

REVIEW ARTICLE

Effects of Climate-Related Disasters on Child Nutrition and Feeding Practices in Low- and Middle-Income Countries: A Narrative Review

Nomagugu Ndlovu^{1*}, Makhosi Mahlangu², Nomagugu M Sibanda³, Patience Marume¹, and Hugo Randinyu⁴

¹Department of Food Science and Nutrition, Faculty of Science and Technology, Midlands State University, P Bag 9055, Gweru, Zimbabwe

²Department of Agro-processing and Food Technology, Lupane State University, PO Box AC255, Ascot, Bulawayo, Zimbabwe

³African Food Revolution, No. 8 Empress Road, Belmont, Bulawayo, Zimbabwe

⁴Department of Development Studies, Lupane State University, P O Box AC255, AScot, Bulawayo, Zimbabwe

DOI: [https://doi.org/10.70851/jfines.2026.3\(3\).414.424](https://doi.org/10.70851/jfines.2026.3(3).414.424)

ABSTRACT

Climate-related disasters are becoming increasingly frequent and severe, posing major threats to child health and nutrition, particularly in low- and middle-income countries (LMICs). These events disrupt food systems, health services, water and sanitation infrastructure, and caregiving practices, increasing the risk of undernutrition among children under five years of age. This narrative review synthesised current evidence on the effects of climate-related disasters on child nutrition and infant and young child feeding (IYCF) practices in LMICs. A narrative review of peer-reviewed literature published up to June 2025 was conducted using PubMed, ScienceDirect, Web of Science, and Google Scholar. Studies were eligible if they examined the association between climate-related disasters including droughts, floods, cyclones, and climate variability and nutritional outcomes or feeding practices among children under five years in LMICs. Findings were synthesised narratively because of substantial heterogeneity in study designs, exposures, and outcome measures. Eleven studies met the inclusion criteria. Most were conducted in Sub-Saharan Africa and South Asia. Droughts and floods were the most frequently investigated climate-related disasters and were consistently associated with increased risks of stunting, wasting, and underweight. Several studies also reported disruptions to breastfeeding and complementary feeding practices, worsening household food insecurity, increased maternal psychological distress, and reduced access to essential health and nutrition services following disasters. Children living in rural and resource-constrained settings were consistently identified as the most vulnerable. Climate-related disasters adversely affect child nutrition through multiple interconnected pathways, including reduced food availability, increased infectious diseases, disruption of feeding practices, and weakened health systems. Strengthening climate-resilient nutrition programmes, protecting infant and young child feeding during emergencies, and integrating nutrition into disaster preparedness and climate adaptation policies are essential to improve child health outcomes in LMICs.

Article history

Received;

26 March, 2026

Revised;

02 September, 2026

Accepted;

04 September, 2026

Keywords

climate-related
disasters
child nutrition
infant and young
child feeding
stunting
wasting
underweight
.

*Corresponding author:

E-mail: nomagugun95@gmail.com (Nomagugu Ndlovu)

Peer review under responsibility of Journal of Food Innovations,
Nutrition, and Environmental Sciences

A Publication of EcoScribe Publishers company Limited,
Uganda. www.ecoscribepublishers.com

All the articles published by [Journal of Food Innovation, Nutrition, and Environmental Sciences](#) are licensed under a [Creative Commons Attribution 4.0 International \(CC-BY\) License](#) Based on a work at <https://jfines.org>



1. INTRODUCTION

Climate-related disasters are increasing in frequency, intensity, and complexity worldwide, posing significant threats to human health, food security, and sustainable development. Floods, droughts, cyclones, heatwaves, and other extreme weather events are becoming more frequent because of climate change, with disproportionate impacts on low- and middle-income countries (LMICs), where livelihoods largely depend on climate-sensitive sectors such as agriculture and where adaptive capacity remains limited. These disasters disrupt food production systems, damage infrastructure, contaminate water supplies, interrupt health services, and displace vulnerable populations, thereby increasing the risk of food insecurity and malnutrition (Ebi et al., 2020; Pizzorni et al., 2024).

Children under five years of age are among the populations most vulnerable to the adverse effects of climate-related disasters. This period represents a critical window for physical growth, cognitive development, and immune maturation, during which adequate nutrition is essential for healthy development. Climate-related disasters threaten child nutrition through multiple interconnected pathways, including reduced household food availability, loss of livelihoods, disruption of health and nutrition services, increased exposure to infectious diseases, poor water and sanitation conditions, and reduced caregiving capacity. These pathways may result in inadequate dietary intake, suboptimal infant and young child feeding (IYCF) practices, and increased risks of undernutrition, particularly stunting, wasting, and underweight.

The burden of child undernutrition remains substantial in many LMICs despite global progress in reducing malnutrition. Climate-related disasters further exacerbate existing vulnerabilities by reducing agricultural productivity, increasing food prices, and disrupting local food systems. Droughts often reduce crop and livestock production, limiting household food availability and dietary diversity, whereas floods may destroy crops, contaminate drinking water, damage sanitation infrastructure, and increase the incidence of infectious diseases such as diarrhoea, all of which contribute to poor nutritional outcomes among young children. These impacts are particularly severe in rural communities where households depend heavily on subsistence farming and have limited access to social protection and healthcare services.

Optimal infant and young child feeding practices are fundamental to child survival, growth, and development. Exclusive breastfeeding during the first six months of life, followed by the timely introduction of safe and nutritionally adequate complementary foods while continuing breastfeeding, is widely recognised as one of the most effective strategies for preventing childhood malnutrition. However, disasters frequently disrupt these recommended practices. Maternal stress, displacement, food shortages, interruptions in health services, reduced access to clean water, and poor sanitation may compromise breastfeeding, complementary feeding, and the overall nutritional care of infants and young children. Consequently, disaster-affected children face increased risks of growth faltering, micronutrient deficiencies, infectious diseases, and mortality.

Growing evidence demonstrates associations between climate-related disasters and adverse child nutrition outcomes. Previous

reviews have shown that droughts, floods, and climate variability are associated with increased risks of stunting and other forms of undernutrition. However, much of the existing evidence has focused on specific disaster types, individual nutritional outcomes, or studies published before recent increases in the frequency and intensity of climate-related disasters. Furthermore, emerging evidence from LMICs has not been comprehensively synthesised to describe the multiple pathways through which climate-related disasters influence child nutrition and feeding practices.

This narrative review therefore synthesises current evidence on the effects of climate-related disasters on child nutrition and infant and young child feeding practices among children under five years of age in LMICs. Specifically, the review examines the types of climate-related disasters most frequently associated with adverse nutritional outcomes, summarises their impacts on child growth and feeding practices, identifies the pathways through which these disasters influence nutritional status, and discusses implications for nutrition programming, disaster preparedness, and future research. By bringing together recent evidence across diverse settings, this review aims to inform policies and interventions that strengthen nutrition resilience among children living in climate-vulnerable regions.

