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VIEWPOINT

Sub-Saharan Africa is experiencing a food-related health risk problem in informal food environments: An urgent need for science and policy actions

Richard A. Nyiawung [a] *
University of Waterloo

Joachim D. Matondo [b] and
Anastazia N. Bikuba [c]
Sokoine University of Agriculture

Victoria Ndinelago Erasmus [d]
International University of Management

Evodius W. Rutta [e]
MAVUNOLAB-The Postharvest Innovation Centre

Rosemary Tegekanya [f]
Sokoine University of Agriculture

Shirley Kansabe [g]
Kyambogo University, and Makerere University School of Public Health

Gery Wamba [h]
Ministry of Livestock, Fisheries and Animal Industries, Cameroon

Neville N. Suh [i]
Africa Rice Center (AfricaRice)

Norbert N. Ngwang [j]
Alliance for Sustainable Development (ASDEV)

Samuel Abalansa [k] and Md. Ruyel Maih [l]
University of Waterloo

Abdul-Rahim Abdulai [m]
University of Alberta

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Introduction

Sub-Saharan Africa's (SSA) food systems have been transformed by science-driven gains in productivity and market access, yet a health crisis is intensifying within its vast informal food environments. Agricultural research and technology investments have strengthened smallholder systems (Shilomboleni & De Plaen, 2019) and expanded food availability (Clark & Hobbs, 2023), while rising socioeconomic conditions escalate nutritional demands (Blekking et al., 2022; Djurfeldt, 2015) and propel calls for dietary diversity (Paulo et al., 2024; Usman & Haile, 2022). However, these advances are harshly undermined by the burden of foodborne diseases. An

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estimated 91 million people in Africa fall ill annually from food-related illnesses, generating over US$15 billion in medical costs and 137,000 deaths (Nigussie et al., 2025; World Health Organization [WHO] Africa, 2019), with downstream economic losses in tourism (Chen et al., 2021). Agrochemical residues, poor hygiene, and weak legislative enforcement in Africa's largely informal food sectors drive this burden.

Here, we synthesize health threats in informal food environments and call for an urgent agenda to protect public health across SSA. This viewpoint provides a snapshot of health-risk exposures across the three dominant value chains: fruits and vegetables, livestock, and aquatic foods. It emphasizes that while food availability, affordability and accessibility reduce food insecurity, they mask uncontrolled hazards. Addressing this demands research to characterize risks, quantify health and economic burdens, and develop context-specific interventions. Integrated science-policy action must follow to safeguard populations relying on these environments.

Keywords
health risk, food safety, policy, informal food environment, sub-Saharan Africa

Food Chain Hazard Profile in SSA

Informal food chains in SSA supply most urban households, but the associated production and vending practices introduce biological and chemical

[a] * *Corresponding author:* Richard A. Nyiawung, School of Environment, Enterprise and Development (SEED), University of Waterloo, Waterloo, Ontario, Canada; rnyiawun@uwaterloo.ca; https://orcid.org/0000-0003-3232-2154

[b] Joachim D. Matondo, Department of Food Science and Agro-processing, Sokoine University of Agriculture, Morogoro, Tanzania; joachim.matondo@sua.ac.tz; https://orcid.org/0000-0002-3982-4600

[c] Anastazia N. Bikuba, Department of Food Science and Agro-processing, Sokoine University of Agriculture, Morogoro, Tanzania; anastazia.bikuba@sua.ac.tz; https://orcid.org/0000-0001-6332-0712

[d] Victoria Ndinelago Erasmus, Swakopmund Research, Conference and Training Centre, the International University of Management, Namibia; erasmus.victoria@yahoo.com; https://orcid.org/0000-0001-9330-7922

[e] Evodius W. Rutta, MAVUNOLAB–The Postharvest Innovation Centre, Morogoro, Tanzania; erutta@mavunolab.org; https://orcid.org/0009-0001-4188-9753

[f] Rosemary Tegekanya, Department of Food Science and Agro-processing, Sokoine University of Agriculture, Morogoro, Tanzania; tegekanyarosemary@gmail.com; https://orcid.org/0009-0002-8328-4207

