

Perspective: Food Environment Research Priorities for Africa—Lessons from the Africa Food Environment Research Network

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ABSTRACT

Over the last 2 decades, many African countries have undergone dietary and nutrition transitions fueled by globalization, rapid urbanization, and development. These changes have altered African food environments and, subsequently, dietary behaviors, including food acquisition and consumption. Dietary patterns associated with the nutrition transition have contributed to Africa's complex burden of malnutrition—obesity and other diet-related noncommunicable diseases (DR-NCDs)—along with persistent food insecurity and undernutrition. Available evidence links unhealthy or obesogenic food environments (including those that market and offer energy-dense, nutrient-poor foods and beverages) with suboptimal diets and associated adverse health outcomes. Elsewhere, governments have responded with policies to improve food environments. However, in Africa, the necessary research and policy action have received insufficient attention. Contextual evidence to motivate, enable, and create supportive food environments in Africa for better population health is urgently needed. In November 2020, the Measurement, Evaluation, Accountability, and Leadership Support for Noncommunicable Diseases Prevention Project (MEALS4NCDs) convened the first Africa Food Environment Research Network Meeting (FERN2020). This 3-d virtual meeting brought researchers from around the world to deliberate on future directions and research priorities related to improving food environments and nutrition across the African continent. The stakeholders shared experiences, best practices, challenges, and opportunities for improving the healthfulness of food environments and related policies in low- and middle-income countries. In this article, we summarize the proceedings and research priorities identified in the meeting to advance the food

Statement of Significance: In Africa, research and policy action to improve food environments, to reduce intake of suboptimal diets, and associated adverse health outcomes have received insufficient attention. This paper articulates previously unpublished priorities to advance the food environment research agenda, and to generate contextually relevant, fit-for-local purpose evidence to confront unhealthy food environments in Africa.

Keywords: Africa, food environments, food systems, obesity, noncommunicable diseases, malnutrition, research priorities, nutrition transition

Introduction

There is a growing recognition that urgent measures are needed in Africa to improve food environments and food systems to address the multiple burdens of malnutrition—the coexistence of undernutrition (including micronutrient deficiencies) along with overweight/obesity, diet-related noncommunicable diseases (DR-NCDs), and food insecurity (1). According to the United Nations High Level Panel of Experts (HLPE) Report on Food Systems and Nutrition, food systems “consist of all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outcomes of these activities” (1, 2). The food environment, a component of the food systems, has been defined in various ways. Swinburn et al. (3) in 2013 characterized it as the collective physical, economic, policy, and sociocultural surroundings and opportunities/conditions that influence people’s food and beverage choices, consumption patterns, and nutritional health. Other conceptual perspectives divide food environments into personal environments (including food accessibility, food affordability, convenience, and desirability) and external environments (encompassing food availability, prices, vendor, and product properties and marketing and regulation) (4). The food environment concept can also be understood as the physical, economic, political, and sociocultural context in which consumers engage with the food system to acquire, prepare, and consume food (2).

In recent decades, there have been significant changes in Africa’s food systems and food environments, leading to dietary and nutrition transitions, fueled by rapid urbanization and industrialization (5–8). Popkin and colleagues (9) define nutrition transition as shifts in diets at the population level coinciding with globalization and changes in a country’s overall development, food environments, and food systems. Presently, nutrition transition is of global concern. Many African countries are experiencing dietary shifts from traditional foods with minimal processing towards diets incorporating highly processed foods that often contain large levels of food additives, refined carbohydrates, sodium, saturated or *trans* fats, and added sugars. These diets are accompanied by a significant reduction in consumption of fruits, vegetables, and other nutrient-rich foods that are associated with maintaining health and preventing disease (6, 10). Closely linked to the urbanization of the African continent is the widespread proliferation of supermarkets, convenience stores, and fast-food restaurants and an increased preference to consume meals outside the home (6, 9, 11). These newer food outlets foster easier access to discretionary energy-dense, nutrient-poor foods, including fast foods and ultra-processed foods, particularly sugar-sweetened beverages (SSBs) and packaged snacks (6, 8, 12). Used here, and throughout the manuscript, the level of food processing—unprocessed or minimally processed, processed, and ultra-processed food—derives from the Nova Food Classification System (12). These changes have influenced food choices and consumption patterns of African populations, alongside decreased physical activity in urban areas—contributing significantly to the rising rates of overweight/obesity and associated DR-NCDs (5, 6). Urgent measures are needed in Africa to improve food environments and to address multiple burdens of malnutrition. In this regard, identified components of the food environment where these measures can be applied include food entry points (the built environment that allows consumers to access these spaces), personal determinants of food choices (e.g., income, education, values, skills), and the political, social, and cultural norms that underlie these interactions (2). According to Downs et al. (13), built food environments (also known as the retail food environments, or markets) include informal and formal markets. Informal market food environments are those that are often not regulated through formal governance structures and include wet markets, street vendors, kiosks, and mobile vendors.

