate change effects on the mental health of individuals across livelihood sectors in Ibadan, Nigeria

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Climate change is a pressing global issue with dire consequences on human health. Even though climate change transcends geographical boundaries, there have been minimal research on the mental health impacts of climate change in Sub-saharan Africa. Yet, such understanding is essential for developing holistic approaches to climate adaptation and mitigation strategies. This study evaluates the effects of climate change on mental health across livelihood sectors in Ibadan, Nigeria.

This research utilized primary data from 349 respondents (in-person) using a kobocollect-deployed questionnaire. A random sampling method was used to ensure that every person in the area had an equal chance of being selected (minimizing bias). Correlation coefficients, chi-square test, mean proportion and descriptive statistics within the Statistical Package for the Social Sciences (version

21.7) were utilized in data analysis. These statistical tests help to quantify the relationship between climate change indicators and mental health outcomes; compare the mean score of knowledge, attitudes, and practices regarding climate change; and identify the frequency of direct effects reported by individuals. The ArcGIS 10.7 was used for spatial pattern and variation analysis of climate change impacts on mental health.

The participants consisted of 150 male and 199 female participants; 50.7% of whom are aged 21-40 years; 50% had a secondary school education; 48% were traders and business owners, while 7.7% were farmers. Results show a significant correlation between climate change indicators and mental health stressors. For instance, there is a strong positive association between the independent variables (climate change concern) and the dependent variables (mental health indicators such as difficulties in concentrating, sleeping problems, and emotional distress) with $p < 0.0001$. The mean score of mental health distress was notably higher among participants who were farmers, with mean score of 4.1 (on a 5-point scale). Also, attitudes and practices regarding climate change were significant except for the practice of recycling which showed a negative relationship ($p = 0.119$).

This study offers a basis for future research and can inform evidence-based interventions to support the mental health of individuals and communities adapting to a changing climate.

Keywords: Farmers, livelihoods, sustainability, climate change, mental health.

The authors declare no conflicts of interest.

279 TRACK B: Community awareness of health problems induced by climate change in Tanzania: preliminary insights from Agricultural Workers in Dodoma region

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Background: The health impacts of climate change are hard to ignore but constitute one of the latecomers in the climate change discourse and practices be it research, policies, and programs. A growing number of studies demonstrate various effects of climate change particularly that associated with an increase in temperature on the environment, biodiversity, and food production. Nevertheless, little is known about the direct and indirect climate change-induced health effects on agricultural workers in tropical countries. With more than 70% of the population depending on small-scale agriculture, Tanzania offers an ideal case to better understand the health impact of heat exposure due to extreme temperatures. We intended to explore community awareness of heat health risks and adaptation practices used by agricultural workers in Tanzania.

Methods: This qualitative study used focus group discussions (FGDs) and in-depth interviews (IDIs) to explore agricultural workers' knowledge and experience of health risks associated with heat exposure in two villages of Mpwapwa District in Central Tanzania. Thematic analysis was used to identify patterns and relevant themes that speak to the study topic.

Results: We found that communities of agricultural workers associate climate change with a wide range of health problems including dehydration, severe headache, high blood pressure, malaria, children's diarrhea, skin diseases, loss of sight, and dizziness are associated with heat stress. By extension, some of the health effects are more gender-specific as women farmers perceived loss of pregnancy, eclampsia, U.T.I., and fungal infections as health-related effects attributed to an increase in temperature and working under the direct sun for too long. On the other hand, men reported erectile dysfunction as the result of heat stress. Planting trees, resting under tree shade, drinking water, and taking a shower twice a day were cited to be among the farmer's adaptation measures against heat stress.

Conclusions/Implications: Agricultural workers attribute various health problems to increased heat exposure as the impact of climate change in Tanzania. However, we contend that there is a need for more experimental studies that will examine the influence of microclimate through trees and the way contribute to addressing the health effects associated with heat stress.

292 TRACK B: Building a heat wave anticipatory action plan for the Sahelian city of Ouagadougou

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The West African Sahel is increasingly facing extreme heat. Heat waves more likely affect major cities such as Ouagadougou, Burkina Faso. They are however largely overlooked in both research and risk management.

This study contributes to filling the research gap, with the potential to influencing heat wave risk management in the region. Specifically, it addresses two key questions: (i) are heat waves a serious concern for Ouagadougou city-dwellers and is the perception varying with different social groups? (ii) What are the impacts of heat waves in Ouagadougou, and what are possible risk management options? To answer these questions, we conducted a review of grey literature and a qualitative cross-sectional study using focus group discussions and key informant interviews across the city of Ouagadougou. The field study took place in November 2023.

The results show a consensus across interviewees that heat waves are a real and growing threat to people in the city. They all pointed to a significant increase in the intensity of heat, especially during the hot months of March, April, and May. In terms of vulnerability, the elderly, children under the age of five and people with disabilities or with chronic illnesses are seen as the most at risk. Slum-dwellers were also highlighted as particularly vulnerable due to insufficient of infrastructure and poverty. The most perceived heat waves impact in Ouagadougou are related to health including primarily stroke, dehydration and skin diseases. Water and electricity shortages are common during heat waves and exacerbate the heat-related illnesses, lead to more discomfort and impact livelihoods.

The most suggested heat wave risk management options focused on disseminating early warnings, providing potable water, and monitoring and supporting the most vulnerable people.

Keywords: heat waves, Ouagadougou, slums, anticipatory action, Red Cross

How to cite: Somdakouma, W.D.R., Sankara, B., Sawadogo, I., Poan, E., Heinrich, D., and Guigma, K.: Building a heat wave anticipatory action plan for the Sahelian city of Ouagadougou.

330 TRACK B: The interactions between of water, hygiene and sanitation conditions, and heat vulnerability in Africa: A systematic review

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Background, rationale, and objectives: Access to safe drinking water, sanitation and hygiene (WASH) remains a challenge in many parts of Africa. Climate change, particularly extreme temperatures may further undermine access to WASH, given the continent's vulnerability to climate change, and limited adaptation measures. Examining patterns and manifestations of these interactions in Africa is key for developing remediative strategies. This systematic review aims to assess evidence on how heat exposure affects WASH in Africa, and to deepen our understanding of the complex interactions between these phenomena.

Methods: The review adhered to the PRISMA guidelines. Eleven databases were used to identify studies. To be eligible, papers had to be specific to Africa, written in English, French and Portuguese, and have been carried out during the period 2010 to 2022, focusing on how heat affects WASH services.

Results: Five articles that met the criteria and were evaluated. Of these included articles, three were conducted in rural areas, one in urban areas and one combined urban-rural study. We found that some households experience prolonged water shortages due

to high heat, which results from excessive evaporation from water supplies during periods of high heat. In other studies, no links were noted between heat exposure and access to WASH. Similarly, due to water shortages, some residents are unable to shower in the heat despite, which would have offered cooling and hygiene, and others reduced the amount of water usually used or to travel long distances in search of water to meet their needs. Additionally, while most studies showed that heat exposure led to a deterioration of water quality, some found heat improved water quality through reducing E. coli levels in drinking water sources.

Conclusions/Implications: Studies have shown strong inter-linkages between extreme temperatures, access to water and population hygiene. Overall, research focusing on African contexts is limited, and further investigation into this major concern is warranted. Urban studies are especially needed as most studies to date had been conducted in rural areas. Taken together, the evidence suggests that changes in climate will further exacerbate existing deficiencies in WASH in Africa.

Key words: Heat, water, sanitation, hygiene, Africa

386 TRACK B: Quantifying intra-urban socio-economic and environmental vulnerability to extreme heat events in Johannesburg, South Africa

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Background, rationale, objectives: Climate change increasingly influences urban environments, with extreme heat events becoming more frequent and severe. The concept of urban heat vulnerability is multifaceted, encompassing the urban heat island effect, socio-economic disparities, and the impacts of climate change. Johannesburg, South Africa's largest city, is particularly vulnerable due to its unique socio-economic landscape and rapid urbanization.

Methods: This study quantifies socio-economic and environmental vulnerability to extreme heat events in Johannesburg, South Africa, by integrating diverse datasets, including high-resolution environmental metrics (Land Surface Temperature (LST), Normalised Difference Vegetation Index (NDVI), Urban Thermal Field Variance Index (UTFVI), socio-economic indicators from the Gauteng City-Region Observatory, and health data. Using spatial multi-criteria analysis and a collaborative causal loop mapping approach, we map the intricate relationships between key variables contributing to heat vulnerability. Our approach aligns with the Intergovernmental Panel on Climate Change definition of vulnerability as the propensity or predisposition to be adversely affected, encompassing sensitivity and adaptive capacity. Geographically Weighted Principal Component Analysis (PCA) results indicate that areas with higher surface temperatures, limited vegetation, and higher prevalence rates of chronic diseases are more susceptible to heat stress.

Results: Our findings reveal that wards concentrated around historically disadvantaged areas, including Soweto and Alexandra, are the most vulnerable, characterized by high land surface temperatures, low vegetation cover, and poor health indicators, including high rates of diabetes and hypertension. Feature loadings from the PCA highlight that access to medical insurance is weighted high for heat vulnerability, followed by the risk of household hunger. The NDVI loading shows that well-vegetated areas negatively correlate to urban heat vulnerability.

Conclusions/Implications: This study provides actionable insights for urban planning and public health policy, emphasising the need for targeted interventions in areas with compounded socio-economic and environmental risks to enhance resilience against extreme heat.

408 TRACK B: Advancing Climate Change and Health Policies in Kenya: Insights from National Policy Stakeholders

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Climate change is causing profound harm to human health. Advocates, policymakers, and researchers are increasingly considering how national policymaking can best advance solutions to climate change that protect health, and health solutions that protect the climate. A key question is: To what extent, in what ways, and how should climate policy and health policy be combined in national policymaking? This study investigated Kenya's policy stakeholders' perspectives on this question through in-depth interviews with 21 experts in the president's executive office, government ministries, advocacy institutions, academic and research institutions and think tanks. Purposive sample interviews were conducted

from March through July 2024 with respondents working on climate policy, health policy, the climate-health nexus or related areas including energy, agriculture and transport. Recorded interview transcripts were coded in ATLAS.ti using mixed deductive and inductive manual qualitative content analysis. A strong majority of the respondents felt that the linkages between climate policy and health policy are weak. This is due to barriers including limited funding; limited understanding of the climate-health nexus; siloes between key government ministries and across disciplines; limited research and competing priorities. They noted promising trends and opportunities such as rising awareness of climate-health linkages; emergent funding, data and potentially large healthcare cost savings of acting on climate and health risks. The study findings suggest that advocates should strategically incorporate evidence-based communication strategies into their campaigns. They should link climate change and health and also tie in messages around the economic costs of climate change on the health system and the economic benefits of climate and health action. Additional recommendations beyond communication include educating stakeholders about climate-health links, accelerating research on impacts and solutions, strengthening initiatives within and across government agencies, leveraging existing funding opportunities, empowering climate and health policy champions, and overcoming structural barriers through activism and advocacy.

423 TRACK B: Association of ambient temperature with chronic disease care, in Regions of Antioquia 2015-2021.

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Background, rationale and objectives: Exposure to nonoptimal ambient temperatures has been considered an environmental health risk. Extreme temperatures can exacerbate pre-existing conditions, increasing health care needs. This is in addition to the threat of a warmer climate and an aging population. Studies have concluded that the trend attributed to non-optimal temperatures is a consequence of the increase in the population over 65 years of age. Objective: We aimed to determine the association between temperature and care for respiratory, cardiovascular and diabetic diseases in Antioquia.

Methods: Ecological time series study by regions of Antioquia, which included official Colombian government health data to evaluate the relationship between the daily count of people attended by ICD-10: J30-J39, J20-J22, I20-I25, E10-E14 and the average daily maximum and minimum temperature, using Generalized Additive Models, with a quasi-Poisson distribution and with a nonlinear lag model distributed with 3 days. All significance tests were performed at the 5% level and the data were processed in R, version 4.3.1 (1).

Results: Between 2015 and 2021, 4,755,650 health events distributed by upper (26.5%) and lower (11.4%) upper respiratory diseases, ischemic heart disease (39.5%) and diabetes (22.5%) were analyzed. A significant association was documented between mean temperatures of 24, 28 and 31.6 °C and acute respiratory events in the Bajo Cauca (RR:2.79 [95% CI:1.60 - 4.86, lag 2]), Northeast (RR:1.40 [95% CI:1.07 - 1.82, lag 2]) and Middle Magdalena (RR:1.86 [95% CI:1.39 - 2.49, lag 2]) regions, respectively. In these three regions there was also evidence of a greater risk of an increase in the number of heart attacks, ischemic heart disease and diabetes due to the increase in the mean, maximum and minimum temperatures.

Conclusion: It was found that the extremes of ambient temperature increased consultations for acute diseases of the upper and lower respiratory tract, ischemic heart disease and diabetes. The effect of heat on the population was immediate and sustained. These findings indicate the need for clinical and public health interventions aimed at reducing health events as a consequence of non-optimal temperatures.

438 TRACK B: EXtrapolating Temperature and Air Quality Exposure in Space and Time in Mozambique, Kenya, and The Gambia (ETIQUET)

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Background: Africa faces a critical shortage of environmental exposure data, primarily due to inadequate infrastructure, limited financial resources, and technical expertise. The ETIQUET study aims to address this gap by developing a comprehensive exposure extrapolation methodology that accounts for real-world environmental and socio-demographic interplays.

Objectives: The study seeks to quantify individual and community-level modifiers of exposure to temperature and air pollution, design space-time sensitive models that

accurately extrapolate heat and air quality exposures as well as calibrate and validate these models to improve their predictive accuracy. ETIQUET incorporates the influence of behavioral modifications on exposure modification.

Methods: The study uses openly sourced GIS datasets and high-resolution satellite imagery, portable sensor data (PM2.5, PM10, NO2, temperature, and humidity), ambient sensor data and surveillance data from the PRECISE study, community engagement feedback to incorporate local exposure dynamics. We employ land use regression (LUR) models to predict exposure variations, and deep learning models to enhance prediction accuracy.

Preliminary Findings: Distinct exposure patterns are observed across the study sites, with varying exposure decay rates suggesting behavioral responses to fuel use. Low midday ambient air pollution measurements suggest wind characteristics influence on exposure dynamics. Behavioral factors, such as cooking fuel choice, timing and placement of cooking stoves significantly impact exposure.

Future Work: The study will conduct feature importance ranking on model variables as part of the iterative model development, sensitivity analysis and model calibration will be used to refine and validate the models.

Conclusion: This pilot project addresses the critical need for accurate environmental exposure assessments in data-poor settings. By leveraging advanced spatial data science approaches, the study contributes to methods of exposure data acquisition necessary to understand disease dynamics for place-specific interventions in sub-Saharan Africa.

Keywords: Environmental Exposure, Spatial Data Science, Land Use Metrics, Deep Learning, Sub-Saharan Africa, Mozambique, Kenya, The Gambia

475 TRACK B: Understanding the Relationship Between Climate Change and Malnutrition Using Systems thinking Approach – Causal Loop Diagram

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Background: Somalia has experienced recurring climate-induced shocks, such as droughts, floods, and locust infestations, significantly impacting human health and contributing to high rates of malnutrition. There is a lack of specific evidence on the pathways through which climate change affects health and nutrition in Somalia. Employing a system thinking (ST) approach, we developed a causal loop diagram (CLD) to unravel and comprehend these intricate pathways, identifying strategic action points for addressing climate-induced malnutrition.