[g] Shirley Kansabe, Department of Nutritional Science and Dietetics, Kyambogo University, Kampala, Uganda; and Department of Health Policy, Planning and Management, Makerere University School of Public Health, Kampala, Uganda; kansabe.shirley@gmail.com; https://orcid.org/0000-0002-4354-5495

[h] Gery Wamba, Directorate of Veterinary Services, Ministry of Livestock, Fisheries and Animal Industries, Yaounde, Cameroon; gerywamba@gmail.com

[i] Neville N. Suh, Africa Rice Center (AfricaRice), Bouaké, Côte d'Ivoire; suhneville@gmail.com; https://orcid.org/0000-0003-3466-6815

[j] Norbert N. Ngwang, Alliance for Sustainable Development (ASDEV), Cameroon; ngwangnorbert@gmail.com

[k] Samuel Abalansa, School of Environment, Resources and Sustainability (SERS), University of Waterloo, Canada; aabalansa@uwaterloo.ca; https://orcid.org/0000-0003-0715-9164

[l] Md. Ruyel Maih, School of Environment, Enterprise and Development (SEED), University of Waterloo, Canada; mdruyel.miah@uwaterloo.ca

[m] Abdul-Rahim Abdulai, School of Urban and Regional Planning, University of Alberta, Edmonton, Canada; abdulai1@ualberta.ca; https://orcid.org/0000-0003-4699-2407

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Author Note Rosemary Tegekanya, Department of Food Science and Agro-processing, Sokoine University of Agriculture, Morogoro, Tanzania; tegekanyarosemary@gmail.com
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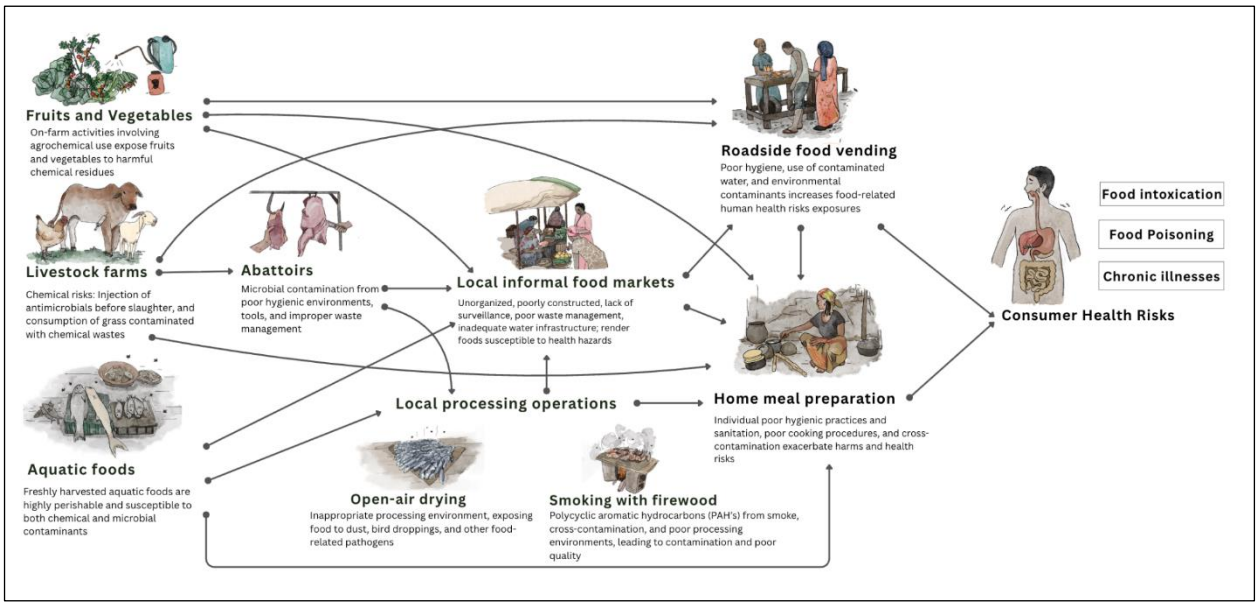
Figure 1. Graphical Representation of the Health-Risk Exposures across Three Key Food System in Informal Food Environments



hazards, undermining nutrition, causing preventable illness, and exposing structural failures that require integrated policy action (see Figure 1).