Climate-related disasters are occurring with increasing frequency, intensity, and unpredictability worldwide (Pizzorni et al., 2024). Evidence from several scientific studies indicates that anthropogenic climate change, driven largely by greenhouse-gas emissions and land-use change, is amplifying extreme weather events, including floods, droughts, tropical cyclones, wildfires, and heatwaves (Ebi et al., 2020; Ndlovu & Chungag, 2024). Floods and droughts stand out as two of the most devastating climate hazards in terms of human impact and economic loss. According to Pizzorni et al., these hydrological extremes now represent over 50% of climate-related disasters globally, affecting millions of people each year (Pizzorni et al., 2024). These events pose a significant risk to the nutritional status of people as they lead to large-scale destruction of homes, stored food, and livestock, and expose individuals living in temporary shelters to harsh weather (Lieber et al., 2022). In 2019 alone, 396 climate-related disasters affected approximately 95 million people and resulted in nearly US\$130 billion in economic losses, with Asia bearing the brunt of the impact (Ebi et al., 2020). As the Earth continues to warm and is projected to surpass 1.5 °C above pre-industrial levels within the next few decades, the intensity, frequency, and compound nature of climate disasters are expected to escalate further (Ndlovu & Chungag, 2024). Clearly, these events are no longer isolated anomalies but recurring phenomena that are reshaping ecological systems, infrastructure, and human livelihoods. Despite the frequent occurrence of climate-related disasters, insufficient research has synthesised their effects across different populations and settings.

Vulnerable populations, such as older adults, women, and most importantly, children aged five years and younger, have a higher likelihood of being affected by interruptions in regular food supply, restricted access to health services, and the diversion of family income. Globally, the prevalence of wasting, a measure of acute malnutrition, is approximately 7.5%, with severe wasting at 2.4%. Low- and middle-income countries report the highest rates of wasting (11.6%). During emergencies, the prevalence of acute malnutrition, including severe acute malnutrition (SAM), can be significantly higher,

potentially reaching 10–15%. Higher rates of acute malnutrition have been documented following emergencies in regions such as East Africa, countries bordering the Sahara, Bangladesh, and Nepal. In settings where stunting or underweight rates are already high, climate-related disasters further increase the risk of malnutrition and mortality in newborns and growing children. Climate-related disasters have been shown in multiple studies to have negative effects on child growth, reducing height-for-age Z scores and increasing the prevalence of stunting. For instance, a rise in wasting among children was observed in Aceh after the tsunami. The nutritional consequences can vary based on the type of disaster; floods, for example, have been associated with malnutrition, including both stunting and wasting, in infants and young children in many countries (Sithole et al., 2021).

The impacts of climate disasters are disproportionately borne by low- and middle-income regions, particularly sub-Saharan Africa, South Asia, and parts of Latin America (Climate Change and Food Security: Risks and Responses, n.d.; Masipa & Masipa, 2017). These areas are characterised by high exposure to climate variability, widespread poverty, limited adaptive capacity, and a heavy dependence on climate-sensitive sectors such as agriculture. According to Masipa, sub-Saharan Africa is considered the most vulnerable continent to climate change, with projections suggesting a decline in agricultural productivity of up to 21% by 2080, primarily due to increased droughts, erratic rainfall, and land degradation (Masipa & Masipa, 2017). Food security in these regions is already fragile and climate change worsens existing vulnerabilities across the four core pillars of food security (Tidiane Ndour et al., 2024). Climate disasters such as droughts and floods damage crops, reduce water availability, and destroy storage and transport infrastructure, leading to food shortages and price spikes (Draper & Mbirimi, 2010). For instance, drought-related losses in Ethiopia and Tanzania have led to sharp declines in staple crop yields like maize, rice, and sorghum, directly undermining household food access and dietary quality (Masipa & Masipa, 2017). Reduced household food access and dietary quality, in turn, affect infant and child feeding practices, especially in low-resource settings (Rizwan et al., 2024). In addition to food insecurity, flooding, droughts, and other events can lead to contamination of water sources (Tidiane Ndour et al., 2024), and destruction of household infrastructure (Pizzorni et al., 2024), which directly impact the availability and safety of infant food supplies.

Infant and young child feeding (IYCF) practices are recognised globally as crucial for improving nutritional status and decreasing infant mortality. However, suboptimal IYCF practices are widespread globally and nationally. In Africa, particularly in sub-Saharan Africa (SSA), suboptimal IYCF practices remain a significant problem, contributing to malnutrition, increased morbidity, and mortality (Bayih et al., 2024; Mekonen et al., 2024). It is estimated that inappropriate feeding practices account for over two-thirds of child and infant mortality in SSA. Few children in most countries meet the criteria for dietary diversity and feeding frequency. The prevalence of appropriate complementary feeding practices among children aged 6 to 23 months in SSA is relatively low, found to be 13.02% in a study spanning 19 countries (Mekonen et al., 2024).

Common challenges affecting IYCF practices in many African countries include failure to exclusively breastfeed infants

during the first six months of life and the early introduction of foods and liquids other than breast milk because of several sociocultural factors (Aboagye et al., 2024). While breastfeeding initiation rates can be high, maintaining exclusive breastfeeding remains a challenge. Complementary foods are often nutritionally deficient or inadequate (Aboagye et al., 2024). The diets of many older infants do not meet the criteria for a minimally acceptable diet (MAD). Dietary diversity is often poor, with low use of animal source foods. Most infants and young children are introduced to normal household foods, predominantly cereals and starchy foods, which are poor in quality (Mekonen et al., 2024). In addition, economic status can influence the ability to purchase diversified foods. Although the World Health Organization (WHO) has emphasised the importance of breastfeeding, mothers in disaster-affected areas, particularly in low-resource countries, may face significant barriers, including reduced lactation due to stress or malnutrition, and limited access to clean water and infant formula. These disruptions can contribute to higher rates of malnutrition and increased susceptibility to infections. While previous reviews, such as the 2020 systematic review synthesizing studies up to 2015, have established that extreme weather events and fluctuations in temperature and precipitation can be associated with childhood stunting (Lieber et al., 2022), these analyses were broader in scope, covering multiple age groups and often limited to older studies. Our review specifically focuses on infants and children under five years in low- and middle-income countries, a subgroup that is both physiologically vulnerable and disproportionately represented among marginalised racial and ethnic populations. Uniquely, we examine how racial and ethnic disparities intersect with climate-related disasters to influence child nutrition outcomes.

2. METHODS

2.1 Review design

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The review aimed to synthesise evidence on the effects of climate-related disasters on child nutrition and infant and young child feeding (IYCF) practices among children under five years of age in low- and middle-income countries (LMICs). The review question, eligibility criteria, data extraction items, and synthesis approach were determined a priori before the literature search and screening commenced.