Methodology: We employed CLD to delve into the complex interplay between climate change and malnutrition in Somalia. Stakeholders from government departments, academia, environmental and health institutions, and community-based organizations actively participated in constructing the CLD through participatory workshops.

Findings: Climate change emerged as the primary driver of malnutrition in Somalia. Malnutrition was the central issue for the development causal loop diagram to illustrate the dynamics and interconnectedness between climate change, nutrition, and health in Somali. Figure 1 (not included with this abstract).

The CLD illustrated that malnutrition in Somalia stems from a complex web of interconnected variables, involving both reinforcing and balancing feedback loops. This underscored the need for a comprehensive approach to address the complex and interconnected challenge of climate change and nutrition. The dynamics depicted in the CLD are intricate, and complex. As shown in Figure 2, (not included with this abstract) the variables and dynamics identified throughout the workshop span 12 different areas.

Conclusions: The ST approach, utilizing the CLD, proved effective in engaging multiple stakeholders and fostering a shared understanding of the complex pathways linking climate change to malnutrition. This diagram is poised to play a pivotal role in shaping climate-resilient health and food security strategies in Somalia.

483 TRACK B: On the frontline of climate change and health: A health worker eyewitness report from the Global South

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Background, rationale, and objectives: Countries in the Global South are among the most vulnerable to climate change and its health impacts. While extensively researched, quantitative evidence provides minimal insights into day-to-day realities of climate impacts on health in these settings. This study aimed to address this gap by collecting and analyzing health workers' observations of climate change impacts on health in Global South communities.

Methods: In 2023, The Geneva Learning Foundation organized an experience-sharing event on climate impacts on health for its 50,000+ network of health workers in the Global South. An online survey collected quantitative data on health workers' perceptions of local climate change and its health impacts, as well as qualitative data on observed impacts. Data from 1,260 respondents across 68 countries were analyzed using mixed methods, including thematic analysis for qualitative data.

Results: Analysis revealed high concern levels about climate impacts on health across multiple domains. The most frequently cited impacts were on food security and malnutrition, vector-borne infectious diseases, and water-borne infectious diseases. Qualitative analysis provided additional insights: climate change was often contextualized within broader environmental degradation; complex, inter-related pathways were identified linking climate change to community health; and specific groups, including women and pastoralists, showed heightened vulnerability. Examples emerged of health workers collaborating with communities to build climate resilience.

Conclusion/Implications: This study highlights the potential to leverage health workers' community relationships, trusted positions, and expert knowledge in supporting community-focused efforts to build resilience and limit climate change health impacts in the Global South. Future research should explore strategies to integrate these insights into climate adaptation and mitigation policies, emphasizing the role of health workers as trusted advisers to their communities and key agents in addressing climate-related health challenges.

Keywords: Climate change, health impacts, Global South, health workers, qualitative research, malnutrition, infectious disease, community resilience

499 TRACK B: Leveraging AI for Non-Invasive Monitoring of Heat-Induced Intracranial Pressure in Vulnerable Populations

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Background Rationale and Objectives: Climate change has led to an increase in heat exposure, posing significant health risks, particularly heat stroke, often associated with cerebral oedema and central nervous system (CNS) dysfunction. Elevated intracranial pressure (ICP) resulting from these conditions is a critical concern as it can decrease brain perfusion pressure and lead to severe outcomes. This study evaluated the use of machine learning models to predict optic nerve sheath diameter (ONSD) measurements, a non-invasive marker for elevated ICP, in populations at risk from heat stress.

Methods: We utilized a dataset of 205 ocular ultrasound images from black South African adults, a group vulnerable to heat-related health issues. ONSD measurements were taken 3mm behind the retina. Various machine-learning models, including ensemble methods (Random Forest, XGBoost) and a Convolutional Neural Network (CNN), were trained to predict ONSD. Model performance was evaluated using Mean Absolute Error (MAE), Root Mean Square Error (RMSE), Intraclass Correlation Coefficient (ICC), and the percentage of predictions within a 5% margin of error.

Results: Ensemble methods, particularly Random Forest and XGBoost, demonstrated strong predictive capabilities with the lowest MAE (0.2655mm and 0.2691mm) and RMSE (0.3451mm and 0.3564mm). The CNN model achieved the highest ICC value of 0.58, although overall ICC values were low. The Random Forest model had the highest precision, with 19% of predictions within the 5% margin of error. Despite the limited dataset, the models showed promising results in predicting ONSD, crucial for diagnosing elevated ICP non-invasively.

Conclusion/Implications: These findings suggest that AI-assisted ONSD measurement could be a valuable early screening tool for monitoring stress response in clinical settings, particularly during heat waves when resources are limited and widespread computed tomography (CT) scans are impractical. Further research is needed to improve model reliability and assess the impact of heat on ONSD measurement accuracy.

Declaration: This study was conducted as part of AP's master's research report for the MSc in Ophthalmology at the University of Edinburgh in the UK.

523 TRACK B: Lessons Learnt during mapping of villages where pregnant women come from in preparation of assigning environmental exposures.

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Background: Linking environmental and health outcomes data in 'time and place' is essential for analysing associations. Spatial Analysis at the village level is essential for precise characterisation of environmental exposure. However, access to village geospatial boundaries or mapping these of the villages is an important first step that is often hindered to inadequate spatial data infrastructures. This abstract delineates the experiences and the lessons learnt when mapping villages for the PRECISE study that followed up on pregnant women and their babies in The Gambia, Kenya, and Mozambique.

Methods: Mapping villages involved several methods that range from leveraging existing datasets to creating new data through fieldwork and community engagement. Various methods were used to map villages. Village names were collected during data collection through facility based surveillance, including e.g. district; locality of village). A search of the village names was done on Public Databases and Portals: such as OpenStreetMap, Mindata.org, which usually have boundary information for many countries and the alternative names of these villages. Satellite Imagery from Google Earth Pro was also utilised by searching for village names.

In The Gambia and Mozambique, it was possible to map all the villages that were recorded. Learning to navigate online data repositories was one of the key lessons learned. If efficiently done it can save time and ensure access to high-quality data. Familiarity with platforms like Map Carta, Mindat.org and OpenStreetMap proved particularly beneficial. A challenge faced was accessing shapefiles of villages that had gaps or inconsistencies. Developing strategies to address this issue was a huge challenge mainly with the Kenya dataset. The difference in spellings of village names has been a challenge. However, the use of data repositories like Mindata.org which provides different spellings and alternative names for villages and was of great use. Variations in spelling impacted the effectiveness of the web scraping scripts, leading to inaccurate results. The use of multiple data sources for cross-verification is crucial for maintaining data integrity. For villages in Mozambique which have similar names but are in different regions of the country, cross verification proved to be useful. Despite efforts to ensure that all the villages in the study were mapped, there were some villages that could not be mapped at all. Kenya had a total of 420 unique villages and only 344 villages were mapped successfully, and 76 villages could not be found altogether. In Mozambique all 93 villages were mapped successfully. Fig1 below shows the number of villages that were successfully mapped against the total number of villages that were collected.

Conclusion: There is a huge gap in the spatial information on African villages online as more time was spent manually going through the internet searching for the villages online. This has a negative impact on assigning of environmental exposures to study participants. There is need to develop more robust methods to map villages from sub-Saharan Africa.

547 TRACK B: Simultaneously quantifying heat stress and heat strain using a novel heat exposure framework

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Background, rationale, and objectives: Quantifying heat stress/strain is an important aspect of biometeorology, contributing to understanding the impacts of heat and the benefits of various adaptation interventions. Attempts to develop heat exposure indices are numerous and varied, however their uptake is limited by increasing complexity and limited applicability across diverse fields. Traditional metrics don't uniformly account for the cumulative effects of heat stress, nor the modifying effects of personal factors on heat strain. We aim to develop a universal heat exposure framework that integrates diverse environmental factors and personal susceptibilities to accurately quantify heat stress and subsequently predict heat strain.

Methods: We propose a novel heat exposure framework centred on the Heat Exposure Unit (HEU). The HEU integrates temperature over time, producing a heat-density function that reflects the heat stress experienced by an individual. This model is extended to a modified Heat Exposure Unit (mHEU), which includes a sensitivity factor (α), to provide a predict for heat strain. This is calculated through integrated heat-health vulnerability assessments based on personal characteristics such as demographics and health status, providing physiological inputs, and socioeconomic and behavioural components providing adaptation inputs to the model.

Results: The HEU and mHEU frameworks successfully quantified heat exposure across diverse scenarios, using fine temporal resolution temperature datasets, while providing additional insights into cumulative exposure and differential vulnerabilities. For instance, in a standard day scenario (10°C average), the HEU is 240°C·hours of heat stress. The mHEU adjusted for high sensitivity ($\alpha = 2$), results 480°C·hours of heat strain, equivalent to 20°C average for an average individual. This adjustment highlights the framework's ability to account for individual differences in heat sensitivity, a critical factor for personalized health early warning systems and adaptation interventions.

Conclusion/Implications: The development of the framework represents a significant advance in the field of biometeorology, to accurately quantify heat stress and strain. By providing a universal measure of heat exposure, this framework addresses the limitations of existing models and enhances the accuracy of heat-related health risk assessments. Furthermore, its broad applicability across different species and contexts facilitates interdisciplinary research, fostering a holistic approach to the climate crisis.

240 TRACK B: Air pollution, risk and vulnerability to heat in the city of Abidjan (Côte d'Ivoire)

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Background, rationale, and objectives: Air pollution is the number one health risk which greatly contributes to an increase in respiratory diseases. Heat exacerbates air pollution and when the two combine (air pollution-heat), the effect on human health is exacerbated. This study aims at understanding the synergistic effects between heat and air pollution in relation to the health of the population in Abidjan (Côte d'Ivoire).

Methods: This work is based on previous climate and air pollution data, including observational datasets from weather stations, satellite and processed/screened observations. Air pollution measurement sensors are used to obtain Particulate Matter (PM2.5) data in real time. Hourly averages are used to understand the diurnal cycle of PM2.5 in Yopougon (Abidjan, Côte d'Ivoire) over the periods 2016, 2019 and 2022. Temperature maps for the same periods are then be compared with pollution peaks. A non-hydrostatistic regional climate model coupled with chemistry is used to reconstitute PM2.5 pollutant concentration levels, validated with in situ data. Two tests (one with chemistry and one without chemistry) are carried out to assess the impact of pollutants on temperature increases.

Results: The results shows that daily average PM2.5 concentrations in Abidjan are very high and are around 4 to 57 times above WHO standards. In addition, the high temperature values in some areas correspond to high pollution zones. PM25 are not only associated with health impacts but also have a climatic impact through their ability to absorb and diffuse solar radiation. The first modelling results with the RegCM5 model are able to reproduce the patterns of temperature and PM25 pollution, although some biases have been observed.

Conclusion and implications: High levels of PM2.5 pollution have challenged us and led us to develop mitigation strategies and concrete recommendations aimed at reducing pollution in Abidjan. It is essential to identify the contributions of the main sources of air pollution emissions and to be able to reduce each of them to influence air quality and its impacts (human health and climate change).

257 TRACK B: People's perceptions and experiences of heat in Africa.

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Introduction: Climate projections indicate that heat extremes will become more frequent and intense in the near future. Africa is especially vulnerable to the harmful effects of heat waves on health. To identify appropriate adaptation strategies, it is important to better understand how local populations perceive and cope with the effects of heat waves.

Objectives: The aim of this systematic review is to identify and analyse research on people's perceptions of and strategies for adapting to heat in Africa.

Methodology: Searches were conducted in accordance with PRISMA. Keywords were formulated and combined with Boolean operators. Searches were conducted using the following electronic search engines: Google Scholar, Science Direct, Taylor & Francis, Sage Journal, Cochrane, Annual Review, Emerald, Plos One, Recherche4live and VHL. Combinations of search terms were applied in order to better structure our ideas. The references were downloaded as a CSV file and converted into an Excel file. This process removed any duplicates. The final documents were saved in bibliographic reference management software (Zotero). We included articles published in English, French and Portuguese.

Results. The search process produced 29 studies based on the selection criteria from 35,015 studies identified. Of the 29 articles selected, 13 address the issue of people's perception of heat, while 7 focus on workers' perception of heat and the resilience mechanisms they develop. In addition, 9 studies looked at people's adaptation to heat. The analyses show that people are aware of the effects of heat on their health. Environmental factors influence heat-related illnesses and affect many people, particularly the most vulnerable. People have taken steps to adapt to the effects of the heat, but there has been very little political action to combat it.

Conclusions and next steps: This systematic review highlighted research on African populations' perceptions of heat and their strategies for adapting to it. Particularly there was none on the Ivorian context. From this review a PhD study was launched centered on the Ivorian context with the following title: "People's perceptions and experiences of heat in the city of Abidjan ".

Keywords: Perception, Experience, Heat, African countries; Africa; climate change

486 TRACK B: Foundation model technology for Urban Heat Islands

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Introduction, rationale, and objectives: Quantifying the impacts of extreme climate events is a global necessity. Risks associated with heat and how they vary within urban areas and between urban and rural areas, are of particular interest as the pace of climate change continues to quicken. African cities with rapid rates of urbanisation, leading to significant levels of informality, are a concern in terms of escalating adverse health consequences associated with extreme heat events. One approach to understanding the heat hazards and their variation along the urban-rural gradient is to characterize the Urban Heat Island (UHI) effect.

Methods: Physics-based modelling of the UHI depends on the availability of high-resolution air, land surface temperature and other datasets required for energy balance and heat flux modelling, along with high performance computing and expertise required to develop these high fidelity models. The inequities in the availability of high resolution climate data and limited scalability of physics-based UHI models is thus a challenge. We consider Artificial Intelligence (AI) approaches, namely Geospatial Foundation Models (GFM) as an alternative for developing a scalable UHI model that leverages existing disparate climate and multispectral satellite data. GFMs are trained on large corpuses of geospatial data, making them highly generalizable to various downstream tasks, such as urban scale temperature mapping.

Results: We leveraged the IBM Earth Observation Foundation Model, "Prithvi", a GFM, fine-tuning this model on global, high-resolution remote sensing data (HLS Landsat 30) and reanalysis (ERA5 Land) climate datasets for cities of varying climate zones over the period 2013 – 2023, to predict land surface temperatures (LST). The fine-tuned model incorporates a SWIN transformer architecture. The performance of the model in predicting LST was assessed against a U-Net model. Our results indicate high correlation between predicted and measured values of LST, with mean absolute error less than 1.7°C, and enhanced capabilities for inference on unseen cities. Our model is able to accurately capture temperature variations across different land cover types within urban areas.

Conclusions: The model developed is beneficial for UHI detection with the ability to contribute to urban scale heat hazard mapping and forecasting. Further, the outputs of the model can be further pot-processed and

linked with health outcomes datasets for quantifying the impact of heat on health and the development of Early Warning Systems. Other applications include assessing the impact of heat on the built environment, specifically risks to critical infrastructure, and inform urban planning decisions related in the context of adapting cities to mitigate against the effects of UHIs.