Specifically, in fruits and vegetables, pesticide overuse leaves residues. In Uganda, 95.6% of samples contained organophosphates and carbamates (Ssemugabo et al., 2022); in central Ethiopia, 45–60% exceeded EU limits (Dinede et al., 2023). In the post-harvest stage, roadside display on bare ground and juice processing in unsanitary environments (where 82.4% of Ethiopian vendors lacked gloves and 58.8% of sites were unsanitary), fecal pathogens such as *Salmonella*, *Staphylococcus aureus*, and *E. coli* were introduced (Ebrahim & Wondimagegn, 2025). Parasites like *Giardia lamblia* contaminate 33.3% of market vegetables. Consequently, these hazards suppress the average consumption of fresh vegetables to 284 grams/day/person, well below the WHO 400 g target, underlining the failure of regulatory oversight (Okekunle et al., 2024).

Similarly, livestock value chains harbor zoonotic threats: gastrointestinal nematodes infect 92.9% of Ethiopian animals (Kimeli et al., 2025), and anthrax and Q fever attack rates of 54.4 per 1,000 and 345.4 per 1,000, with a 345.4 per 1,000 fatality rate, signal acute spillover (Ateudjieu et al., 2023). Over 70% of medically important antimicrobials used in husbandry drives up to 62.7% resistance of *E. coli* in Ugandan poultry (Elbehiry & Marzouk, 2025). Moreover, informal slaughter amplifies contamination: only 3 of 36 Nigerian states have standard abattoirs; handlers work without training or protective equipment; and unsanitary surfaces elevate *Salmonella* and *E. coli* (Christiana Cudjoe et al., 2022; Ovuru et al., 2024). Additionally, raw milk consumption by 34.46% of Rwandan farmers directly transmits Brucella, while undercooked meat transmits *Taenia solium*, perpetuating disease cycles amid weak enforcement (Christiana Cudjoe et al., 2022; Munyaneza et al., 2025).

Furthermore, aquatic foods are prone to spoilage, adulteration, and chemical contamination. Formalin was detected in all Ghanaian fish species sampled, ranging from 0.174 to 3.710 microgram (μg)/g (Asare-Donkor et al., 2018). Traditional smoking generates carcinogenic PAHs; Senegalese samples reach benzo(a)pyrene 33 μg/kg and total PAHs 1082.3 μg/kg (while the EU limits are 2 and 12 μg/kg) (Diop et al., 2023). Lake Victoria sardines have median cadmium levels of 0.081 mg/kg and lead levels of 0.012 mg/kg, yet 96% of Tanzanians remain unaware of contamination (Venant et al., 2025). Organochlorine metabolites account for

55–60% of pesticide loads in Ghana, elevating cancer risk (Adokiya et al., 2025). Consequently, the absence of cold chains, open-air drying, and weak regulations expose fish products to dust, droppings, and mold, while chemical additives compound the threat.

Factors Associated with Health Risk Exposures in SSA

Informal food environments in SSA supply most of people's daily sustenance, yet these environments operate with regulatory neglect, infrastructural collapse, and socioeconomic entrapment that systematically generate health risks. This section dissects these interconnected drivers, revealing an imperative for integrated, evidence-based policy intervention.

Poor Food Safety Procedures, Regulations, and Enforcement

Regulatory frameworks remain profoundly fragmented. For example, Namibia enforces Hazard Analysis and Critical Control Points (HACCP) systems exclusively in formal fish processing, leaving compliance in informal operations to vendor discretion (Haimbala, 2021). Heavy-metal testing covers commercial seafood but bypasses small-scale and informal harvests, despite documented contamination risks (Erasmus et al., 2018). In other contexts, weak agrochemical oversight introduces chemical residues directly into food chains, precipitating health crises across the region (Malhat et al., 2025). Critically, inspection regimes across the region target export and import commodities while neglecting the domestic informal markets that feed the vast majority of the population. This regulatory asymmetry creates a de facto dual system in which local consumers bear disproportionate exposure to unmonitored hazards.