2.2 Data sources and search strategy

A comprehensive literature search was conducted between April and June 2025 using four electronic databases: PubMed, ScienceDirect, Web of Science, and Google Scholar. The search strategy was developed using the Population–Exposure–Comparator–Outcome (PECO) framework.

The population of interest comprised infants and children aged 0–59 months living in LMICs. The exposure was climate-related disasters, including droughts, floods, cyclones, rainfall variability, temperature variability, and other extreme weather events. Where available, comparator groups consisted of children of the same age who were not exposed to climate-related disasters. Outcomes of interest included infant and young child feeding practices (including breastfeeding and

complementary feeding), child nutritional outcomes (stunting, wasting, and underweight), and household food security.

Search strategies combined Medical Subject Headings (MeSH), where applicable, with free-text keywords using Boolean operators ("AND" and "OR"). The principal search concepts included: ("climate change" OR "climate-related disasters" OR drought* OR flood* OR cyclone* OR "extreme weather") AND ("child*" OR infant* OR newborn* OR "under five") AND ("nutrition" OR malnutrition OR stunting OR wasting OR underweight OR breastfeeding OR "infant and young child feeding" OR IYCF).

The search strategy was adapted to suit the indexing requirements of each database.

2.3 Eligibility criteria

Studies were eligible for inclusion if they: were original quantitative research studies (cross-sectional, cohort, longitudinal, panel, or observational designs); included children aged 0–59 months or their caregivers; were conducted in low- and middle-income countries; investigated the effects of climate-related disasters on child nutrition or feeding practices; reported at least one nutrition-related outcome, including stunting, wasting, underweight, breastfeeding, complementary feeding, or food security; and were published in English between January 2013 and December 2024.

The following publications were excluded: review articles; editorials; conference abstracts; case reports; dissertations and theses; opinion papers; and studies that did not examine climate-related disasters or did not report child nutrition outcomes.

2.4 Study selection

All retrieved records were exported to Microsoft Excel, where duplicate records were identified and removed. Two reviewers independently screened titles and abstracts against the eligibility criteria. Full-text articles of potentially eligible studies were then assessed independently by the same reviewers. Any disagreements regarding study eligibility were resolved through discussion until consensus was reached.

2.4 Data extraction

Data were extracted independently by two reviewers using a standardised Microsoft Excel data extraction form. The following information was extracted from each included study: first author and year of publication; country and study setting; study design; sample size and study population; type of climate-related disaster; child age group; nutrition and feeding outcomes assessed; and the main findings relevant to the review objective.

Additional contextual information, including maternal mental health, household food security, child morbidity, and socioeconomic characteristics, was extracted where reported. Disagreements during data extraction were resolved through discussion between the reviewers.

2.6 Data synthesis

Given the considerable heterogeneity in study designs, exposure definitions, nutritional outcomes, and analytical approaches, quantitative meta-analysis was not considered appropriate. Findings were therefore synthesised narratively. Studies were grouped according to the type of climate-related disaster and the nutritional outcomes investigated. Common themes, patterns, and mechanisms linking climate-related disasters with child nutrition and feeding practices were identified and summarised.

2.7 Quality assessment

A formal methodological quality or risk-of-bias assessment was not conducted because of the substantial diversity in study designs and outcome measures included in this review. Nevertheless, methodological limitations identified during data extraction including small sample sizes, reliance on self-reported exposure measures, inconsistent adjustment for confounding variables, and variability in nutritional outcome measurements were considered during the interpretation of findings and are discussed as limitations of the review.

3. RESULTS

3.1 Study selection

The study selection process is presented in the PRISMA 2020 flow diagram (**Figure 1**). The database search identified records from PubMed, Scopus, Web of Science, and other electronic sources. Following the removal of duplicate records and the screening of titles and abstracts, full-text articles were assessed for eligibility against the predefined inclusion criteria. Eleven studies met the eligibility criteria and were included in the final review.

3.2 Characteristics of included studies

The characteristics of the included studies are summarised in **Table 1**. Most studies were conducted in Sub-Saharan Africa ($n = 9$), including Ethiopia, Kenya, Burkina Faso, Uganda, Ghana, Senegal, and Sierra Leone, while the remaining studies were conducted in South Asia, including Bangladesh, Nepal, and India. The majority employed observational study designs, including cross-sectional surveys, longitudinal studies, demographic surveys, and cohort analyses.

Droughts and floods were the most frequently investigated climate-related disasters, followed by climate variability, rainfall variability, temperature variability, and cyclones. These disasters were examined in relation to a range of child nutrition outcomes, including stunting, wasting, underweight, breastfeeding practices, household food security, and maternal mental health.

Across the included studies, stunting was the most reported nutrition outcome, followed by underweight and wasting. Several studies also described disruptions to infant and young child feeding practices, reduced household food availability, increased maternal psychological distress, and reduced access to health and nutrition services following climate-related disasters.