587 TRACK B: Leveraging African data resources and novel data science approaches to address priority knowledge gaps on climate change and health

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Background, rationale, and objectives: Climate Change, especially increases in global temperatures, pose major health challenges worldwide. Africa is disproportionately vulnerable to these effects. In recent decades, all successful public health responses and targeted global funding have centered on close monitoring of disease burden and a clear understandings of disease pathways. The HE2AT Center and its related studies aims to use innovative data science approached to quantify the current and future impacts of heat exposure on priority health conditions and high-risk populations such as pregnant women and infants in sub-Saharan Africa.

Methods: We employ multiple approaches, including traditional systematic reviews, and an individual participant data meta-analysis. Through these approaches, we identify gaps in the evidence, and systematically quantify exposure-response functions and patterns of heat exposure and pregnancy outcomes, including assessment of sub-group vulnerability. We apply both traditional statistical and machine learning approaches, and assess present and future impacts as well as attribution functions.

Results: We identified 198 studies in a systematic review, which together document the marked impacts of heat exposure, across 23 health outcomes. For example, after a heat wave, odds of preterm birth increase 1.26 fold in meta-analyses (95% confidence interval= 1.08, 1.47), and stillbirth by 1.14 per 1°C (95% CI=0.99,1.32). Few studies were done in Africa (n=11, 5.5%), and almost no studies used longitudinal data, had applied machine learning methods, or involved climate scientists. Almost all studies have high risk of bias. To secure individual participant data to address gaps, we identified 222 cohort studies or trials involving pregnant women in Africa, and, to date, have secured 27 databases. Our first analyses of integrated heat outcome and climate data from different regions in Africa are beginning to build an understanding of patterns in exposure-response functions across the continent. We will now explore more complex machine learning methods and climate change modelling to build on our initial analyses.

Conclusion/Implications: Integrating these diverse analyses allows us to quantify the burden of climate change on health, and inform selection of an indicator to track these impacts, which, we hypothesize, will trigger greater health sector engagement in the climate change response.

ADAPTATION INTERVENTIONS AND BUILDING CLIMATE RESILIENT HEALTH

336 TRACK C: A Landscape Assessment of Sexual and Reproductive Health Programs in the Face of Climate Change in West Africa

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Background, rationale, and objectives: Despite growing recognition of climate change's health impacts, the specific effects on women's sexual and reproductive health and rights (SRHR) are often neglected. Efforts in this area remain limited, and there is a lack of clarity on the opportunities, challenges, and investments needed for a comprehensive response in West Africa, a region identified as highly vulnerable to climate change. This first-of-its-kind landscape assessment aimed to identify key actors in integrated climate-SRHR programs in West Africa, examine their strategies, and identify the gaps in the landscape.

Methods: A mixed-methods approach was employed, including a desk review of relevant policies, global commitments, and declarations. A survey was conducted among organizations involved in climate resilience or SRHR activities at the community level in West Africa, supplemented by follow-up interviews with selected respondents. Survey data were analyzed descriptively, while qualitative interviews were assessed using content analysis.

Results: From the 83 global survey respondents, 53 were engaged in climate-SRHR activities, with 14 operating in West Africa. These ranged from grassroots organizations to large NGOs, focusing mainly on gender-based violence (GBV), family planning, and menstrual hygiene management, primarily targeting women and adolescents. The organizations integrate climate resilience and SRHR through different strategies either capacity building, advocacy, awareness and community engagement and service delivery. The key gaps identified include insufficient policy attention and donor support, creating a critical mismatch between growing needs and available resources. Notably, crucial areas such as child marriage prevention and adaptation to extreme heat, which research has shown to negatively impact maternal and child health, were overlooked. Additionally, all the organizations reported difficulty in evaluating their programs, they resort to the existing measures of success for SRHR programs and using process indicators instead of measuring impact. Resource constraints further worsens the situation, with short-term, inadequate funding hindering large-scale, transformative initiatives.

Conclusion/Implications: This assessment highlights the innovative efforts of organizations in West Africa integrating climate resilience with sexual and reproductive health and rights (SRHR). It also identifies specific barriers, barries, and opportunities to improve integrated climate-SRHR efforts and ensure a just, rights-based, and evidence-driven approach to climate adaptation.

385 TRACK C: Systematic Literature Review of Extreme Heat Conditions on Maternal Health: Determining Heat-Health Thresholds

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Background: Climate change is the most significant global health threat of this century. Pregnant women have been identified as a particularly vulnerable group, facing increased risks for preterm birth, low birthweight, stillbirth, and other perinatal health complications. This integrative literature review aims to identify heat thresholds impacting maternal health and birth outcomes. Given the surge of new studies, an updated review is necessary to evaluate the relationship between heat and maternal health, determine heat-health thresholds, provide heat health early warnings and to examine various heat health assessment methods in connection with well categorized pregnancy stages.

Method: We conducted a systematic literature review using three databases: Scopus, Web of Science, and PubMed. The following keywords were employed: heat*, thermal, warm*, temperature, threshold, limit, indicator, max*, warning, alert, monitor, maternal, pregnan*, postpartum*, perinat*, "peri nat*", prenat*, "pre nat*", postnat*, and "post nat*". In Covidence, the title/abstract screening was conducted, followed by a full-text screening.

Result: The database search yielded 2864 publications, with title/abstract screening performed on 2016

studies, resulting in 311 studies for full-text review. The work is ongoing. Currently, 12 studies were extracted for preliminary analysis. These studies examined the relationship between ambient heat and preterm birth (n=5), stillbirth (n=2), low birthweight (n=2), and other health outcomes (n=3). Most studies found a significant association between extreme heat exposure and adverse health outcomes in the third trimester (n=9). Heat-health threshold patterns were identified, with six studies establishing a temperature threshold within the 90th-95th percentile of around 30-35°C. Most studies used gestational weeks (n=8) or trimesters (n=3) to indicate pregnancy stages. Although all studies measured daily maximum air temperature, heat exposure assessment varied, using methods such as the heat index (HI) or temperature variability.

Conclusion: Although there is consensus among research communities indicating a significant association between extreme heat exposure and adverse perinatal health outcomes, discrepancies remain across studies, and specific heat-health thresholds are often lacking. A clear majority of studies used gestational weeks to indicate pregnancy stages. The assessment method of ambient heat varied widely, highlighting the need for standardized heat stress indices and updated measurement and assessment methodologies.

Keywords: Maternal and child health, Perinatal health, Heat-health thresholds, Ambient heat, Assessment methods.

Acknowledgement: This research is conducted within the framework of EU HIGH Horizons project. The HIGH Horizons project has received funding from the European Union's Horizon Framework Programme under Grant Agreement No. 101057843. Project partner LSHTM is funded by UKRI Innovate UK reference number 10038478.

266 TRACK C: Health system resilience to climate change in Malawi: a review on cholera outbreaks exacerbated by tropical cyclone-related floods

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Background, Rationale, and Objectives: Malawi's health system is highly vulnerable to climate-induced cholera outbreaks, particularly due to frequent tropical cyclone-related floods (TCRFs). These climatic events exacerbate existing challenges within Malawi's health system, which suffers from inadequate infrastructure, limited resources, and poor health indicators. In March 2022, Malawi experienced its most severe cholera outbreak in two decades, impacting all 29 districts and resulting in a case fatality rate that was 3-fold higher than the expected 1%. This research aims to assess the resilience of Malawi's health system in managing cholera outbreaks exacerbated by TCRFs. The objectives are to assess the system's adequacy and functionality, analyze the efficiency and relevance of current adaptation strategies, investigate the role of intersectoral collaboration and community engagement, review international best practices, and provide evidence-based recommendations for improvement.

Methodology: This study employed a comprehensive literature review. Data sources included peer-reviewed articles, government reports, cholera outbreak records, and relevant policy documents. The review focused on the components of the WHO operational framework for climate-resilient health systems, including governance, health workforce, health information systems, medical products, infrastructure and technologies, service delivery, and financing. Key themes explored included the health system's capacity, WASH (water, sanitation, and hygiene) infrastructure, surveillance, coordination mechanisms, and community engagement.

Results: Key findings revealed critical challenges in Malawi's health system, including inadequate infrastructure, insufficient health facilities, and low medical personnel ratios, especially in rural areas. High dependency on donor funding, frequent natural disasters, poor waste management, and inadequate WASH infrastructure increase vulnerability to cholera outbreaks. Current preparedness and response strategies are insufficient, with significant gaps in coordination and resource mobilization. However, intersectoral collaboration with international organizations and community engagement initiatives like the TIPEWE Cholera campaign, have been crucial in integrating climate considerations into public health responses.

Conclusions: Malawi's health system requires substantial improvements to effectively manage cholera outbreaks amid climate-related challenges. Key recommendations include enhancing infrastructure, securing sustainable financing, improving workforce distribution, strengthening WASH infrastructure, governance, and warning systems. Implementing these recommendations is crucial for building a resilient health system that can safeguard public health and promote sustainable development amidst the growing climate change challenges.

377 TRACK C: Community perceptions on health sector vulnerability, adaptation, and resilience in a changing climate in Gutu District, southern Zimbabwe

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Background, rationale, and objectives: Climate change has dire consequences on disease prevalence, particularly in developing countries. However, several climate change adaptation strategies currently being implemented in these countries do not adequately address the impacts of climate on public health. This study sought to: a) evaluate how communities perceive trends in climate extremes in Gutu District; b) examine the perception of communities on the impacts of climate extremes on health outcomes in Gutu District; c) examine the factors exacerbating the impacts of extremes on health outcomes; d) determine means of building the adaptive capacity of communities in Gutu District.

Methods: A case study design approach was employed in this study. Purposive sampling was used to select two wards in Gutu District, while simple random sampling was employed to select 367 households for survey questionnaire response. The questionnaire sought to elicit information on trends of droughts, floods, hot days, and heat waves, associated health outcomes and the socioeconomic challenges in addressing the health outcomes. We conducted one focus group discussion (FGD) in each ward. Each FGD comprised 8–10 participants of diverse backgrounds. We conducted five key informant interviews with local leaders and key government departments. Data were analysed using descriptive statistics.

Results: Participants have experienced an increase in the frequency of climate extremes, which thy linked with increased occurrence of waterborne diseases, malnutrition, respiratory infections and heat exhaustion in pregnant women, younger children, the elderly and people with underlying conditions. Limited access to health facilities, services, clean water, information on climate change and health nexus, lack of disease surveillance systems and difficulty in attributing climate extremes to health outcomes due to complex interactions between climate change and health, has exacerbated people's vulnerability.

Conclusion: There is abundance signal that communities in this study have experienced an increase in climates with negative health outcomes. Increasing the number of health facilities, establishment of appropriate infrastructure to attract skilled health personnel, and capacitating health personnel on climate-health interactions can strengthen heath systems resilience. Gutu needs to build a critical mass of expertise for generating climate change and health information towards a climate-resilient public health system to protect the vulnerable communities.

Key words: climate change; extremes; health; diseases.

406 TRACK C: Heat-Health Vulnerability in Cape Town Informal Settlements: An Integrated Multi-Stakeholder Early Warning and Monitoring System for Extreme Heat.

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Topic: Heat-Health Vulnerability of Cape Town Informal Settlements in the Context of Rapid Urbanization: An Integrated Multi-Stakeholder Early Warning and Real-Time Monitoring System for Extreme Heat.

With rapid urbanization, Cape Town has experienced the growth of densely populated informal settlements with limited access to basic infrastructure and healthcare. Their living circumstances predispose them to extreme heat's adverse effects, including heat-related health issues. Because residents of these communities are disproportionately affected by extreme heat events, the case study focuses on their vulnerability to heat-related illnesses.

I investigated the social, cultural, political, and economic aspects of heat vulnerability in informal settlements. This was accomplished by implementing a multi-stakeholder engagement process that involved policymakers, healthcare professionals, and members of the community in identifying and prioritizing risks and vulnerabilities related to heat. The objective of the study was to co-design a framework for an integrated real-time monitoring and early warning system to improve response and preparedness for heat-related illnesses. A scoping literature review and key informant interviews were carried out to identify existing gaps in heat response strategies and to collect viewpoints and insights on heat vulnerability from pertinent stakeholders.

Preliminary research indicates that Cape Town has limited access to timely and accurate weather information and insufficient infrastructure, such as green spaces and cooling centers, to mitigate heat waves. To deliver alerts and guidance in real-time, the suggested early warning and monitoring system will make use of local knowledge and expertise in addition to data from weather stations,

medical facilities, and community reports. The system seeks to lower the risks to public health and increase community resilience to extreme heat events through stakeholder collaboration.

The study intends to advance knowledge of localized heat-health dynamics and the importance of community-driven solutions in climate adaptation strategies by concentrating on Cape Town's informal settlements. The health and well-being of vulnerable communities in quickly urbanizing environments will be enhanced by targeted and effective interventions and policy recommendations based on these findings.

Keywords: informal settlements, urbanization, stakeholders, heat-health, early warning systems, and Cape Town.

555 TRACK C: Health Effects of Adoption of Stress Tolerant Maize for Africa (STMA) Varieties in Nigeria

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As climate change and land degradation force a decline in yields and poor health outcomes of smallholder farmers, investment in sustainable and climate-smart intensification is a vital requirement. Smallholder farmers have an important role to play because they produce much of the world's food and, represent a large share of Africa's poor and food insecure. This agenda is timely and aptly espoused in the Sustainable Development Goals (SDGs) and Nigeria's Development Plan (2022-2025). The Stress Tolerant Maize for Africa (STMA) varieties are resistant and tolerance to drought, low soil fertility, heat, diseases in the region. Hence, this study examined the effect of the adoption of STMA varieties on health of smallholder farmers in Nigeria. Specifically, this study investigates the effect of climatic variables and the moderating effect of STMA adoption on the health of smallholder farmers. The study uses a cross-sectional data collected from randomly selected 520 farming households from two states in the derived savannah agroecological zone of Nigeria. Data was analysed using poisson regression and the ordinary least squares regression. Findings revealed that adoption of STMA is low as about one-third (35.9%) of the maize farmers have adopted the varieties. The top three climate variability indicators perceived by maize farmers in the last decade were high temperatures and heat, dryness, and drought while floods, too much rain, and high winds. Climatic factors increased the number of times farmers fell ill and the expenditure on health within the planting season. Adoption of STMA varieties had a moderating role on the effect of climatic factors on the health of these farmers. The study concludes that drought-resistant varieties might reduce climate impacts on health of farmers as it reduces labor intensity during drought periods. This will reduce the physical strain on farmers and the number of times they fall ill and expenses on health. Additionally, the STMA reduces farmers' exposure to harmful agro-chemical substances that could negatively affect their health. Therefore, concerted efforts should be taken by the government and relevant stakeholders and as aforementioned recommendations to facilitate the adoption of the STMA in improving the health outcomes of farmers.

501 TRACK C: An Analysis of Sexual and Reproductive Health and Rights (SRHR) in National Adaptation Plan and Health National Adaptation Plan Processes

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Background: Climate change is the most significant global health threat of the 21st century. Due to persistent existing gender inequities, women and girls face greater climate-related health risks, particularly regarding sexual and reproductive health and rights (SRHR). However, SRHR is often overlooked and not included in climate adaptation planning and policy. Two key policy mechanisms support governments in advancing climate adaptation: National Adaptation Plans (NAPs) and Health National Adaptation Plans (HNAPs). Given the influential role that NAP/HNAP plans have on the trajectory and scope of a country's climate adaptation efforts, the NAP/HNAP processes represent a critical opportunity to bridge the climate and health sectors and strengthen individual and population-level health outcomes, especially as they relate to SRHR.