Inadequate Infrastructure for the Local Food Environment

Infrastructure gaps magnify these vulnerabilities. For example, perishable fruit and vegetable value chains lose up to 72% of tomato harvests due to the absence of cold storage, a spoilage rate that simultaneously destroys nutrition and fosters mycotoxin-producing fungi (*Aspergillus*, *Penicillium*, and *Fusarium*) in the retained fraction (Christiana Cudjoe et al., 2022; Nigussie et al., 2025; Owino et al., 2025;). Aquatic foods suffer parallel post-harvest decay and become vectors for *Vibrio cholerae* and heavy metals when processed with contaminated water or ice. The livestock sector, which channels an estimated 70–80% of meat through informal markets, epitomizes systemic failure: unregulated slaughtering occurs without reliable veterinary inspection, water, or waste disposal, often under trees or in dilapidated structures where floors go uncleaned due to water scarcity (Abdullahi et al., 2025; Hannah et al., 2025; Hossain et al., 2025). These commodity-specific risks converge in marketplaces that uniformly lack potable water, sanitation, and waste management. This foundational deficit, affecting over 80% of the population, transforms waterborne pathogens into foodborne threats and drains an estimated 5% of regional GDP annually (Chirwa & Nyong, 2025; Dos Santos et al., 2017; Sheehama & Singh, 2025).

Socioeconomic Constraints on Food Safety

Socioeconomic realities lock these hazards in place. In particular, most informal food actors have limited formal education and minimal access to food safety training, thereby entrenching inherited handling practices that are often harmful (Adhikari & Struwig, 2024; Salamandane et al., 2023; Wallace et al., 2022;). Consumer preference for informal markets, driven by accessibility, affordability, and cultural familiarity, sustains the demand (Kakaza & Naude, 2025; Kuboka et al., 2024). Yet vendors' marginal incomes preclude their investment in cold storage, potable water, or hygienic stalls. Formal market entry—carrying registration fees, taxes, and the spectre of punitive inspections—is perceived as a threat to fragile livelihoods, pushing actors deeper into unregulated spaces. Consequently, a vicious cycle that crystallizes infrastructure scarcity forces reliance on unsafe water and ambient storage, fueling spoilage and pathogen proliferation, and the resulting health and economic losses further impoverish vendors. The impoverishment locks them out of the investments needed for safety, with enforcement approaches that penalize rather than support cement informality.

Setting the Agenda for Food Safety Priorities in SSA

Addressing this challenge of foodborne diseases demands evidence-based interventions tailored to the realities of these complex food environments. To this end, we identify four urgent and interconnected research priorities.

First, researchers must characterize the distinct health risks embedded in diverse informal settings by shifting from top-down assessments to participatory methods, such as participatory action research, storytelling, and participatory GIS mapping, that position informal actors as co-producers of knowledge and capture contextual nuances (Barker et al., 2010). Second, a systems lens is essential for moving beyond siloed, vendor-focused studies. Whole-chain approaches, including farm-to-fork and One Health frameworks, can reveal how practices from producers to consumers interact, equipping policymakers with holistic insights to design adaptable, impactful regulations (Brouwer et al., 2020; Rodríguez-Melcón et al., 2024).

Third, context-specific investigations on governance must dissect the incentives and institutional failures that undermine enforcement and compliance. Tracing outbreaks and upholding standards remain exceedingly difficult, and draconian enforcement often backfires. Place-based research should uncover how to foster environments that encourage systemwide ownership of safety regulations, thereby guiding officials toward interventions with genuine stakeholder buy-in. Finally, research must drive the co-design and adoption of appropriate infrastructure. Deploying contextually relevant solar-powered cold storage, dryers, and preservation facilities in off-grid communities, where most aquatic foods, fruits, and vegetables originate, can radically reduce post-harvest losses and safeguard public health. Collectively, these integrated efforts will empower decision-makers to transform food safety in Africa's informal markets.

Conclusion

Overall, the health risks to consumers and food system actors remain an understudied issue in SSA. We posit the need for investments and support for research programs that extend the existing knowledge base and produce policy-relevant insights on the different forms of risk in the local food environment in SSA. Such research frontiers support effective policymaking that responds to the unique needs of actors in informal food environments and will help trace outbreaks and minimize food-related illnesses and vulnerabilities in SSA.

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