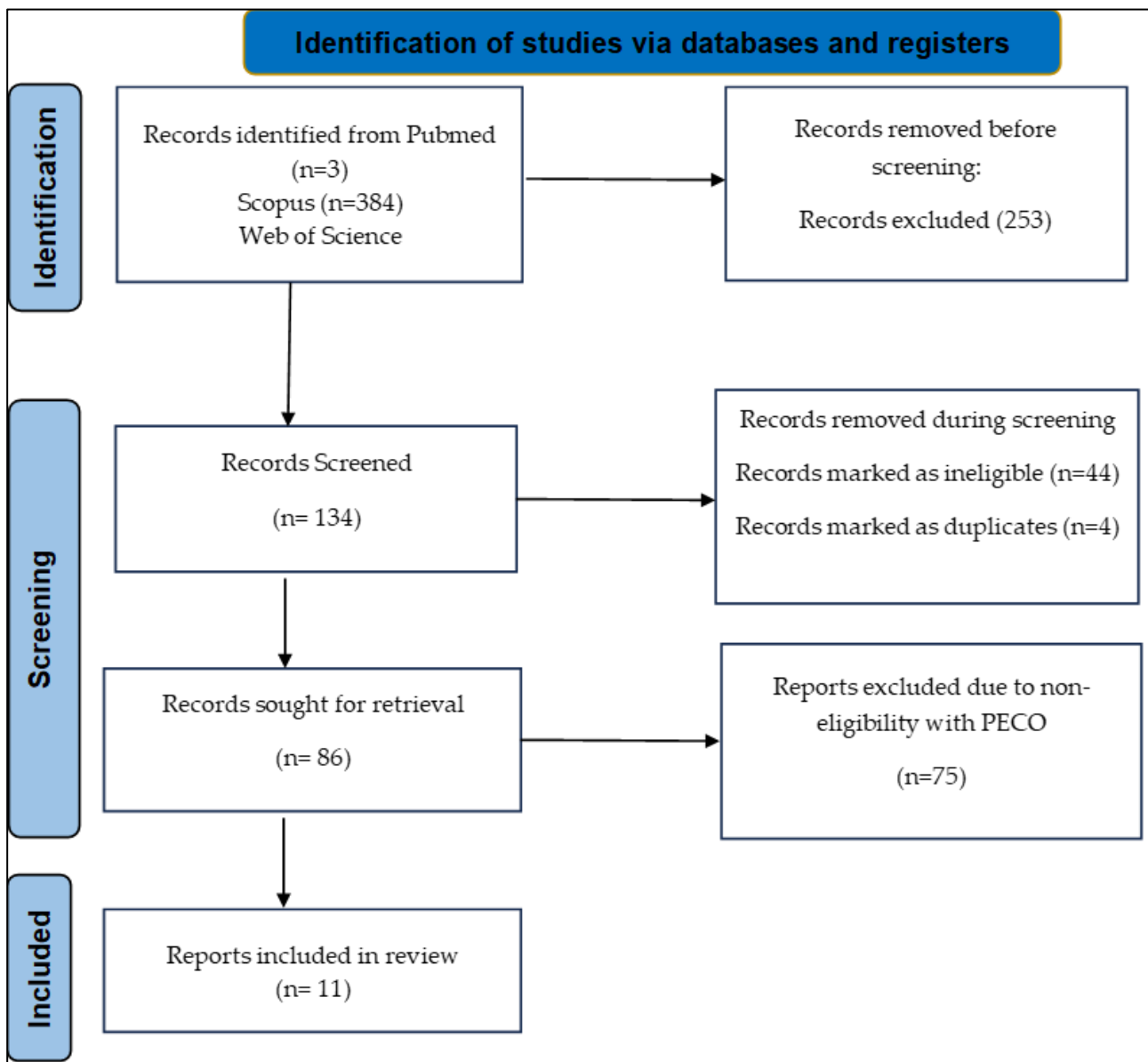


Fig. 1. PRISMA Flow Diagram of the Systematic Review

Owing to substantial heterogeneity in study designs, exposure measurements, and outcome definitions, findings were synthesised narratively rather than through meta-analysis.

3.3 Evidence of the impact of climate-related disasters

The characteristics and principal findings of the included studies are summarised in **Table 1**. The studies are described according to country, study design, type of climate-related disaster, study population, and reported nutrition and feeding outcomes. Due to differences in study designs, exposure measures, and outcome definitions, findings are presented narratively.

The most frequently reported types of climate-related disasters were droughts and climate variability, including rainfall extremes and temperature fluctuations, which appeared in at least 9 of the 13 studies. Other documented disasters included floods (n = 5), cyclones (n = 2), and earthquakes (n = 1). Several studies reported exposure to more than one type of environmental shock.

Child undernutrition outcomes were the most frequently assessed, with stunting (n = 11), underweight (n = 9), and wasting (n = 7) appearing frequently as primary endpoints. Disruptions to breastfeeding practices (n = 5) and maternal mental health challenges (n = 4) were also noted as secondary outcomes associated with disaster exposure. The most frequently studied age group was children under five years, with particular emphasis on infants and toddlers aged 6–59 months.

The geographical distribution of studies reflects the disproportionate exposure of rural, low-resource populations, especially in Sub-Saharan Africa, to the adverse nutritional impacts of climate-related disasters.

Drought was frequently identified as a key driver of chronic undernutrition, with several studies demonstrating that both concurrent and early-life exposure to drought negatively affected height-for-age Z-scores (HAZ). In many cases, drought conditions led to reduced household food availability,

Table 1. Characteristics of the included studies

No.	Country	Study design	Type of disaster	Population	Outcome	Reference
1	Senegal	Survey	Drought	Children aged <5 years	25% reduction in weight-for-age Z-scores	Lazzaroni & Wagner (2016)
2	Bangladesh	Demographic Health Survey	Cyclones Sidr (2007) (2009)	Children aged <5 years	Reduced HAZ and increased likelihood of stunting and underweight	Ahsanuzzaman & Islam (2020)
3	Ethiopia	Longitudinal panel	Rainfall and temperature variability	Children aged <5 years	Increased rainfall: increased moderate stunting (0.242 SD per 1 SD rainfall increase); increased temperature: reduced moderate stunting (0.216 SD per 1 SD temperature increase); severe wasting increased with extreme rainfall (quadratic effect)	Acharya & Das (2020)
4	Ghana and Bangladesh	Feed the Future surveys	Droughts and heavy rainfall	Rural households and children aged <5 years	Household hunger and child nutrition	Cooper et al. (2019)
5	Burkina Faso	Remote sensing and survey	Climate change (rainfall variability, droughts, and torrential rainfall)	Rural smallholder farmers	Smallholder yields and child undernutrition	Karst et al. (2020)
6	Nepal	Survey	Epidemics and floods	Children aged 6–59 months	Child stunting	Gaire et al. (2016)
7	Kenya	Questionnaires, interviews, and group discussions	Prolonged droughts	Children aged 6–23 months, older women, and fathers from pastoral communities	Household food security and child nutrition	Matiri et al. (2025)
8	Uganda	Survey	Drought and unexpected rainfall	Children aged <5 years	Underweight and stunting among children aged <5 years	Epstein et al. (2019)
9	Burkina Faso	Longitudinal analysis using a frailty Cox proportional hazards model	Climate variability	Children aged <5 years in subsistence-farming households	Lower food-crop productivity, increased mortality risk, reduced cereal-crop yields, and decreased child survival	Belesova et al. (2017)
10	Kenya	Interviews	Droughts, heat stress, and food insecurity	Informants and caregivers	Malnutrition, mental health issues, and food insecurity	Chongwo et al. (2025)
11	India	Large-scale observational study	Climate change	Children aged <5 years	Increased child malnutrition rates, including stunting, wasting, and underweight	Mahapatra et al. (2021)

Note. ↑ = increased/improved; ↓ = reduced/lowered; HAZ = height-for-age Z-score.