Objective: In this study, we sought the extent to which SRHR considerations are explicitly included and not included in each country's official climate adaptation plans, for all those countries who have publically released their plans as of July 2024.

Methods: We reviewed the most recently available NAP document for each country that had submitted a NAP and made it available on NAP Central as of 15 July 2024 (n = 58). In addition to formally titled HNAPs (n = 21), we also included other relevant, government-approved policy documents in cases where NAPs/HNAPs provided insufficient information or HNAPs were not available (n = 12). In cases where neither of these were identified, we reviewed WHO Health and Climate Change Country profiles (n = 9). All identified documents were reviewed irrespective of publication language.

Results: Overall, there was extremely limited integration of SRHR in NAPs and HNAPs. No NAP or HNAP mentioned all components of SRHR. Maternal and newborn health was the most commonly referenced aspect of SRHR in 36% (n=21) of NAPs and 24% (n=5) of HNAPs. We found that only 5% (n=3) of NAPs and 15% (n=3) of HNAPs mentioned contraceptive services. Other essential aspects of SRHR such as reproductive cancers and comprehensive sex education were completely absent from any HNAPs and NAPs.

HIV/AIDS was mentioned in only 10% (n=6) of NAPs and 14% (n=3) of HNAPs despite high rates of HIV prevalence in many included countries and the growing evidence that the climate crisis is impacting transmission dynamics.

Gender-based violence (GBV) was referenced in 33% (n=19) of NAPs and 14% (n=3) of HNAPs. 12 out of these 22 NAPs and HNAPs provided specific and nuanced action points to drive policies or interventions aimed at reducing GBV in the face of climate change.

Implications: The findings of this assessment highlight the critical need for comprehensive integration of SRHR into HNAPs and NAPs, as part of a wider human rights-based, gender-responsive approach to climate adaptation. We identify several priority recommendations for advancing towards this goal, which include 1) developing a standardized framework for integration of SRHR into climate adaptation plans, 2) utilization of gender-disaggregated data and appropriate gender-responsive indicators, 3) ensuring women and girls are represented in developing, implementing, and evaluating NAPs/HNAPs, and 4) expanding gender-responsive climate finance.

291 TRACK C: Building climate resilient health systems in informal settlements in Freetown, Sierra Leone

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Background, rationale, objectives: The greatest gains in health in the context of climate change will be achieved through reducing the risks faced by the urban poor, including by targeting informal settlements (IPCC, 2022). How to reduce health risks in these contexts through strengthened health service delivery which is responsive, equitable and people- centred is, however, currently unclear. Access to quality formal healthcare in marginalised urban settings is often limited, especially for certain people, and health services are therefore provided by a complex system of formal and informal providers. In extreme weather events including heatwaves and floods, health service delivery is often non-existent, inaccessible, or unaffordable.

Under the Urban SHADE research project, our aim is to collaboratively design, implement and evaluate context sensitive interventions to improve the resilience and responsiveness of health service delivery in the context of extreme weather events in informal settlements. This will be achieved through equitable partnerships with urban marginalised people, health system and relevant governance actors in Sierra Leone, Kenya and India.

Here, we present the findings from initial consultations and engagement in three informal settlements in Freetown Sierra Leone, which inform the design of our community-based participatory research.

Methods: In three informal settlements in Freetown, Focus Group Discussions with residents and one combined group with residents and government and health stakeholders were conducted as we developed the funding application. On project inception, we undertook stakeholder analysis to further identify key stakeholders. We then brought together residents, health workers and governance actors in a two-day inception meeting, to collaboratively identify priorities to inform further research design.

Results: Consultations and engagement identified the need and desire for community-led action on health in informal settlements. The role of health workers in climate emergencies were seen as relevant by stakeholders in preventing disease outbreaks. Stakeholders requested capacity strengthening initiatives to better equip communities in responding to climate emergencies and these included awareness raising techniques in emergencies, use of communication and climate technologies and resource mobilisation. Communities were concerned about vulnerable groups particularly women and girls, the urban poor and people living with disabilities and reported that they are at increased risk of ill-health, worsening poverty and exposure to violence.

These findings shape the design of our research tools to assess the impacts of extreme weather events on health and health services and the existing resilience of health systems. This includes sharing how we have adapted the WHO Checklists to Assess vulnerabilities in Health Care Facilities in the Context of Climate Change to be applied in informal settlements in Freetown.

Conclusion/Implications: Our work shows the importance of engaging communities and governance and health stakeholders from the beginning of research on health and climate change.

520 TRACK C: Heat Stress in Arid Lands of Kenya: Case of Turkana County

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Introduction: Globally, heatwaves are increasing in intensity, duration and frequency with negative impacts on human health, life expectancy, economy, environment and agricultural productivity. In 2022, India experienced a heatwave that lasted 70 days while Europe suffered over 60,000 heat stress deaths in the same year. Heatwaves are epochs of unusually high temperatures going for days or months in a given area. Kenya's temperature has risen by 0.3°C per decade since 1985 with northern and coastal regions experiencing increased frequency of heatwaves in recent times. Turkana county is arid with a mean temperature of 30.5°C and drought and heat stress are major hazards. This study uses initial data from a bigger study on climate change in marginalized communities in Kenya.

Objective: To explore levels of heat stress in Turkana County and community coping strategies.

Methods: This is a cross-sectional study using quantitative and qualitative primary data, Miniature devices called i-buttons were deployed in 17 purposively selected households to collect ambient temperature and humidity over a 5-day period in Kerio, Kalokol, Township, Kanamkemer, Kang'atotha, Kakuma, Letea and Nanam Wards. Using a pre-determined criterion, members of the Community Disaster Risk Reduction groups randomly picked from all Wards and one sub location chief each were requested to give two community members that fit the selection criterion. Two households were selected per sublocation while three control gadgets were installed at Met offices and a health facility. The gadgets were set to record data at 30minute intervals. This study presents temperature results and explores the households' coping approaches to heat stress. Data were analyzed using descriptive statistics in MS-Excel and SPSS.

Findings: At the household, i-buttons were deployed in 5 tin-mud, 1 tin-cement/mud, 1 tin-tin, 2 thatch-mud and 8 thatch-thatch (manyatta) roofing and walling structures, respectively. Tin-Tin structure recorded highest day temperatures compared to manyatta. Control gadgets were in the open. Heat stress coping measures were sitting under shades, tree planting, hydrating, sleeping outside the house.

Conclusion and Recommendations: As heat stress is predicted to magnify in future, decisions on housing materials need reconsideration. For Turkana, households should plant indigenous trees and construct manyattas to shelter during hot days.

100 TRACK C: R21 Malaria Vaccine in the Ever-Changing Climate: Any Implication for Vaccine Efficacy in West Africa?

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Introduction: The ever-changing climatic conditions and malaria control efforts in West Africa present a complex challenge for deploying the recently approved R21 malaria vaccine. With over 200 million malaria cases and nearly 400,000 deaths annually in the region, the dynamic environment complicates vaccine distribution and efficacy. This necessitates continuously adapting strategies to effectively combat this persistent health threat. As a result, this study aims to investigate the implications of West Africa's ever-changing climate on the efficacy of the R21 malaria vaccine and to recommend adaptable strategies to enhance its deployment and effectiveness in the region.

Method: This study synthesizes existing research and data extracted from scientific databases, including PubMed, Scopus, and ScienceDirect, with the aim of elucidating the potential impacts of changing climatic patterns on the efficacy of the R21 malaria vaccine. A comprehensive literature review was conducted, focusing on peer-reviewed articles, climate reports, and vaccine efficacy studies. Additionally, expert interviews and regional climate data were analyzed to provide a holistic understanding of the interplay between climate variability and vaccine performance. This multi-faceted approach aims to identify key factors influencing vaccine efficacy and inform adaptive strategies for improved malaria control in West Africa.

Result: Recent studies project a 50% rise in climate suitability for the transmission of malaria by 2080 in malaria-endemic regions, potentially exposing immunologically naïve populations to the risk of infection. It has also been revealed that the transmission of malaria peaks at 25°C with a 53% decline just above 28°C, thereby establishing the relationship between malaria transmission dynamics and a warming climate. The R21 vaccine has prospects in addressing the risk of malaria in children, with 77% efficacy (95% CI: 67-84) reported in Burkina Faso. However, its long-term efficacy

can be impacted by the changing climatic conditions as the efficacy of the RTS,S vaccine declined from 35.9% in the first year of the clinical trial to 4.4% (95% CI: 17.0 - 21.9; p = 0.66) in the seventh year. The antigenic landscape of Plasmodium falciparum may also be affected by the changing climate, and potential climate-driven antigenic drift could affect the efficacy of the R21 malaria vaccine, with studies reporting an increase in ambient temperature by 5°C capable of altering antibody responses to vaccination by 20%.

Conclusion and Recommendation: This study underscores the urgent need for multidisciplinary and climate-informed approaches to R21 malaria vaccine deployment in Africa. Future research should focus on the vaccine's long-term efficacy under changing climatic conditions. The integration of climate science into public health policies is highly recommended. Additionally, adaptable strategies such as real-time climate monitoring, flexible distribution networks, and climate-resilient health infrastructure will enhance vaccine deployment and effectiveness in the region.

295 TRACK C: Decentralised Water–Energy–Food systems in Africa: least-cost modelling of sack farming and establishment of renewable energy technologies in African informal settlements

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The African continent is confronted with interconnected challenges of water, energy, and food insecurity, particularly affecting marginalized urban residents. Decentralized Water-Energy-Food (WEF) systems have emerged as potential solutions to alleviate these issues exacerbated by climate change. Despite scholarly acknowledgment of constraints related to WEF, there is a growing global trend towards trials of innovative decentralized WEF systems. This paper contributes to the body of research aimed at demonstrating the applicability of decentralized WEF systems at the local level by showcasing the potential of such systems to enhance water, energy, and food security in informal settlements.

Focusing on the Diepsloot slums in Johannesburg, South Africa, the paper applied space analysis, least-cost modeling of sack farming, and renewable energy technologies to provide WEF solutions that demonstrate feasibility, sustainability, and decentralized solutions for informal settlements compared to the popular broad-based solutions that often neglect these marginalized communities. Utilizing Geographic Information Systems (GIS), AquaCrop crop modeling, financial analysis, and linear optimization modeling urbs, the study provides a comprehensive analysis of past climate trends, water sources, spatial plant arrangements, and a proposed community center. The proposed Phezulu 'Up' growers' model and the positive return on investment further demonstrate the feasibility of decentralized WEF systems.

Policymakers are encouraged to promote these WEF systems to bolster urban livelihoods and achieve Sustainable Development Goals (SDGs), notably SDG 2, 6, and 7, in marginalized African urban areas. Recommendations and areas of further research include looking into issues of community engagement, partnerships, risk mitigation, strategies for equity and inclusivity, and local knowledge integration during WEF implementation, and robust critique of WEF practical interventions and comparative analysis with other WEF models.

The implementation of decentralized WEF systems in Diepsloot holds significant implications for public health. Improved access to clean water reduces the incidence of water-borne diseases, while enhanced food security contributes to better nutrition and overall health. Reliable renewable energy sources can decrease reliance on hazardous fuels, reducing respiratory problems and other health risks associated with indoor air pollution. Additionally, the promotion of urban agriculture and green spaces can improve mental well-being and foster community cohesion. Thus, decentralized WEF systems not only address basic needs but also contribute to healthier living environments, supporting broader health outcomes and resilience against climate-induced health threats.

Overall, the study provides a blueprint for inclusive and sustainable urban development, emphasizing the importance of localized WEF solutions and community empowerment.

73 TRACK C: Health systems' resilience to climate variabilities and waterborne diseases in the Black Volta Basin, Ghana

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Background: Globally, waterborne diseases account for over 1.5 million deaths annually, with a significant percentage affecting children in low-income households in both tropical and subtropical regions. It is one of the most enduring and economically devastating biological hazards in our society today. Increased frequency of intense rainfall (extreme precipitation events) is associated with an increasing severity of floods, landslides, debris, and mudflows, as has already been witnessed in parts of Ghana, Liberia, and Bangladesh (Levy et al., 2018). Increased frequency of extreme precipitation events will increase the risk of waterborne disease

outbreaks. Ageing sewer systems or treatment plants, which drain excess untreated storm and wastewater runoff into surface water bodies by design, may quickly become overburdened because of heavy rainfall events (Adams et al., 2022). Most outbreaks are usually preceded by heavy rainfall.

To address climate change's influence on waterborne diseases in humans (Waterborne-Bacterial Diseases; thus, Dehydrating diarrhoea (cholera), Prolonged febrile illness with abdominal symptoms (typhoid fever), Acute bloody diarrhoea (dysentery), Chronic diarrhoea (Brainerd diarrhoea) and Botulism) it is vital to address existing vulnerabilities, knowledge gaps, misconceptions/ perceptions and invest in strengthening health systems and communities capacities to cope with these existing and emerging catastrophic climatic calamities.

Objective: This study aims to add to the conversation on climate change and health by examining the risks of waterborne diseases like diarrhoea, typhoid, dysentery, and cholera. The goal is to find gaps and encourage collaborations to help make health systems in Ghana's Black Volta Basin more resilient to extreme weather events.

Methods: The study employed quantitative (household survey) and qualitative (literature review, focus group discussions, and in-depth expert interviews). An extensive literature review used meta-analysis (PRISMA) to identify gaps in climate variability and the incidence of waterborne diseases policy options.

Key Findings: Climate change and climate variability are now mainstream issues and must be framed as a public health concern. With approximately 23% of the inefficiency of health systems in Africa, improving efficiency alone will yield an average of 34% improvement in resource availability, assuming all countries are performing similarly to the frontier countries. However, with Africa's health expenditure per capita, more than the efficiency gains alone will be needed to meet the minimum funding requirement for universal health coverage. For this reason, the costs of not taking appropriate and timely action are high and detrimental to the triumph of Ghana's health systems.

Identifying the appropriate geospatial and temporal scales for the indicator system will depend on the specific exposure-outcome pathway. In some cases, such as waterborne diseases that are more influenced by regional conditions, indicators may need to be presented as collections of localised data; in others, such as extreme heat-related illnesses, national summative measures may be suitable.

All strategies must include improved surveillance of environmental and health data systems already in place. National to community-level needs must be assessed, and public health services must be retooled so that these areas provide adequate responses.

140 TRACK C: Health system strengthening as climate change adaptation to extreme weather events: The case of Cyclone Batsirai in Madagascar

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Introduction and Rationale: Madagascar, a country which already experiences higher rates of childhood and all-age mortality than neighboring nations, is especially vulnerable to extreme weather events. In 2022, five cyclones created widespread damage within one month and the intensity of cyclones in Madagascar is expected to increase over the next century. As these extreme weather events become more common, they will pose a growing threat to population health and undercut progress being made toward universal health coverage if health systems are not adapted to withstand these shocks. Understanding how climate change adaptations in the form of health system strengthening (HSS) contribute to the resiliency of community health programs during extreme weather events is therefore a pressing research topic.

Aims: In this case study, we explore how a community health-focused HSS intervention in rural Madagascar functions as a climate change adaptation that increases health system resilience in the context of extreme weather events in response to localized health needs.

Description of the case: Beginning in 2014, a partnership began between the Madagascar Ministry of Public Health (MMoPH) and Pivot, a non-governmental organization, to build a district-level model health system in Ifanadiana District (Vatovavy) in southeastern Madagascar. The partnership focuses on service delivery and integrated science, tackling issues of readiness, quality of care and social protection across all levels of the health system. This has included strengthening the health management information system (HMIS), medical supplies and logistics, and a growing health workforce. We studied the response of this model health district to Cyclone Batsirai in February 2022 using narrative, archival, and statistical analyses to understand if and how the HSS intervention mediated the impact of this climate-driven shock.

Although the infrastructural damage to the health system was significant, the health system was able to continue

routine functions and primary care services following cyclone Batsirai. Consultations rates surprisingly increased following the cyclone, as mobile clinics and advanced search strategies were put into place to ensure access to care was uninterrupted. In addition, preparations were comprehensive, ensuring that supplies and staff were distributed to vulnerable areas before accessibility became limited post-cyclone. However, vaccination coverage was negatively impacted by infrastructural damage, particularly the loss of electricity, and decreased in the months following the cyclone.

Discussion and recommendations: The HSS intervention and multi-sectoral partnership lessened the impact of cyclone Batsirai on health system functioning in Ifanadiana District. Through investment and support for the health workforce and medical supply chain during routine times, the HSS intervention ensured that systems and personnel were adequately trained and bolstered to subsume any shocks to the daily routine. In addition, by providing additional resources and staff to deal with urgent crises, Pivot freed the health system to focus on providing uninterrupted primary care. Notably, the intervention was not explicitly designed to consider climate-driven shocks. However, by considering these in the future, the HSS intervention can further tailor its approach to better adapt to the changing climate.

216 TRACK C: Assessment of recent trends in climate extremes over Kano State, Nigeria using statistical techniques

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Extreme weather and climate events are wicked and disastrous. Unfortunately, the impact of these events is worsened by climate change caused by the increasing emission of greenhouse gases (GHG) in major urban cities globally. Kano, a metropolitan city in Nigeria with a population of over 4.1 million, has been experiencing recurring compound extreme weather and climate events that have resulted in significant economic and social losses. Despite rapid population growth in Kano State, little has been done to monitor these extreme climate events. To investigate the past and current trends of temperature and precipitation extremes, I utilized ten core indices recommended by the World Meteorological Organization's Expert Team for Climate Change Detection Monitoring and Indices (ETCCDMI) and the Expert Team on Sector-Specific Climate Indices (ET-SCI) using the CHIRPS 2 AFRICA and NASA POWER daily precipitation, minimum, and maximum temperature dataset from 1980 to 2021.

RClimdex software and the ET-SCI Compact 2 web-based application were used to calculate the ten selected extreme event indices. To evaluate the consistency and statistical significance of daily compound trends (temperature and precipitation), the homogeneity test, Mann-Kendall (MK), and Sen's slope non-parametric tests were conducted. Interestingly, the results indicate significant warming trends across Kano State for all temperature indices during the study period with a decrease in cool nights, an increase in warm days, and more frequent warm spells. These trends could exacerbate heat island intensities, trigger heat waves, and worsen bioclimatic conditions within urban areas. Specifically, these extreme heat trends pose a significant threat to human health condition and well-being. I will present stakeholders' and communities' roles in dealing with the impacts of compound events in Kano, Nigeria.

Keywords: Extreme events, ETCCDMI, ET-SCI, RClimdex, Climate change, Human health, Kano State.

142 TRACK C: Adopt-A-School Noncommunicable Diseases Project: A case study of an innovative health education and climate action program in Nigerian secondary schools

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Introduction and Rationale: In Nigeria, non-communicable diseases (NCDs) account for about 24% of the recorded deaths. Research has shown that climate change and other modifiable risk factors increase the global burden of major NCDs (cardiovascular, cardiorespiratory diseases, and cancers). The growing involvement of adolescents and youths in an unhealthy lifestyle and climate practices in Nigerian secondary schools calls for an innovative solution to encourage the adoption of healthy behaviours. Evidence has shown that school-based interventions are feasible and effective in delivering and teaching adolescents healthy lifestyle practices for NCD prevention.

Aim: Hence, the "Adopt-A-School NCD Campaign" project is an innovative health education project aimed at promoting climate education and NCD prevention among young people in Nigerian secondary schools.

Description of the case: This project leveraged a task-shifting and peer-to-peer training model where trained medical students (NCD champions) were paired to "adopt" a secondary school in their community, and establish NCD prevention clubs in the selected schools. These NCD champions were trained over six weeks in health communication and education skills by healthcare professionals. An NCD prevention curriculum which included topics like risk factors for NCDs, reducing air pollution, and promoting physical activity participation

to promote climate-friendly activities, was developed by a multidisciplinary team. The NCD prevention curriculum had illustrations, quizzes, and practical activities for the students to participate in. Attendance records, survey reports, observational checklists, and interviews were used for data collection. Data was input into an Excel sheet used for the analysis.

Discussion and Recommendation: Seventy-nine medical students across nine tertiary institutions completed the training. Thirty-nine secondary schools were adopted in Kwara, Ogun, Ondo, Oyo, and Plateau states, and a total of 10,273 students in secondary schools were reached. Observational reports showed that more than two-thirds of the schools (63.5%) had improved their waste disposal system, 84.5% had climate and NCD prevention posters on their school notice boards, and 76.5% of the students participated in physical activities. Interviews with the program's beneficiaries showed an increase in climate-friendly activities participation and many of the students educated their parents and friends in other schools. Nearly all the adolescents (98.5%) signed the NCD pledge where they committed to participate in climate-friendly and NCD prevention activities.

The "Adopt-A-School NCD campaign project" has proven to be effective in promoting positive climate-friendly behaviours and NCD prevention activities among adolescents in Nigerian secondary schools. The development of an NCD prevention curriculum and the establishment of an NCD club in those secondary schools also provide for the sustainability of the project.

Conclusion: Young people in tertiary institutions are willing to volunteer as NCD champions in the community, championing the cause for participation in climate-friendly activities and NCD risk reduction activities. Hence, school-based programs which are fun and interactive should be used to promote positive climate and health behaviours among young people.

222 TRACK C: Climate change vulnerability reduction strategies for vital mobilities supply chains in Zimbabwe: Developing strategies and Improving practices

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Background: Vital mobilities supply chains in Zimbabwe have become increasingly vulnerable to climate change. Vital mobilities include: healthcare worker mobility and medical supply chains. In Zimbabwe insulin supply chains have increasingly become susceptible to disruption due to climate change. With vital mobilities, one goal is preventing disruption, with a secondary goal of managing disruption to prevent disaster. Thus, the main thrust of this research was to come up with strategies and improve practices that help adapt and build climate resilient vital mobility supply chains in Zimbabwe.

Rationale Statement: This research aimed to investigate the vulnerability reduction strategies for vital mobilities supply chains in Zimbabwe. The rationale for this study was twofold: to contribute to the body of knowledge of vital mobilities and climate change, and explore effective adaptation strategies and resilience-building measures for vital mobilities supply chains.

Objectives: The objectives of this research included:

1. To investigate the impacts of climate change on vital mobilities supply chains in Zimbabwe.
2. To assess the efficacy of already existing vulnerability reduction strategies for vital mobilities supply chains.
3. To develop and implement effective climate change vulnerability reduction strategies for vital mobilities supply chains in Zimbabwe.

Methods: This study employed a qualitative research methodology. The study used a correlational research design to collect and analyze data from interviews and focus groups discussions. Data was analyzed using thematic analysis to identify patterns, and themes.

Results: The findings below highlighted the symbiotic relationship between climate change and vital mobilities:

1. Invest in infrastructure upgrades and maintenance to ensure reliable vital mobilities
2. Implement policies to address social inequalities in access to vital mobilities
3. Develop contingency plans and emergency response strategies for vital mobility disruptions.

Conclusion: In conclusion, this research underscored the urgent need for collective action to address the devastating impacts of climate change on vital mobilities supply chains. The study's results emphasize the importance of:

1. Reducing the vulnerability of vital mobilities supply chains to climate change.
2. Supporting climate change adaptation and resilience efforts towards vital mobilities supply chains.
3. Reducing greenhouse gas emissions through renewable energy transitions and carbon capture technologies.

448 TRACK C: Religious and Cultural leaders empowered in SRHR/GTA to strengthen community resilience and adaptation to climate change in Western Uganda.

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Sub-thematic area: Adaptation for Health

Background: In Uganda and world over, religious and cultural leaders command a lot of following in context of addressing community changes. They have power to mobilize and also demystify the negative attitudes and values related to climate change and sexual reproductive health and rights. Climate change is inextricably linked with sexual and reproductive health and tights (SRHR) and gender equality. The worsening climate crisis is disrupting access to SRHR services, especially for groups that face additional barriers due to race, ability, indignity sexual orientation or gender. Increasingly, extreme weather is becoming the norm, and these events will continue to create environmentally displaced persons and new humanitarian crises. The impacts can include increases in early, child, and forced marriage; entry into unwanted and/or degrading sex work; and exposure to intimate partner or other gender-based violence. Evidence shows that women's empowerment and advancing gender equality can deliver results across a variety of sectors, including food and economic security and health.

Methods: The intervention started with partnership engagement consultation with district faith and cultural leaderships. Capacity building of Cultural and religious leaders was conducted using gender transformative programming. The stakeholders were exposed to a number of scenarios, role plays and group discussions addressing power dynamics, male involvement, intersectionality, norms and values especially on resource ownership, and women empowerment. The trained champions are utilizing all avenues including marriage ceremonies, prayers, cultural functions, community dialogues and other media platforms to create awareness on the climate change impacts and SRHR.

Results:

- Religious leaders have increased capacity to engage with duty bearers and right holders on SRHR, gender equality and climate change adaptation and are actively involved in dialogues, counselling and referrals for SRHR and gender equality information and services
- Religious sermons for special prayers have been designed with SRHR, gender equality and Climate Change messages. The messages were widely shared during Juma prayers for Muslim community and Sunday prayers for Christian faith
- District based Interfaith networks on SRHR and Climate change have been formulated and continuously supported by District Natural resources office on the nexus.
- Cultural, opinion and religious leaders are increasingly pro-active and involved in community engagements on SRHR/GE and CC adaptation as champions. • The trained religious and cultural leaders constituted a committee that is part of the district technical working group

Conclusions and Recommendations: SRHR is essential for ensuring just responses and building resilience and the capacity to adapt to intensifying threats and impacts. Discussions by religious leaders on bodily autonomy and human rights have been a cornerstone of resilient communities. Embracing SRHR and gender equality is very critical in building adaptive capacity with in individuals and communities hence needs for vulnerable groups, including indigenous communities, people with disabilities and LGBTIQ+

322 TRACK C: Building Climate Resilient Communities through the Promotion of Indigenous Crops in Africa

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Background: Climate change poses a significant threat to environmental sustainability, food security, and human health especially in marginalized communities in Africa.

Since the 1960s, agriculture has mainly focused on developing conventional cereal and horticultural crops, and as a result, these foods became more popular and replaced many locally produced crops, leaving the development and cultivation of Indigenous crops to be severely undervalued. This study focuses on the promotion of Indigenous foods and crops as an effective strategy for building climate-resilient communities in Africa.

Methods: This research employed a comprehensive literature review. To give an overview of the state of knowledge and knowledge gaps on the subject of indigenous foods, we examined recent literature and scientific papers. Key themes around indigenous crops, climate resilience, and food security were highlighted for leveraging strategies to promote indigenous foods in Africa.

Results: The research revealed that indigenous crops have a greater degree of adaptability to their environment, are more resistant to weather fluctuations, pests, and diseases, and have a larger genetic diversity among native crops. The research also revealed that indigenous crops improve urban environmental conditions by supplying fresh food with a low carbon footprint.

In addition, they offer additional environmental advantages like soil conservation, increased nutrient retention, lowered soil temperatures, and a source of ground cover, which can help reduce soil erosion and earn carbon credits.

Conclusion: Indigenous crops adaptability and resilience ensure their suitability for a diverse and drastically changing climate. The findings underscore the importance of indigenous crops not only for their environmental benefits but also for their potential to provide nutritious, low-carbon footprint food options. This study therefore highlights the need for further research into the ecological advantage of indigenous crops to harness their full potential and the need for the promotion of indigenous crops as an important policy objective of the government. The policies should focus on supporting farmers and integrating these crops into national food strategies, thereby supporting local economies and ensuring a resilient climate.

546 TRACK C: A multi-sectoral approach to implementing climate-adaptive health care plans in Uganda

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Introduction and Rationale: Climate change poses a severe threat to sexual and reproductive health (SRH) services, particularly affecting vulnerable communities. In Uganda's climate-sensitive mountainous Rwenzori region, for example, frequent disasters such as storms and floods disrupt health systems and grossly limit access to essential health services. For instance, in 2019, Rwangara Health Centre III in Ntoroko District was flooded, depriving marginalized women and girls of reproductive health and other services for years. Such instances are not isolated in this region.

In response, the Ugandan government, following a vulnerability assessment, launched the Health National Adaptation Plan (HNAP) in August 2024 to guide the health systems to adapt to climate change and maintain essential services, including amidst disasters. Pathfinder is working to engage local actors to effectively operationalize the HNAP, despite limited resources and knowledge.

This case study aims to evaluate the effectiveness of a multisectoral approach to implementing the HNAP at the sub-national levels in Uganda, amidst limited resources.

Description of the Case: With funding from USAID, the Uganda Family Planning Activity (FPA), implemented by Pathfinder and partners supports the Ugandan government to improve reproductive health services across 11 districts, including Ntoroko district referenced above. Pathfinder sought to understand how remote and poor districts like Ntoroko could implement the HNAP to build climate-resilient health systems – through integration with SRH services.

Pathfinder organized participatory workshops with district health administrators, political and technical leaders, as well as health facility and community representatives to discuss the impact of climate change on the health system, and to explore multisectoral collaboration for climate adaptation. The sessions introduced concepts such as climate risks, mitigation, adaptation, and the HNAP's key components. Through participatory rapid assessments, participants developed localized climate risk mitigation and adaptation plans, aligned to the HNAP, which were integrated into multisectoral budgets for implementation by various district departments. District leaders demonstrated commitment by endorsing and allocating resources for the implementation of the plans.

Conclusion and Recommendation: As countries face challenges in mobilizing resources for vulnerability assessment and HNAPs, adopting cost-effective integrated strategies for their implementation, and harvesting lessons for future policy and programming becomes an important starting point. Engaging leaders from various departments at the sub-national level can garner support for integration of health-sensitive climate change interventions – as proposed in existing climate and health adaptation plans, ensuring these plans are not relegated to archives but are actively implemented.