Table 2. Summary of key nutrition outcomes reported in the included studies

Outcome	No. of studies	Overall evidence
Stunting	7	The most consistently reported nutrition outcome. Evidence showed increased stunting following droughts, floods, climate variability, and rainfall extremes, largely through reduced food availability, poor dietary diversity, and household food insecurity.
Underweight	5	Underweight was frequently associated with climate-related disasters, particularly droughts, floods, and rainfall variability. Reduced household food access and declining agricultural productivity were identified as major contributing factors.
Wasting	3	Wasting increased following severe climatic shocks, particularly extreme rainfall events and prolonged food insecurity. Although fewer studies examined wasting, the findings consistently indicated an increased risk among children exposed to climate-related disasters.
Infant and young child feeding (IYCF) practices	2	Two studies reported disruptions in infant and young child feeding practices during drought and flood emergencies, including reduced breastfeeding and challenges in complementary feeding because of food shortages, displacement, and caregiver constraints.
Household food insecurity	4	Several studies identified household food insecurity as an important pathway linking climate-related disasters with poor child nutritional outcomes. Droughts and floods reduced crop yields, household food availability, and dietary quality.
Maternal mental health	1	One qualitative study reported that drought-related food insecurity increased maternal psychological distress, which negatively influenced caregiving and child feeding practices.

diminished caregiving capacity, and increased risks of underweight and wasting. These findings are supported by broader evidence, such as the meta-analysis by Delbiso et al., which linked drought-induced crop failures to elevated child mortality, particularly during the critical developmental window between 6 months and 1.9 years of age (Delbiso et al., 2017).

Flooding also emerged as a significant contributor to undernutrition, especially through its role in increasing exposure to infectious diseases such as diarrhoea and respiratory infections. These acute health conditions are known to compound nutritional deficiencies and impair growth trajectories. For instance, ul Haq et al. observed elevated rates of undernutrition in flood-affected regions, where children were at heightened risk of diarrhoeal illnesses, particularly in humid subtropical zones (ul Haq et al., 2024). Across the reviewed studies, children under five years of age, especially those between 6 and 24 months, were consistently identified as the most vulnerable to environmental shocks, due to their rapid physical and cognitive development and high dependency on caregivers (Rahman et al., 2024; ul Haq et al., 2024). Disruptions in feeding practices during this critical window can lead to long-term and often irreversible, developmental consequences.

The findings also revealed gendered dynamics in caregiving during climate stress. Increases in maternal agricultural labour, especially during periods of drought or heavy rainfall, were linked to reduced time and energy available for optimal child feeding and care (Agabiirwe et al., 2022; Delbiso et al., 2017). Maternal mental health also emerged as a critical, yet underexplored, mediator, with studies reporting heightened levels of stress and depression among mothers affected by disasters (Naaz & Muneshwar, 2023; Nguyen et al., 2014). These mental health challenges further compromise feeding practices and caregiving quality. The pathways through which climate-related disasters impact child nutrition are complex and multifactorial, involving reduced food production, food insecurity, poor water and sanitation conditions, increased disease exposure, and reduced access to healthcare services (Rahman et al., 2024). These effects are most pronounced in low-income rural communities across Sub-Saharan Africa and

South Asia, where structural vulnerabilities and limited adaptive capacity amplify the nutritional risks. The key pathways through which climate-related disasters impact child nutrition outcomes are illustrated in **Figure 2**, highlighting how immediate effects such as food insecurity and service disruption mediate nutritional vulnerabilities through multiple mechanisms including poor feeding practices, increased infections, and maternal mental health challenges.

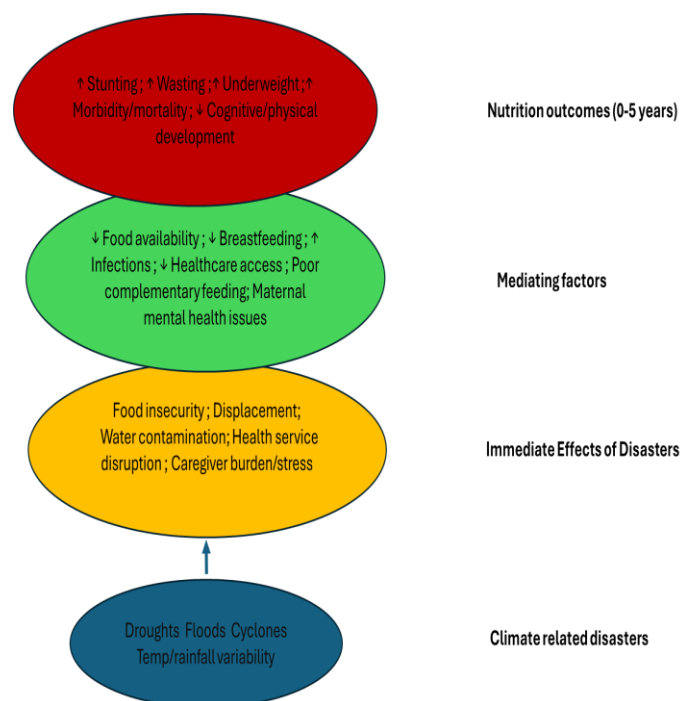


Fig. 2. Pathways linking climate-related disasters to nutrition outcomes in infants and young children in LMICs.

3.4 Structural and social determinants of vulnerability

The vulnerability of children from marginalised racial and ethnic groups to the nutritional impacts of climate-related disasters is shaped by longstanding structural inequities. Land tenure insecurity is a persistent challenge for many minority communities, particularly Indigenous populations and rural ethnic groups, who often cultivate land without formal rights.

During droughts or floods, these households are more likely to experience crop losses without access to compensation or recovery aid, exacerbating food insecurity (Mohamed Shaffril et al., 2024; Randell et al., 2022). Discriminatory allocation of disaster relief resources has also been reported, where racial and ethnic minorities receive less timely or lower-quality assistance, reflecting systemic biases in humanitarian response (Bethel et al., 2013). In addition, gendered cultural norms compound vulnerabilities; in some ethnic minority households, women have limited decision-making power over household food distribution, which can lead to reduced prioritisation of young children's nutritional needs during times of scarcity (Fallah Ghanbari et al., 2025). These structural and social determinants collectively increase the susceptibility of minority children to malnutrition in the aftermath of climate disasters.

3.5 Cultural dimensions of feeding practices

Cultural beliefs and practices surrounding infant and young child feeding (IYCF) strongly influence nutritional outcomes during disasters. For example, traditional feeding practices in some communities discourage exclusive breastfeeding or promote early introduction of herbal teas or porridges, practices that may be intensified when disasters reduce food availability (Amzat et al., 2024; Ramulondi et al., 2021). Indigenous food systems often provide resilience through locally adapted crops and preservation techniques; however, droughts and floods disrupt these systems, undermining culturally appropriate sources of nutrition (Akinola et al., 2020; Olarewaju et al., 2025). Relief efforts may further marginalise minority families by distributing food aid that is culturally unfamiliar or religiously inappropriate, such as fortified blends containing animal-source ingredients not accepted by certain groups (Hazzard et al., 2024). These cultural mismatches can result in underutilisation of aid, leaving children vulnerable to inadequate diets. Strengthening culturally sensitive approaches to food assistance and supporting indigenous food practices could mitigate some of these risks.