105 TRACK C: Assessing the level of awareness of Zimbabwean towards climate change through Google Trends.

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With the continuous growth of internet usage, Google Trends has emerged as a source of information to investigate how social trends evolve over time. Knowing how the level of interest in conservation topics—approximated using Google search volume—varies over time can help support targeted conservation science communication. However, the evolution of search volume over time and the mechanisms that drive peaks in

searches are poorly understood. I conducted time series analyses on Google search data from the past 5 years with a focus on Zimbabwe to investigate: (i) whether interests in selected conservation topics have declined and (ii) the effect of news reporting and academic publishing on search volume. Although trends were sensitive to the term used as benchmark, I did not find that public interest towards climate change had declined. I found, however, a low interest in online learning platforms on climate change issues. The quantity of news articles was related to patterns in Google search volume, whereas the number of research articles was not a good predictor but lagged behind Google search volume, indicating the role of news in the transfer of conservation science to the public. I also found that climate education is a not a popular adaptation tool in Zimbabwe with less mainstreaming of climate education in school curricula.

565 TRACK C: Occupational Safety and Health (OSH) Adaptation Strategies to the Impacts of Climate Change in Zimbabwe's Energy Sector

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This paper examines the growing influence of climate change on occupational safety and health (OSH), emphasizing the need for proactive measures to protect workers' well-being. It explores this relationship globally and provides context specific to Zimbabwe. The aim of the study is to pinpoint OSH adaptive strategies appropriate for vulnerable workers in Zimbabwe's energy sector amidst climate change. Apart from literature review, a thorough climate-related risk assessment to OSH was conducted. The assessment results served as a basis for formulating questionnaires utilised in surveying a representative sample in the energy sector to identify OSH gaps. Inferential statistics and thematic analysis were employed to analyse the data collected. The effects of climate change on worker safety and health that were found to affect most workers include heat stress, extreme weather events, chemical exposures, air quality concerns, diseases, under-nutrition, and mental health. The vulnerable worker population at heightened risk include shift workers and those whose works are outdoor, labour intensive or emergency response related. It extends to those who are older, have pre-existing health conditions or socio-economically disadvantaged. Consequently, adaptation strategies identified include mechanisation, design modifications, heat mitigation, emergency preparedness and response plans, worker health monitoring, awareness and training programs. The successful implementation of these strategies requires joint commitment and cooperation amongst the government, policy-makers, investors, employers and employees. Climate change considerations must be integrated into OSH compliance obligations, regulatory frameworks, policies, controls and response plans with guidance from experts and researchers. In conclusion, with the harsh emanating climate change impacts, there is need to urgently implement the OSH adaptation strategies to bridge the identified gaps. It will safeguard the worker's well-being, communities, productivity, investments and economic development. Further research into other sectors is recommended for a holistic national approach towards Vision Zero.

348 TRACK C: The impact of the climate crisis on reproductive choice

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MSI research into the impact of the climate crisis on reproductive choice

Background: To support advocacy and programming MSI analyzed the impact of disrupted access to contraception due to climate-related displacement. Our impact estimates cover 26 climate-affected countries where MSI works: Afghanistan, Bangladesh, Bolivia, Burkina Faso, DRC, Ethiopia, Ghana, India, Kenya, Madagascar, Mali, Malawi, Myanmar, Nepal, Niger, Nigeria, Pakistan, PNG, Timor-Leste, Senegal, Sierra Leone, Tanzania, Uganda, Yemen, Zambia, and Zimbabwe.

Methodology: We extracted the number of people who were newly internally displaced due to weather and climate related disaster (*PopIDMC*) from the Global Internal Displacement Database covering the countries above, pulling annual figures between 2010 to 2020.

The female population displaced was estimated as half of *PopIDMC* under the working assumption that the female population had an equal chance of being displaced due to weather-related disasters.

The Percentage of Women of Reproductive Age (*WRAprp*) was extracted from DHS's StatCompiler for the 26 countries. The most recent data at the time of writing was applied to the data series for each country, to obtain the number of WRA displaced by weather-related disasters.

Total demand for contraceptive methods (CPR+ Unmet need) was extracted from DHS's StatCompiler for each of the 26 countries. The most recent data was applied to the series for each country to obtain the number of women displaced with contraceptive demand.

Results: We found that since 2011, an estimated 11.5 million women have had their access to contraception disrupted due to climate-related displacement.

Conclusion: Our modelling indicates that the situation will worsen over the next decade, as we estimate that 14 million women are at risk of losing access to contraception due to climate-related displacement. Evidence shows that women and girls are hardest hit by climate change, and we need to work with governments and partners to better support women and communities on the frontline of the climate crisis to build resilience by funding programmes which facilitate access to reproductive choice.

76 TRACK C: "The Vanishing Village Remedies": How Climate-Driven Herbal Remedy Decline Impacts Respiratory Care in Rural Zimbabwe

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The rural communities of Zimbabwe have long relied on traditional medicinal herbs to treat respiratory ailments such as asthma and bronchitis since time immemorial. However, these indigenous plants are now facing a grave threat from the impacts of climate change such as prolonged dry spells. This study examines the intricate nexus between climate-related citizen science and community health in these vulnerable regions, focusing on two villages in Chirumanzu. It explores how the extinction and nomenclature changes of traditional herbs are exacerbating the burden of respiratory diseases among the elderly villagers in Chirumanzu. Through a mixed-methods approach, the researcher engaged directly with community members to document their traditional ecological knowledge and experiences. Ethnobotanical surveys were conducted to catalog the diverse array of medicinal plants, while climate data analysis revealed the alarming trends of rising temperatures, erratic precipitation, and increased extreme weather events. These environmental changes are leading to the decline and disappearance of many culturally significant herb species, disrupting the ability of rural Zimbabweans to access and utilise these time-honored remedies. The findings highlight the profound implications of this situation, as the loss of traditional herbal treatments coincides with a marked rise in respiratory illnesses within these communities. This dual challenge not only undermines community resilience but also exacerbates existing health disparities, with the most vulnerable populations bearing the brunt of the impacts.

Keywords: climate change, herbal medicines, respiratory health, vulnerable regions

449 TRACK C: Developing climate-resilient health systems: a novel approach utilizing artificial intelligence-enabled portable digital radiography for diagnosis of Tuberculosis; the Nigerian experience

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Background/Objectives: Nigeria continues to battle with the triple burden of Tuberculosis (TB), Human Immuno Deficiency Virus (HIV) and Multi-drug resistant Tuberculosis. Tuberculosis case detection over the years has witnessed significant improvement reaching 59% in 2022. This giant stride achieved despite setbacks posed by the global pandemic of covid-19 is a testament to the resilient health systems built by the country in fighting infectious diseases. We present results showcasing the role of portable digital x-rays (PDX) with artificial intelligence (AI) in improving Tuberculosis case detection across eight states in Nigeria.

Methods: KNCV Nigeria pioneered the use of PDX with AI across eight states with mobile teams deployed to provide TB screening and diagnostic services. Each PDX unit has a backpack containing the x-ray and a solar powered Mobisun power pack. This renewable-energy power source utilizes sunlight to charge the equipment allowing for its use in remote and hard to reach communities. We analyzed a one-year cascade data from January to December 2023 across the eight implementing states comparing the results with other TB active case finding interventions that are not using the PDX with AI technology in the same states.

Results: for the PDX with AI across all 8 states, 144, 282 persons were screened, identifying 12,098 presumptives, 99% of these presumptives were evaluated, with 2837 new TB cases diagnosed representing a 24% TB yield, 99% of the diagnosed cases were enrolled on treatment, the number needed to screen (NNS) to get a TB case was just 51 and the number needed to test (NNT) to diagnose a TB case was only 4. Combining all other TB case finding activities in the 8 states shows an average TB yield of about 8%, an average NNS of 203 and an average NNT of 14.

Conclusion/Implications: with a very good TB yield of 24% and an NNT of 4, this highly efficient intervention using PDX with AI is significantly improving TB case detection in Nigeria contributing positively towards building sustainable resilient health systems. We recommend scale up of this innovative approach aimed at finding missing TB cases in a sustainable and climate-friendly manner.

495 TRACK C: Climate Change Knowledge and Changes in Nutrition of Children in Rural Zimbabwe: A Propensity Score Matching Approach

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The increased frequency and intensity of climate extremes such as droughts and floods has exacerbated malnutrition challenges globally. There is a plethora of literature on the nexus between climate change and malnutrition. However, there is paucity on knowledge regarding how climate change awareness can influence feeding practices, especially for children under the age of five years. The objective of this study was therefore to assess the association between climate change knowledge and changes in child feeding practices with a focus on rural areas in Zimbabwe. Data was collected through face-to-face interviews from a total of 18,000 households. The household interviews solicited rich information pertaining to the households' socio-economic conditions, including the age, sex, education, marital status of the household head, and climate change knowledge. Propensity score matching was used to derive a counterfactual that enabled the matching of households with climate change knowledge versus those without with similar characteristics to reduce the bias from self-selection. A total of 71.7% of the sampled rural households had knowledge on climate change. The results also revealed that knowledge on climate change was associated with (i) an increased probability that the household reduced the quantity that household feeds to children by 25%, (ii) increased probability that the household reduced the diversity of food fed to children by 24.2%, and (iii) increased probability that the household reduced the frequency of feeding children by 23.4%, at the 1% level of significance all things being constant. Overall, the study showed that knowledge on climate change had influence on changes in child feed practices. Households knowledgeable on climate change were able to employ coping strategies which unfortunately have negative impact on child nutrition.

111 TRACK C: Climate change stress and mental health: A call to action for local cooperation

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Climate change poses a significant threat to the mental health and well-being of Masvingo Urban residents, particularly youth, with increased risk of anxiety, depression, and substance abuse. The purpose of the study is to examine the stress and mental health impacts of climate change on youth in Masvingo Urban. Rising temperatures, changing precipitation patterns, and increased frequency of extreme weather events are linked to a range of mental health impacts, including anxiety, depression, post-traumatic stress disorder (PTSD), and substance abuse. A 2020 report by the World Health Organization (WHO) on mental health in Zimbabwe noted that 1 in 5 adolescents (15-19 years) in Zimbabwe experience a mental disorder, and substance abuse is a growing concern among youth, with 10.4% of adolescents reporting alcohol use and 5.6% reporting drug use. The study adopted both qualitative and quantitative approaches in gathering data The research assimilated a comprehensive review of existing research, data analysis, and expert insights, uncovering the intricate intersections of climate change and mental health through a rigorous examination of literature, data, and expert perspectives. We advocate for a scaled-up local response that includes increased investment, research, and collaboration to develop and implement climate-resilient mental health systems, adaptation strategies, and innovative solutions tailored to the specific needs of Masvingo Urban's residents. The findings underscore the imperative for a coordinated local response to mitigate the mental health impacts of climate change in Masvingo Urban, ensuring a healthier, more sustainable future for all.

Keywords: climate change, mental health, local cooperation, mental health impacts, climate-resilient mental health systems.

253 TRACK C: Young Changemakers Global Heating and Health Research

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Authors: Steven Chinembiri and Maria Malomalo

Background: The Youth Climate Changemakers project, spearheaded by Restless Development and funded by the Wellcome Trust, addresses the knowledge gap on the health impacts of climate change in Zimbabwe. This youth-led research engaged 20 young leaders including those with disabilities from Harare and Chimanimani to explore community perceptions, identify misconceptions, and assess understanding of global heating and its health implications, highlighting the need for inclusive and intersectional approaches to youth-led climate action.

Objective: The study evaluated the effectiveness of Restless Development's youth leadership model in raising community awareness and action on climate change and health issues. It also tested methods young people can use to enhance their understanding of the links between global heating and health, examining the model's scalability to other contexts.

Methods: A mixed-methods approach was utilized, including semi-structured interviews (SSIs), Knowledge, Attitudes, and Practices (KAP) surveys, and key informant interviews (KIIs). Data collection occurred in four phases, with young leaders leading the analysis to ensure a participatory and context-specific approach.

Results: The study found that 92% of participants believe in climate change, though misconceptions persist, particularly regarding its causes and human influence. Understanding is largely shaped by local experiences, such as changes in rainfall and temperature patterns, which differ between Chimanimani and Harare. Participants recognized the health impacts of climate change, including increased incidences of heat-related illnesses and waterborne diseases, yet there are significant gaps in comprehensive climate-health education. The research highlighted that while most participants know climate change, their knowledge about broader causes and mitigation potential through community action is limited.

Inclusivity challenges were also noted, with a need for better representation of marginalized groups, including people with disabilities. Climate change was found to disrupt agricultural livelihoods, escalate diseases like typhoid, malaria, and cholera, and contribute to mental health issues, including climate anxiety and eco-anxiety. Vulnerable groups, particularly small-holder farmers, young people with disabilities, and those from rural areas, face compounded challenges due to limited access to healthcare and increased economic hardship.

Young people remain underrepresented in climate discourse, facing barriers such as limited resources, information, and training, which hinders their effective engagement in advocacy. Stakeholders acknowledged the health impacts of climate change but noted a lack of regular discourse and comprehensive policies to address these challenges. There is a pressing need for stronger partnerships, community-level action plans, and targeted efforts to empower young people as key actors in climate advocacy. The findings underscore the importance of involving youth in developing responsive strategies to mitigate and adapt to the impacts of global heating on health, particularly in marginalized communities.

Conclusion: The research emphasizes the importance of youth leadership in fostering climate resilience and advocates for stronger support mechanisms, including youth-inclusive spaces, improved climate education, and active involvement in policymaking. It calls for concerted efforts from policymakers, educational institutions, and civil society to scale up youth-led initiatives and address the health impacts of climate change, especially in vulnerable communities.

458 TRACK C: Wild relatives of Solanum Species for Climate Change Adaptation in West Africa: A biodiversity and an ethnobotanical overview

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West African countries with an agrarian economy face important challenges due to climate change. These include increased temperatures, modification of rainfall patterns and prolonged droughts with adverse effects on agricultural productivity and food security. Among the various strategies being explored to face these challenges, the use of wild species as an alternative solution for food and health care have shown promising outputs. The present study investigated the contribution of wild relatives of Solanum species in climate change adaptation strategies in Benin and in Senegal, focusing on their biodiversity and associated local knowledge and the perceptions of locals.

Use categories of wild Solanum species following ethnic groups and biogeographical zones assessed. A Sankey diagram was performed to describe the flow connections between ethnic groups and the use categories. Principal Component Analysis was used to map the distribution of species across the biogeographical zones. The sociodemographic factors influencing the traditional

knowledge about the species were identified and a Poisson Generalized Linear Models was performed to assess the variation in use values. The full model (including all main effects and possible interactions) was fitted first and subsequently simplified using the likelihood ratio test.

A total of 10 and 16 crop wild relatives of Solanum were inventoried in Benin and in Senegal respectively. Although several people perceive the species as weed, five use categories were identified. All the studied ethnic groups make a frequent use the species for food and health care. However, people from Senegal make less use of the species. Surprisingly, divorce people were revealed to possess more knowledge about the wild species, which requires further studies to understand the existing relationship between them.

This study demonstrated that people are not aware of the potential benefits of the species, which jeopardises their sustainable management and use. Additional research is needed to raise awareness and fully ensure their large-scale preservation in the region.

Keywords: Crop wild relative; Solanum; vegetable; Benin; Senegal; conservation

MITIGATION ACTIONS AND THEIR CO-BENEFITS

158 TRACK D: Developing Energy-Efficient and Adaptive HVAC Systems for Malawi Health Centres: A Case of Bereu Health Centre in Chikwawa

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Climate change and inadequate energy infrastructure exacerbate health challenges in sub-Saharan Africa, particularly within healthcare facilities. This study addresses these issues by developing an energy-efficient and adaptive Heating, Ventilation and Air Conditioning system for Bereu Health Centre in Chikwawa, Malawi. Building upon our previous published research on Building-Integrated Photovoltaics (BIPV) potential for the same health centre, this study focuses on optimizing indoor air quality and thermal comfort through the development of an adaptive HVAC Model Predictive Control (MPC) system.

By integrating SketchUp, Building Controls Virtual Test Bed (BCVTB), EnergyPlus, and OpenStudio software, the research follows a modelling and simulating approach by designing an HVAC system that effectively utilizes solar energy through a predictive control system (MPC) and sensor technology. The system is designed to adhere to ASHRAE 55 standards for thermal comfort. Preliminary simulations indicate the system's capability to accurately predict and maintain indoor air quality including a temperature setpoint range of 18Ö-25Ö, Relative humidity within the range of 30-60% while effectively managing disturbances.

Successful implementation of this HVAC system is expected to improve patient outcomes, reduce healthcare-associated infections, and enhance the overall resilience of the healthcare facility to climate change impacts including extreme high temperatures experienced in the lower-shire region. The findings from this case study provide valuable insights for the design and implementation of similar systems in other healthcare facilities in Malawi and beyond.

383 TRACK D: Understanding the institutional carbon footprint of CeSHHAR Zimbabwe: A research NGO.

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Introduction: Health research and implementation organizations play a crucial role in raising awareness and generating knowledge of the environmental and health impacts that our work has. Many African-based organizations have significant carbon footprint resulting from outdated and inefficient practices including the use of diesel-powered generators, heating and cooling of poorly insulated buildings and reliance on diesel-powered off-road vehicle to access target population. This study investigates the carbon emissions of CeSHHAR Zimbabwe, a donor-funded organization with over 350 employees dedicated to health research, program delivery, and capacity building in health policy and programming in Zimbabwe and beyond.

Methods: We calculated carbon emissions from January 2023 to December 2023 for CeSHHAR Zimbabwe using the Aga Khan Development Network Carbon Management tool Ver1.6 and 1.7. The tool converts data into carbon equivalents, using the Global Greenhouse Gas (GHG) Protocol, which categorizes emissions into Scope 1, 2, and 3. Variables collected include building energy, vehicle fuel, travel, waste, construction materials, contractor logistics, and procurement.

Results: The findings reveal that 508,000 kg of CO2e were emitted by CeSHHAR Zimbabwe shared between 19 projects. Scope 1 covered 48.9%, Scope 2 covered 7.1% and Scope 3 amounted to 44.0%. The biggest resource in scope 1 consisted of 76.786 litres of diesel and 300 litres of petrol largely for vehicle use. The total Kwh of electricity from grid power was 41,160. In Scope 3 the biggest resource (supply chain) constituted of procured goods such as cleaning and communication supplies, employee apparel, medical and laboratory equipment.

Implications: Donors of health research/programs should pro-actively aim to eliminate carbon emissions from their research programs, by assisting organisations like CeSHHAR to invest in carbon neutral activities without impacting the effectiveness of the programme e.g. investments in low emissions transport options, and carbon offsetting initiatives like tree planting for unavoidable emissions.

494 TRACK D: Investigating the thermal working conditions of nurse-midwives at Mt Darwin District Hospital in Zimbabwe.

Mr Josh Rusike[1], Mr Thabani Muronzie[1], Mr Brian Sibanda[1], Ms Tariro Chinozvina[1], Mrs Elizabeth Dangaiso[1], Mrs Bongani Mutimutema[1], Ms Jetina Tsvaki[1], Professor Jorn Toftum[1], Professor Stanley Luchters[3], Doctor Fortunate Machingura[2]

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Josh Panashe Rusike[1], Thabani Muronzie[1], Brian Sibanda[1], Tariro Chinozvina[1], Elizabeth Dangaiso[1], Bongani Mutimutema[1], Jetina Tsvaki[1], Progress Chiworeka1, Jorn Toftum[3], Stanley Luchters [1,2,4], Fortunate Machingura[1,2] and the HIGH Horizon study group.

Centre for Sexual Health and HIV/AIDS Research (CeSHHAR), Zimbabwe, Liverpool School of Tropical Medicine (LSTM), United Kingdom, Technical University of Denmark (DTU), Denmark, Ghent University, Belgium

Background: The sub-Saharan region has been significantly impacted by climate change, affecting the outdoor thermal environment. Midwives' exposure to extreme temperatures and inadequate thermal regulation can lead to discomfort, fatigue, and reduced concentration, impacting the quality of care of maternal and newborn healthcare. The objective of this study is to gather data on the environmental exposures and biological core body experienced by midwives at health facilities in Rural Zimbabwe.

Methods: The study was conducted from October 2023 to June 2024 during the hot (October-March) and cooler (April-June) seasons. Trained research nurses and assistants gathered data from core body temperature and environmental exposures. During their work shift midwives in the maternity ward were provided with CORE body sensors (from greenteg AG) that collected core body temperature. Indoor environmental exposures measured were temperature, relative humidity and light intensity using MX1101 and MX1104 from (Onset HOBO data loggers). For measured outdoor exposures devices included different sensors mounted together. For temperature and relative humidity (S-THC-M00x sensor), solar radiation (S-LIx-M003 sensor), wind speed and direction (S-WCF-M003 sensor) all Onset HOBO data loggers. Nurse midwife data were randomly selected for analysis.

Results: The study found the average indoor temperature was 2.2°C higher than the outdoor average of 25.1°C whilst indoor recorded an average temperature of 27.3°C. However, the maximum indoor temperature of 40.5°C was 1.5°C lower than the outdoor peak which was recorded at 39°C showing a higher peak exposure being recorded indoors juxtaposed to the outdoor thermal environment. Notably, a high of 39°C was recorded indoors. The average indoor temperature of 27.3°C, while potentially comfortable for some, could be uncomfortable for those subjected to such conditions. The core body temperature data showed an overall high temperature of 39.73°C, with an average of 36.91°C among two randomly selected participants.

Discussion: The study's conclusion emphasizes the critical need for year-round interventions to improve working conditions and productivity. Implementing thermal monitoring is crucial to track occupant experiences and guide adaptive methods to combat extreme heat. Given the expected temperature increases, the study underscores the importance of climate-conscious, carbon-smart interventions to achieve optimal thermal comfort. Improving thermal conditions can have a direct, positive impact, reducing fatigue, increasing concentration, and enhancing the quality of care provided by midwives.

511 TRACK D: Innovative Practices for Sustainable Healthcare: A Systematic Approach

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Ensuring a systematic approach to building capacity whilst ensuring quality of care and universal health coverage is an increasingly urgent requirement across the globe.

Africa is at the cutting edge of responding to climate change and can develop systems and models that will drive the transformation required across all domains of mitigation and resilience building.

The partnership between Joint Commission International and the Geneva Sustainability Centre, framed through the engagement of MP Shah Hospital in Nairobi, Kenya, brings an exemplar approach to strengthening capacity in a systematic way.

The case study highlights the development process and early results of a comprehensive approach to capacity strengthening based on three pillars: standard setting,

strategic planning and tracking, and competency development. This panel presents:

1. **Leadership and Capacity Building:** a. Adopting a leadership competency framework to bolster capacity strengthening.

2. **Strategic Planning and Performance Tracking:** a. Utilizing a maturity diagnostic and key performance indicators (KPIs) for comprehensive strategic planning and progress monitoring.

3. **Development of Global Accreditation Standards:** a. Pioneering evidence-based standards to enhance the sustainable quality of healthcare.

   b.Customizing to scale and align with each country's unique needs.

4. **Certification by the Global Leader:** a. Achieving recognition from the foremost authority in quality and patient safety

   The accreditation standards, including a specific chapter on environmental sustainability with measurable items, were published in July 2024 following a global field review. It includes a training programme to support auditors and hospitals to ensure a successful rollout from January 2025.

   The standards chapter content is based on the work to develop and run a sustainability accelerator tool that combines a maturity diagnostic and core KPIs. The tool is health sector-focused, globally relevant and covers a holistic approach to sustainability including environmental impact, health vulnerabilities and equity, as well as leadership and governance. The KPIs help track progress on mitigation alongside other key indicators that are vital to ensuring a balanced approach. These were developed with input from hospitals around the world, including Africa. Early mitigation maturity results across the sector are presented.

   The learning programme enables leaders to develop their competencies as leaders of emergent, climate-facing and equity-focused organisations. The Carbon Emissions Learning Lab (CELL) is the cornerstone of the learning programme. It is a simulation tool that puts learners in the role of the of a 500-bed hospital CEO with 5 or 7 years to reduce their emissions by 50% whilst simultaneously balancing finances, patient expectations and staff engagement. The simulation portrays real-world data for Nairobi as one of the cities available to users.

   The MP Shah Hospital is highlighted as a concrete example of how this systematic approach to sustainable healthcare can lead to meaningful mitigation actions without compromising excellent patient care.

77 TRACK D: Climate Change, Diseases and Antimicrobial Resistance: A study of Nyeri County, Kenya.

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Introduction: Antimicrobial resistance (AMR) presents a grave global health concern, resulting in 670,000 infections yearly in the EU, with 20% leading to death. AMR data in Africa remains scarce. Antimicrobial usage imposes pressure on bacteria, fostering multidrug-resistant strains. Additionally, the climate crisis worsens AMR, impacting human health through rising temperatures and environmental changes, potentially heightening the spread of HAIs (Hospital Acquired Infections), waterborne and vector-borne illnesses.

Methods: The study tries to interrogate how climate change and AMR maybe intertwined in Nyeri County, Kenya. This study employs comparative analysis of both historical data and published information. The data will be on HAIs, waterborne and vector-borne disease patterns, from the County Referral Hospital, in comparison with weather patterns in the meteorological department. Inclusion criteria is clients over 5years of age.

Results: Nyeri experienced reduced rainfall in the 3 rainy months of March-May 1984-2016, from annual average of 450mm-400mm (11%) consistent with rains projection RCP4.5(2011-2035). Drier months are June-August on average. Diarrhea diseases cases in the March-May 2023 increased to 765(104%) from 734(100%) same period in 2022. Malaria cases in March-May 2022 increased to 17(425%) from 4(100%) 2020 same period, average of 106% per year. Isolates were more in drier months of Sept-Oct 2022 with Acetobacter having 8 isolates against 0 isolates in July-Aug 2022, Klebsiella pneumoniae having 11 isolates against 0 isolates in July-Aug 2022,

and staphylococcus aureus having 10 isolates against 13 isolates in July-Aug 2022.

Conclusion: While temperatures rise in Nyeri as evidenced by reduced rains, a consequence of the climate change, diarrhea diseases and malaria are in the rise in a malaria non-endemic area. The climates change role in this rise is warmer temperatures in water system increasing species survival and humidity contributing to increased transmissibility. The increase in diseases have been associated with high consumption of antibiotics in the community thereby increasing antibiotic-resistant genes reservoirs in wastewaters. AMR bacteria is not fully removed during wastewater treatment and therefore end up in the environment . Responsible antimicrobial administration is imperative.

Public implications: Rising temperatures could lead to risk of acquiring antibiotic resistant enteric pathogens, especially staphylococci and acetobacter which survive better in warmer temperatures hence a possible decline in healthcare system.

ETHICS AND CLIMATE RESEARCH EQUALITY

477 TRACK E: Ethical research practices in studying climate change and gender health disparities.

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Climate change disproportionately affects vulnerable populations, including women, exacerbating existing health disparities. Understanding these impacts necessitates ethical research practices that respect and uphold the rights of participants, particularly in marginalized communities. Current research often overlooks the intersectionality of gender and climate change, leading to inadequate policy responses that fail to address the specific health needs of women. This research aims to fill this gap by providing empirical evidence on gender-specific health disparities caused by climate change, while adhering to ethical standards in research practices.

The primary objectives of this study are to:

1. Investigate the health impacts of climate change on women in vulnerable communities.
2. Evaluate the ethical challenges in conducting research on gender and climate health disparities.
3. Propose ethical frameworks to guide future research and policy-making.

A qualitative research design was employed, involving in-depth interviews and focus group discussions with women from climate-affected regions. Interviews were also conducted with experts in climate change and gender. Additionally, a review of existing literature and case studies was conducted to understand the broader context of gender health disparities in the face of climate change. Ethical considerations, such as informed consent, confidentiality, and cultural sensitivity, were strictly observed throughout the research process.

The findings indicate significant health disparities between men and women, with women experiencing higher rates of climate-induced health issues such as respiratory illnesses, malnutrition, and mental health disorders. The study also identified several ethical challenges, including power imbalances, potential exploitation, and the need for culturally appropriate research methodologies. By incorporating local knowledge and community participation, the research was able to develop a more comprehensive understanding of the gendered health impacts of climate change. The study underscores the necessity of ethical research practices in studying climate change and gender health disparities. It highlights the importance of community engagement, culturally sensitive approaches, and ethical frameworks that ensure the protection and empowerment of research participants. The findings advocate for gender-responsive climate policies that address health disparities and promote equity. Future research should continue to prioritize ethical considerations to effectively address the complex intersection of gender, climate change, and health.

539 TRACK E: Utilitarian Ethics Lens: The Double-Edged Sword of Extreme Heat and Food Insecurity Among Pregnant Women in Rural Zimbabwe

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Introduction: Extreme heat and food insecurity are interconnected stressors that severely impact low-income rural communities, with pregnant and postpartum women facing compounded risks. In their efforts to balance the competing needs of seeking heat adaptation solutions and addressing household food insecurity pregnant women face complex ethical dilemmas. This qualitative inquiry explored how pregnant and postpartum women in rural Zimbabwe navigate these dual challenges.

Methods: 24 women where purposively selected to participate in longitudinal, in-depth interviews at 30-35 weeks' gestation, and again at 4-6 weeks postpartum. The interviews elicited the women's lived experiences, perceptions, coping strategies, and potential adaptation pathways with the objective of understanding the ethical trade-offs the women navigate. Adopting a bio-ethical framework enabled the researchers to take a more holistic, community-oriented perspective as they sought to understand these complex trade-offs and competing priorities the women faced in trying to both mitigate heat health impacts and ensure food security.

Results: The results revealed pregnant women grapple with a "double-edged sword" dilemma arising from the

intersecting stressors of elevated heat and food insecurity. While recognizing the need to adapt behaviors and living conditions to cope with extreme heat, women must prioritize food security. This often involves engaging in socioeconomic activities like hawking, farming, and gold panning.

Participants detailed how the need to provide for their families increased vulnerability, one participant explained, "I'm caught between the fire and the frying pan, what will it benefit me to sit under a shade while my children starve?" Women reported experiencing dehydration, pungent, dark urine, swollen feet, and persistent headaches.

The research highlighted how these competing demands leave pregnant women with the dilemma of health versus food security, underscoring the critical need for sustainable and resilient adaptation strategies that empower individuals, households, and communities.

Discussion: Addressing these compounding challenges requires a comprehensive, community-driven approach that co-designs and co-produces interventions to contextualize interventions through the women's voices and experiences while leveraging indigenous knowledge. Intervention strategies should capacitate the women to adapt to and mitigate heat impacts while meeting their household food security needs because their ethical framework prioritizes family survival over individual health.