3.6 Intersectionality

The risks faced by children from marginalised racial and ethnic groups cannot be understood in isolation; rather, they reflect the intersection of multiple social identities and structural disadvantages (Bethel et al., 2013). Race and ethnicity intersect with poverty, rurality, and gender to compound nutritional vulnerabilities. For example, in drought-affected regions of Kenya and Ethiopia, minority pastoralist groups not only contend with limited access to land and water but also face exclusion from formal markets and social protection schemes (Asokan et al., 2025). Similarly, in multi-ethnic settings such as India and Bangladesh, children from scheduled castes or religious minorities experience higher rates of stunting and wasting after floods compared to dominant groups (Dolui & Sarkar, 2024; Pandey et al., 2024). These disparities highlight how overlapping forms of marginalisation amplify risks and delay recovery, underscoring the importance of intersectional analyses in disaster nutrition research.

3.7 Access to and trust in health and nutrition services

Disasters often disrupt access to health and nutrition services, but the impact is particularly severe for racial and ethnic minority populations. Structural discrimination within health systems can manifest in unequal distribution of relief supplies,

neglect of remote minority communities, or reduced attention to their specific health needs (Clark et al., 2022; Hamed et al., 2022). Language barriers further complicate communication during emergencies, limiting caregivers' ability to access accurate information on safe infant feeding and hygiene practices (Clark et al., 2022). Historical experiences of neglect or coercion in government-led health programmes also fuel mistrust, leading some minority groups to avoid formal relief efforts altogether. This mistrust can result in reliance on unsafe alternatives, such as diluted infant formula prepared with contaminated water, thereby worsening child malnutrition and disease risks. Building equitable and culturally competent health and nutrition systems is therefore critical to improving resilience among minority populations.

3.8 Migration, displacement, and ethnic identity

Migration and displacement caused by climate-related disasters is another pathway through which child nutrition is affected, particularly for minority groups (Trummer et al., 2023). Refugee and internally displaced populations often experience prolonged stays in camps where food rations are limited and poorly aligned with cultural dietary preferences (Gooding et al., 2024). The erosion of traditional food practices in displacement settings undermines dietary adequacy and disrupts the cultural continuity of feeding practices (Trummer et al., 2023). For example, children from Indigenous and pastoralist groups who depend on livestock-based diets face abrupt dietary changes when relocated to urban or camp environments. Displacement also heightens risks of exclusion, as minority children may face discrimination in access to aid or prioritisation in resettlement programs. These dynamics highlight the importance of recognising ethnic identity in the design of nutrition support programmes for displaced populations.

4. POLICY IMPLICATIONS AND FUTURE RESEARCH

The findings highlight the need for integrated, climate-sensitive nutrition programming that links early warning systems, disaster risk reduction, and maternal-child health services. Policy responses should prioritise nutrition-sensitive agriculture, social protection schemes for caregivers, and health system resilience, particularly in high-risk rural areas. There is also an urgent need for climate adaptation policies that explicitly incorporate child nutrition goals.

Future research should prioritise longitudinal designs to establish causal pathways, improve disaggregated reporting, and adopt mixed methods approaches to capture both quantitative impacts and lived experiences of affected families. These strategies will support more equitable, responsive, and data-driven interventions to safeguard child nutrition in the face of escalating climate challenges.

5. CONCLUSION

Climate-related disasters, particularly droughts and floods, have a demonstrable and consistent negative impact on child nutrition, contributing to increased risks of stunting, wasting, and underweight among children under five. These effects are most pronounced in low-income, rural communities during critical developmental periods, such as infancy and early childhood. Structural inequities in land rights, access to aid, and health services, combined with cultural feeding practices and

displacement, amplify these vulnerabilities and deepen existing disparities.

Protecting child nutrition in the face of climate change requires equity-focused and culturally sensitive strategies. This includes ensuring fair disaster relief, strengthening health and nutrition systems, supporting indigenous food practices, and embedding nutrition into climate adaptation policies. Future research should adopt intersectional approaches to capture the compounded risks minority children face, while guiding inclusive interventions that build resilience and promote nutrition equity.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AI/LLM DISCLOSURE

Grammarly was used to improve the readability of the manuscript.

FUNDING

The authors would like to thank HIVOs for funding and all the Urban Futures partners for the support and collaboration in this study.

AUTHOR CONTRIBUTIONS

NN: Conceptualisation, literature reviewing, writing first draft of manuscript

MM: Conceptualisation, editing, reviewing and supervision

PM: Conceptualisation, Methodology, reviewing and editing

NMS: Literature search, methodology, reviewing and editing

HR: Reviewing, editing, supervision and visualisation

CONSENT FOR PUBLICATION

All authors give consent to the publication of this manuscript.

REFERENCES

- Aboagye, R. G., Seidu, A. A., Ahinkorah, B. O., Cadri, A., Frimpong, J. B., Dadzie, L. K., Budu, E., Eyawo, O., & Yaya, S. (2024). Prevalence and predictors of infant and young child feeding practices in sub-Saharan Africa. *International Health*, 16(1), 68–82. <https://doi.org/10.1093/inthealth/ihad022>
- Acharya, A., & Das, A. K. (2020). District-level analysis of climate vulnerability and household nutrition status among rural communities in Odisha, India. *International Journal of Population Studies*, 6(1), 41–55. <https://doi.org/10.18063/ijps.v6i1.1069>
- Agabiirwe, C. N., Dambach, P., Methula, T. C., & Phalkey, R. K. (2022). Impact of floods on undernutrition among children under five years of age in low- and middle-income countries: a systematic review. In *Environmental Health: A Global Access Science Source* (Vol. 21, Number 1). BioMed Central Ltd. <https://doi.org/10.1186/s12940-022-00910-7>