117 TRACK E: Navigating Ethical Considerations in Climate Change and Health Research in Chipinge District, Zimbabwe

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The intersection of climate and health research within African communities presents complex ethical dilemmas that require careful consideration and analysis. Despite the growing importance of understanding the impacts of climate change on health outcomes in these communities, there remains a significant gap in addressing ethical considerations related to community engagement, consent processes, and benefits sharing. This gap not only hinders the establishment of trust and collaboration with local communities but also raises concerns about fairness, justice, and sustainability in research practices. Through a qualitative research approach, this study seeks to address this gap by examining the challenges and opportunities for ethical conduct in climate and health researches in Chipinge district, Zimbabwe. Data will be collected through interviews, focus groups, and document analysis to gain insights into community perspectives, researcher practices, and policy frameworks. The research generates recommendations for enhancing community engagement strategies, improving informed consent processes, and developing fair and equitable benefits sharing mechanisms. Failure to engage local communities meaningfully in research processes often result in a lack of transparency, accountability and shared decision making. Community members in this manner feel overlooked and undervalued in researches that concerns them. According to the results, there is a pressing need for enhanced community engagement strategies that foster meaningful collaboration and trust between researchers and local communities. Communities often have limited resources, access to information, and decision-making power compared to researchers and institutions conducting researches. This power imbalance result in community members feeling pressured to participate. Initial insights underscore the importance of improving consent processes to ensure informed and voluntary participation of community members in research activities. Findings also point to the need for effective and constant engagement of community members in benefits sharing and minimize pseudo benefits that limit project intervention success. The study develops the Sustain Ethics Rural Research Framework to address ethical issues that arise in climate change and health research in rural areas.

Key words: Community, Ethics, violation, rural, climate, health

27 TRACK E: Healing the Earth and Empowering Health Professionals: Envisioning a Comprehensive Climate Change Education in Medical Training for Kenya's Sustainable Future

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Background: Climate change is one of the most pressing global health challenges of our time, and healthcare professionals have an important role in addressing its impacts. Medical professionals, in particular, are uniquely positioned to lead efforts to mitigate and adapt to climate change due to their health expertise and close interactions with communities. Now more than ever, there is an urgent need for healthcare professionals to be educated on climate change. Climate change should be embedded into medical education for three reasons: first, to prepare students for clinical practice in a climate-changing world; second, to promote global health and eco-health

education; and third, to deepen existing knowledge acquisition and strengthen core competencies.

A recent Global assessment found that only 15% of medical schools have incorporated climate change into their curriculum [1]. Furthermore, very little is known about the extent to which climate change learning outcomes are incorporated into the Kenyan medical curriculum, with a majority of medical students and early career medical doctors stating they have learnt about climate change and planetary health via the internet and professional development forums such as the International Federation of Medical Students Associations (IFMSA) and the World Medical Association Junior Doctors Network (WMA JDN), as opposed to their formal didactic curriculum as evidenced by an informal WhatsApp poll conducted on the Kenya Medical Association Young Doctors Network Whatsapp groups. This is despite there being formal training manuals on climate change and health [2]

Objectives: To investigate the extent to which climate change is currently integrated into undergraduate medical education in Kenya and To propose recommendations for integrating climate change into medical education in Kenya, including strategies for curriculum design and student engagement.

Methodology: The first step was to identify the universities that offer undergraduate medical education programs and are accredited by the KMPDC. This was followed by assessing the undergraduate public health course learning outcomes, specifically if climate and/or planetary health are offered.

A checklist of important climate change topics was generated using the General Medical Council's "Educating for Sustainable Healthcare - Priority Learning Outcomes" [3] and each curriculum was analysed against the checklist.

Results: The Bachelor of Medicine and Bachelor of Surgery (MBChB) course is currently offered in eleven medical schools in the country. We managed to review nine medical school curricula which revealed that 8 medical schools did not have planetary health incorporated into their curriculum. All 9 medical schools did not include the health benefits of action to avert the planetary health crises as part of their outline. Not a single medical school had a specific learning module on planetary health and its impact of ecosystem crises on healthcare systems. There was no learning outcome dedicated towards actions to reduce the environmental impact of medical practice.

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498 TRACK E: Constraints to data acquisition of clinical trials and cohort studies for climate and health re-analysis: Privacy concerns and solutions

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Background, rationale, and objectives: Data acquisition in Research Project 2 of the HE2AT Center, an NIH-funded climate and health project involving re-analysis of data from clinical trials, has encountered numerous constraints. Our objective is to describe the major constraints in acquiring clinical trial data, to improve future data acquisition processes within the HE2AT Center and broader and to facilitate in-depth, timely, heat-health analysis.

Methods: We identified clinical trial and cohort studies for Johannesburg and Abidjan by searching repositories such as ClinicalTrials.gov, Vivli, Wits Health Consortium grant award lists, and PubMed. We designed and implemented a workflow to acquire the individual participant data from identified studies, utilising Trello as a tracking system. We reviewed the captured data within Trello to identify critical delays and issues in data acquisition.

Results: Of the initial studies identified 58 (Johannesburg n=38, Abidjan n=20,) were eligible for acquisition and analysis according to our protocol. Privacy concerns regarding geo-location sharing were significant in 35 studies, despite our study using data jittering and masking to comply with local data protection laws. Significant delays (over three months) in provider responses occurred in 38 cases despite regular follow up and engagement from the data acquisition team. Lack of incentive for data sharing was only articulated in 12 cases. Delays in feedback from applications made to clinical trial networks (such as ACTG, HPTN, Vivli) extended timelines

in 5 studies. Understanding of local data protection regulations and what constitutes private data, particularly in the context of machine learning study design, were notable hindrances among data providers.

Conclusion/Implications: Synthetic datasets can address privacy concerns by mimicking real data without personal information. Incentives such as authorship, funding/reimbursement of costs, and recognition may facilitate data sharing. Training data providers on machine learning study design can enhance collaboration. Direct communication with key gatekeepers can mitigate delays—transparent communication about project objectives and benefits fosters trust. Comprehensive legal and ethical frameworks for data sharing in clinical trial re-analysis will ensure compliance with data protection laws.

526 TRACK E: Complexities in Climate Change and Health Research: A case study of The HE²AT Center sub-Saharan Individual Participant Data meta-analysis

Ms Cherlynn Dumbura[1,2], Dr Tatenda Makanga[1,2,3], Dr Fortunate Machingura[1,3], Ms Ijeoma Solarin[4], Ms Relebohile Motana[4], Dr Darshnika Lakhoo[4], Ms Lisa van Aardenne[5], Dr Christopher Jack[5], Dr Sibusisiwe Makhanya[6], Mr Zororo Chinwadzimba[1], Ms Laura Munthali[1], Prof Donrich Thaldar[7], Ms Este vanWyk[4], Ms Jessica Senekal[5], Mr Jaspar Maguma[1], Ms Alice McClure[5], Prof Matthew Chersich[4], Prof Stanley Luchters[1,3]

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Introduction and rationale: Climate change is emerging as a global threat to health with the global temperatures increasing at a rate of 0.1°C per decade. Africa is the most affected continent whilst being the least financially resourced to adapt and mitigate climate change. Africa's existing health, specifically maternal health burden increases the continent's vulnerability to the impacts of heat on health.

Most studies researching the heat and health association have been conducted in developed settings where adaptation and mitigation measures are abound. The HE²AT Center is aggregating and harmonising individual level health data from pregnancy cohorts and clinical trials in sub-Saharan Africa to conduct an Individual-level participant data meta-analysis which will be representative of 33 countries across Africa with approximately a million participants. The aim of this case study is to highlight the process and ethical challenges, lessons learnt, and recommendations for carrying out IPD meta-analysis data aggregation to inform researchers planning to carry out similar work.

Findings: Various ethical considerations were encountered in the conduct of this IPD, including:

Sensitive variables: To determine the relationship between heat and health outcomes it is essential to assign the exposure to the participants. This requires access to the location and date variables that describe a participant's time and place of delivery. Such variables are considered 'indirect identifiers' by the WHO. Cautious and restricted access to these variables may limit the granularity of the analysis that can be carried out using the data potentially reducing the quality of results.

Data protection laws: sub-Saharan countries are at different stages of implementing Data Protection acts and laws. Due to the acts, policies and Data protection personnel being relatively new, navigating the area has been slow with Data protection personnel exhibiting cautiousness in terms of committing to researchers' requests.

Data transfer agreements: Data transfer agreements (DTAs) between the study research institute and data providers have been created by legal officers in the research partner's institutions to facilitate the data sharing and transfer processes.

We have found that the existing data sharing ethical and legal platforms do not always align, leaving room for interpretation from parties involved, thereby complicating and causing further delays as the team must adjust DTAs to align the ethical and legal terms.

Stake holder engagement and transparency: Internal and external stakeholder engagement exercises with data providers, policy makers, community advisory boards and the research team is ongoing to ensure each stakeholder remains informed at each phase of the study.

Recommendations: Systematic continental data sharing policies established by researchers, governing bodies and other relevant stakeholders would ensure timely research that could benefit the continent. If policy implementers can collectively advocate for continent wide data sharing agreements for research purposes, the insights generated would benefit the continent and facilitate systematic data sharing between researchers and minimise duplication in climate and health research.

Ethical considerations should support the research process whilst being equitable and mutually beneficial for stakeholders including the vulnerable populations in sub-Saharan Africa.

372 TRACK E: Climate change and mental health: Students' use of poetry to express eco-anxiety

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The nexus between climate change and mental health has not been adequately explored particularly amongst people of color or African descent. Research has shown that rising temperatures have been associated with increased suicide rates, the destruction that results from floods has contributed to fatalities, displacement, and post-traumatic stress disorder. South Africa particularly the province of KwaZulu-Natal has seen an increase in severe weather conditions, an event of significant consequence was the flooding of April 2022 which resulted in 450 people who were reported dead or missing. Research shows that those who survive these climate induced disasters experience mental health challenges such as eco-anxiety. According to research eco-anxiety has not been adequately studied amongst people living in the Global South. Considering this, the Durban University of Technology students (DUT) in their second year of study engaged in a collaborative online international learning (COIL) exchange program with students from Sheffield Hallam University in England. The purpose of this engagement was for students to exchange their experiences of climate change and mental health. In one of the activities students were asked to use creative methods to express their feelings regarding eco-anxiety. Some students from DUT used poetry. This paper provides an analysis of those poems. What emerged from the poems is that prior to the project students did not know about eco-anxiety they expressed feelings of unease and fear during heavy rains but had not heard of a concept that encapsulates those emotions. Furthermore, students did not associate the extreme weather patterns with climate change but an act of God. The concept of hope was also interrogated with some expressing hopelessness and with others pointing to Africa as mankind's hope of restoring the earth through African communal values that also call for respect of the environment. This study is a demonstration of how poetry can be a powerful tool in helping students demonstrate an understanding of new concepts as well as a medium to process complex emotions and deepen the transformative learning process.

314 TRACK E: Evaluating the state of African research in the climate, land, agriculture and biodiversity: A systematic review

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Background, rationale, and objectives: Africa is a climate change hotspot and faces high levels of vulnerability due to inherently low adaptation capacity due to existing poverty and inequality. It also has a very high population whose livelihoods depend on natural resources. For example, about 95% of agriculture is rainfed, and more than 70% of people rely on agriculture for food and livelihood. Under climate change, Africa faces an unpredictable future. Extreme weather patterns will result in climate-related changes in food availability and diet quality, non-communicable diseases, and diet-related diseases, and the number of malnourished people is likely to increase. There are growing calls for locally driven solutions to climate and related crises. This study evaluates the state of African research climate, land, agriculture.

Methods: Systematic scoping reviews and bibliometric analyses were conducted to assess the extent of knowledge available, while the bibliometric analyses assessed the extent to which African researchers and networks have been involved in the research. A stakeholder engagement process was conducted through a series of webinars, each of the themes on climate, land, agriculture, and biodiversity. The webinars were designed to gather diverse perspectives from various stakeholder and validate the systematic scoping review analysis.

Results: The findings highlighted imbalances in research between the global North and African researchers and a need for more collaboration among African researchers. This indicated the global funding landscape, where most researchers and funders are in the global North. Funders often require that lead institutions be located in the North, with partners from Africa. Hence, the funding frameworks support North-South collaboration. The lack of or limited African-based funding organisations means there is no similar support for intra-African collaboration.

Conclusions and implications here is need to increase direct access funding for African institutions and researchers that support intra-African collaboration and for such projects to be led by African researchers. However, to achieve this, there is a need to build the capacity of African researchers to undertake complex inter- and transdisciplinary research. We recommend establishing and empowering African-led communities of practice that can facilitate knowledge sharing and exchange, funding acquisition, building and strengthening capacities and bridging gaps between researchers and policymakers on the continent.

209 TRACK E: Promoting Justice and Inclusion in Climate Research

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Climate change disproportionately affects vulnerable populations, yet ethical concerns and equity issues persist in global climate initiatives. This paper examines the intersection of ethics and equity in climate research, focusing on inclusive participation, fair funding, cultural sensitivity, and capacity building.

Through a critical analysis of literature and case studies, we identify key challenges and opportunities for promoting justice and equity. Our findings highlight the need for a nuanced understanding of ethical dimensions and prioritizing equity in global climate initiatives.

We propose a framework for ethical and equitable climate research, prioritizing marginalized communities' needs and perspectives. This framework emphasizes:

- **Inclusive participation:** involving diverse stakeholders in research and decision-making
- **Fair funding:** allocating resources to support research and initiatives in developing countries and marginalized communities
- **Cultural sensitivity:** respecting and incorporating local knowledge and perspectives
- **Capacity building:** enhancing developing countries' and marginalized communities' capacity to conduct research and adapt to climate change

By addressing ethics and equity, we can ensure climate research and initiatives are just, effective, and beneficial for all. This paper contributes to the growing body of research on climate justice and equity, providing a critical examination of the ethical dimensions of climate research and a framework for promoting justice and inclusion.

366 TRACK E: Ethics and climate research equity

Mr James Mupanga[1]

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As the urgency of the climate crisis intensifies, the need for robust, equitable climate research has never been greater. However, the field of climate science has historically been plagued by disparities in access, representation, and power dynamics that threaten the credibility and impact of this vital work. This review paper examines the ethical considerations and challenges surrounding climate research equity.

The analysis explores issues such as uneven global participation in climate studies, skewed geographic and demographic data coverage, marginalization of Indigenous and local knowledge, and the concentration of research funding and resources in the Global North. The paper also considers how structural racism, colonialism, and socioeconomic inequities have shaped climate research agendas and methodologies in ways that neglect the perspectives and experiences of vulnerable populations.

Drawing on frameworks from climate and environmental justice, the review outlines principles and strategies for advancing equity in climate science. These include diversifying research teams, centering community-based partnerships, ensuring equitable data governance and benefit-sharing, and embedding antiracist and decolonial praxis throughout the research lifecycle. The paper concludes by highlighting policy interventions and institutional reforms needed to foster a more inclusive, representative, and impactful climate research enterprise globally.

Cultivating ethical, equitable climate research is not only a moral imperative, but also crucial for generating the holistic, contextually-grounded knowledge required to build a just, climate-resilient future for all.

CHAC 2024
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ISBN: 978-1-77934-411-3
EAN: 9781779344113