- Ahsanuzzaman, & Islam, M. Q. (2020). Children's vulnerability to natural disasters: Evidence from natural experiments in Bangladesh. *World Development Perspectives*, 19. <https://doi.org/10.1016/j.wdp.2020.100228>
- Akyıldız, C., Şipar, V., Yavuz, M.A., Gur, K. (2025). The Effect of the 2023 Turkey-Syria Earthquakes on the Sixth-Month Breastfeeding Rate of Infants: A Single-Centre Cohort Study. *Inn J Pediatr*.35(1): e150787. <https://doi.org/10.5812/ijp-150787>
- Akinola, R., Pereira, L. M., Mabhaudhi, T., de Bruin, F. M., & Rusch, L. (2020). A review of indigenous food crops in Africa and the implications for more sustainable and healthy food systems. In *Sustainability* (Switzerland) (Vol. 12, Number 8). MDPI. <https://doi.org/10.3390/SU12083493>
- Amzat, J., Aminu, K., Matankari, B., Ismail, A., Almu, B., & Kanmodi, K. K. (2024). Sociocultural context of exclusive breastfeeding in Africa: A narrative review. In *Health Science Reports* (Vol. 7, Number 5). John Wiley and Sons Inc. <https://doi.org/10.1002/hsr.2.2115>
- Asokan, S. M., Kweyu, R. M., Kalibbala, M. M., & Obando, J. A. (2025). Prolonged drought and governance challenges in Turkana County, Kenya – Access to water and livelihood changes. *Environmental Development*, 55. <https://doi.org/10.1016/j.envdev.2025.101193>
- Bayih, M. T., Belayneh, M., & Mekonen, W. (2024). Infant and young child feeding practice among mothers-child pair in irrigated and non-irrigated areas of Dangila district, Northwest Ethiopia, 2020: a community based comparative cross-sectional study. *BMC Pediatrics*, 24(1). <https://doi.org/10.1186/s12887-024-04721-2>
- Belesova, K., Gasparini, A., Sié, A., Sauerborn, R., & Wilkinson, P. (2017). Household cereal crop harvest and children's nutritional status in rural Burkina Faso. *Environmental Health: A Global Access Science Source*, 16(1). <https://doi.org/10.1186/s12940-017-0258-9>
- Bethel, J. W., Burke, S. C., & Britt, A. F. (2013). Disparity in disaster preparedness between racial/ethnic groups. *Disaster Health*, 1(2), 110–116. <https://doi.org/10.4161/dish.27085>
- Chongwo, E. J., Aoko, B., Kaniyala, M., Esala, M., Magoma, P., Njoroge, E., Nyamanya, S., Marangu, J., Khamis, A., Ng'asike, J., Huizink, A. C., & Abubakar, A. (2025). Intersection between individual, household, environmental and system level factors in defining risk and resilience for children in Kenya's ASAL: A qualitative study. *PLoS ONE*, 20(1). <https://doi.org/10.1371/journal.pone.0316679>
- Clark, E. C., Cranston, E., Polin, T., Ndumbe-Eyoh, S., MacDonald, D., Betker, C., & Dobbins, M. (2022). Structural interventions that affect racial inequities and their impact on population health outcomes: a systematic review. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-022-14603-w>
- Climate change and food security: risks and responses. (n.d.).
- Cooper, M. W., Brown, M. E., Hochrainer-Stigler, S., Pflug, G., McCallum, I., Fritz, S., Silva, J., & Zvoleff, A. (2019). Mapping the effects of drought on child stunting. *Proceedings of the National Academy of Sciences of the United States of America*, 116(35), 17219–17224. <https://doi.org/10.1073/pnas.1905228116>
- Delbiso, T. D., Altare, C., Rodriguez-Llanes, J. M., Doocy, S., & Guha-Sapir, D. (2017). Drought and child mortality: A meta-analysis of small-scale surveys from Ethiopia. *Scientific Reports*, 7(1). <https://doi.org/10.1038/s41598-017-02271-5>

- Dolui, M., & Sarkar, S. (2024). Decomposing social groups differential in stunting among children under five in India using nationally representative sample data. *Scientific Reports*, 14(1). <https://doi.org/10.1038/s41598-024-78796-3>
- Draper, P., & Mbirimi, I. (2010). *Climate Change & Trade: The Challenges for Southern Africa*. Fanele. <https://books.google.co.ug/books?id=j9TTzm9NDPgC>
- Ebi, K. L., Vanos, J., Baldwin, J. W., Bell, J. E., Hondula, D. M., Errett, N. A., Hayes, K., Reid, C. E., Saha, S., Spector, J., & Berry, P. (2020). Extreme Weather and Climate Change: Population Health and Health System Implications. In *Annual Review of Public Health* (Vol. 42, pp. 293–315). Annual Reviews Inc. <https://doi.org/10.1146/annurev-publhealth-012420-105026>
- Epstein, A., Torres, J. M., Glymour, M. M., López-Carr, D., & Weiser, S. D. (2019). Do Deviations From Historical Precipitation Trends Influence Child Nutrition? An Analysis From Uganda. *American Journal of Epidemiology*, 188(11), 1953–1960. <https://doi.org/10.1093/aje/kwz179>
- Fallah Ghanbari, M. R., Jahangiri, K., Safari, M., Ghomian, Z., & Nekooie, M. A. (2025). Experts' Views on Factors Influencing Resource Allocation for Infectious Disease Emergencies Based on Humanitarian Principles: A Qualitative Study. *AJPM Focus*, 4(1). <https://doi.org/10.1016/j.focus.2024.100286>
- Food and Agriculture Organization of the United Nations (2015). Climate Change and Food security:risks and responses. SBN 978-92-5-108998-9. Available at: www.fao.org/publications
- Gaire, S., Delbiso, T. D., Pandey, S., & Guha-Sapir, D. (2016). Impact of disasters on child stunting in Nepal. *Risk Management and Healthcare Policy*, 9, 113–127. <https://doi.org/10.2147/RMHP.S101124>
- Gooding, C., Musa, S., Lavin, T., Sibeko, L., Ndikom, C. M., Iwuagwu, S., Ani-Amponsah, M., Maduforo, A. N., & Salami, B. (2024). Nutritional Challenges among African Refugee and Internally Displaced Children: A Comprehensive Scoping Review. In *Children* (Vol. 11, Number 3). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/children11030318>
- Hamed, S., Bradby, H., Ahlberg, B. M., & Thapar-Björkert, S. (2022). Racism in healthcare: a scoping review. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-022-13122-y>
- Hazzard, V. M., Kunin-Batson, A. S., Trofholz, A. C., Noser, A. E., De Brito, J. N., Pitera, R. T., & Berge, J. M. (2024). Food assistance use barriers, facilitators, and recommendations: Insights from a qualitative study of racially and ethnically diverse parents. *Journal of Nutritional Science*, 13. <https://doi.org/10.1017/jns.2024.75>
- Karst, I. G., Mank, I., Traoré, I., Sorgho, R., Stückemann, K. J., Simboro, S., Sié, A., Franke, J., & Sauerborn, R. (2020). Estimating yields of household fields in rural subsistence farming systems to study food security in Burkina Faso. *Remote Sensing*, 12(11). <https://doi.org/10.3390/rs12111717>
- Kyozuka, H., Yasuda, S., Kawamura, M., Nomura, Y., Fujimori, K., Goto, A., Yasumura, S., & Abe, M. (2016). Impact of the Great East Japan Earthquake on feeding methods and newborn growth at 1 month postpartum: results from the Fukushima Health Management Survey. *Radiation and Environmental Biophysics*, 55(2), 139–146. <https://doi.org/10.1007/s00411-016-0636-7>
- Lazzaroni, S., & Wagner, N. (2016). Misfortunes never come singly: Structural change, multiple shocks and child malnutrition in rural Senegal. *Economics and Human Biology*, 23, 246–262. <https://doi.org/10.1016/j.ehb.2016.10.006>
- Lieber, M., Chin-Hong, P., Kelly, K., Dandu, M., & Weiser, S. D. (2022). A systematic review and meta-analysis assessing the impact of droughts, flooding, and climate variability on malnutrition. In *Global Public Health* (Vol. 17, Number 1, pp. 68–82). Routledge. <https://doi.org/10.1080/17441692.2020.1860247>
- Mahapatra, B., Walia, M., Rao, C. A. R., Raju, B. M. K., & Saggurti, N. (2021). Vulnerability of agriculture to climate change increases the risk of child malnutrition: Evidence from a large-scale observational study in India. *PLoS ONE*, 16(6 June). <https://doi.org/10.1371/journal.pone.0253637>
- Masipa, T. S., & Masipa, T. (2017). Jambá-Journal of Disaster Risk Studies Affiliation. <https://doi.org/10.4102/jamba>
- Matiri, E., Ramirez, L., Elmi, A., Gaithuma, J., Kavithe, R., Waweru, M., Kahiga, M., & Kavle, J. A. (2025). Tailoring Trials of Improved Practices (TIPs) to Improve Child Feeding and Use of Indigenous Preserved Foods in Drought-Affected Kenya: Considerations for Climate Shocks. *Maternal and Child Nutrition*. <https://doi.org/10.1111/mcn.70018>
- Mekonen, E. G., Zegeye, A. F., & Workneh, B. S. (2024). Complementary feeding practices and associated factors among mothers of children aged 6 to 23 months in Sub-saharan African countries: a multilevel analysis of the recent demographic and health survey. *BMC Public Health*, 24(1). <https://doi.org/10.1186/s12889-023-17629-w>
- Mohamed Shaffril, H. A., Abu Samah, A., Samsuddin, S. F., Ahmad, N., Tangang, F., Ahmad Sidique, S. F., Abdul Rahman, H., Burhan, N. A. S., Arif Shah, J., & Amiera Khalid, N. (2024). Diversification of agriculture practices as a response to climate change impacts among farmers in low-income countries: A systematic literature review. In *Climate Services* (Vol. 35). Elsevier B.V. <https://doi.org/10.1016/j.cliser.2024.100508>
- Naaz, A., & Muneshwar, K. N. (2023). How Maternal Nutritional and Mental Health Affects Child Health During Pregnancy: A Narrative Review. *Cureus*. <https://doi.org/10.7759/cureus.48763>
- Ndlovu, N., & Chungag, B. N. (2024). Impact of heat stress on cardiovascular health outcomes of older adults: A mini review. In *Aging and Health Research* (Vol. 4, Number 2). Elsevier B.V. <https://doi.org/10.1016/j.ahr.2024.100189>
- Nguyen, P. H., Saha, K. K., Ali, D., Menon, P., Manohar, S., Mai, L. T., Rawat, R., & Ruel, M. T. (2014). Maternal mental health is associated with child undernutrition and illness in Bangladesh, Vietnam and Ethiopia. *Public Health Nutrition*, 17(6), 1318–1327. <https://doi.org/10.1017/S1368980013001043>
- Olarewaju, O. O., Fawole, O. A., Baiyegunhi, L. J. S., & Mabhaudhi, T. (2025). Integrating Sustainable Agricultural Practices to Enhance Climate Resilience and Food Security in Sub-Saharan Africa: A Multidisciplinary Perspective. In *Sustainability (Switzerland)* (Vol. 17, Number 14). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/su17146259>
- Pandey, S., Rahut, D. B., & Araki, T. (2024). Ethnicity/caste and child anthropometric outcomes in India using the National Family Health Survey 2015–16 and 2019–21. *PLoS*

- ONE, 19(12 December).
<https://doi.org/10.1371/journal.pone.0311092>
- Pizzorni, M., Innocenti, A., & Tollin, N. (2024). Droughts and floods in a changing climate and implications for multi-hazard urban planning: A review. In *City and Environment Interactions* (Vol. 24). Elsevier B.V. <https://doi.org/10.1016/j.cacint.2024.100169>
- Rahman, M., Sarkar, P., Islam, M. J., Adam, I. F., Duc, N. H. C., & Al-Sobaihi, S. (2024). Factors mediating the association between recurring floods and child chronic undernutrition in northern Bangladesh. *Nutrition*, 119. <https://doi.org/10.1016/j.nut.2023.112300>
- Ramulondi, M., de Wet, H., & Ntuli, N. R. (2021). Traditional food taboos and practices during pregnancy, postpartum recovery, and infant care of Zulu women in northern KwaZulu-Natal. *Journal of Ethnobiology and Ethnomedicine*, 17(1). <https://doi.org/10.1186/s13002-021-00451-2>
- Randell, H., Gray, C., & Shayo, E. H. (2022). Climatic conditions and household food security: Evidence from Tanzania. *Food Policy*, 112. <https://doi.org/10.1016/j.foodpol.2022.102362>
- Rizwan, W., Sadiq, M., Bukhari, M. H., & Tasneem, M. (2024). Impact of Flood on Breastfeeding Practices at Flood Relief Camps of Pakistan. *Pakistan Journal of Medical Sciences*, 40(8), 1724–1728. <https://doi.org/10.12669/pjms.40.8.8488>
- Sithole, Z., Nyadzayo, T., Kanyowa, T., Mathieu, J., Kambarami, T., Nemaramba, M., Machaka, R., Bekele, H., Njovo, H., & Gasasira, A. (2021). Enhancing capacity of zimbabwe's health system to respond to climate change induced drought: A rapid nutritional assessment. *Pan African Medical Journal*, 40. <https://doi.org/10.11604/pamj.2021.40.113.30545>
- Tidiane Ndour, C., Diop, W., & Asongu, S. (2024). The effect of natural disasters on food security in Sub-Saharan Africa. *Social Responsibility Journal*. <https://doi.org/10.1108/SRJ-05-2024-0354>
- Trummer, U., Ali, T., Mosca, D., Mukuruva, B., Mwenyango, H., & Novak-Zezula, S. (2023). Climate change aggravating migration and health issues in the African context: The views and direct experiences of a community of interest in the field. *Journal of Migration and Health*, 7. <https://doi.org/10.1016/j.jmh.2023.100151>
- ul Haq, I., Mehmood, Z., Ahmed, B., Shah, J., Begum, N., Nawsherwan, Hajira, B., Xu, J., & Wang, S. (2024). Determinants of Diarrhea Among Children Aged 1 to 6 Years in Flood-Affected Areas of Pakistan: A Cross-Sectional Study. *American Journal of Tropical Medicine and Hygiene*, 110(2), 323–330. <https://doi.org/10.4269/ajtmh.23-0611>