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Abbreviations used: DR-NCD, diet-related noncommunicable disease; FERN, The Africa Food Environment Research Network; FERN2020, the First Africa Food Environment Research Network Meeting; Food-EPI, Healthy Food Environment Policy Index; HLPE, United Nations High Level Panel of Experts on Nutrition and Food Security; INFORMAS, International Network for Food and Obesity NCDs Research Monitoring and Action Support; LMIC, low- and middle-income country; MEALS4NCDs, Measurement, Evaluation, Accountability and Leadership Support for Noncommunicable Disease Prevention Project; NCD, noncommunicable disease; SSB, sugar-sweetened beverage.

Formal market environments are those that are regulated through formal governance structures where sellers can publicly advertise their locations and prices and include hypermarkets, supermarkets, and retailers as well as farmers' markets and restaurants (13). Unhealthy or obesogenic food environments provide an increased availability of energy-dense, nutrient-poor foods (e.g., refined grains, fast foods) at cheaper prices (14). Together with prices/costs of food, taste and convenience, and food safety, unhealthy food environments are linked to suboptimal dietary intake and adverse health outcomes (6, 8, 15).

The interaction of the food environment and its influence on food acquisition and consumption is not clearly elucidated in low- and middle-income countries (LMICs). Policies to create healthy food environments are recognized as critical components of efforts to prevent obesity and DR-NCDs (6, 8) as well as to decrease the prevalence of micronutrient deficiencies and other forms of malnutrition. Some examples of food environment policies include regulation of unhealthy food marketing, especially that which targets children, front-of-package nutrition labeling, and healthy food provision in public sector institutions. Other policies and interventions designed to nudge consumers toward healthier diets have also been implemented in other settings, with positive outcomes on the food environment (10, 15). Additionally, implementation of culturally appropriate health and nutrition education programs to improve nutrition literacy is important, especially when efforts to improve food environments often contend with information, misinformation, and disinformation from various sources, including social media, television (16), and the food industry (17), which impacts consumers' beliefs, perceptions, and, in turn, influences their food choices. Therefore, efforts that aim to improve food environments in Africa must include a portfolio of tailored individual and community-based interventions as well as "carrot and stick" policies. Collectively, these policies inform and empower, guide and influence, and incentivize or discourage actions of actors within the food environments. Of note, such policies or interventions, however, operate through complex, interconnected paths moderated by global, national, and local contexts (18). Their identification, promulgation, and implementation ought to be grounded in context-relevant evidence.

The identification of food environment research priorities in Africa is of vital importance to the generation of evidence to inform effective policymaking. Local evidence that can provide insights into which policies may be effective in improving the healthfulness of the food environment to mitigate DR-NCDs, while decreasing micronutrient and other deficiencies, remains modest. This is not surprising. High-level African nutrition and health policies including the 2003 Maputo Commitments (19), the 2014 Malabo Declaration (20), the Africa Region Nutrition Strategy 2015–2025 (herein referred to as Agenda 2025) (21), and Agenda 2063 (22) have focused almost exclusively on eliminating hunger and food insecurity. If malnutrition in all its forms is not effectively addressed, the visions of Agenda 2025

and Agenda 2063 (e.g., the visions of assuring a healthy Africa, and delivering on its goal for inclusive and sustainable development: an integrated, prosperous, and peaceful Africa) will remain elusive.

To this end, the Measurement, Evaluation, Accountability, and Leadership Support for Noncommunicable Diseases Prevention Project (MEALS4NCDs) (23) initiated the Africa Food Environment Research Network (FERN) to serve as a regional platform to build capacities and foster collaboration among researchers working towards developing healthier food environments in the African subregion. The initiative is led by the University of Ghana, in collaboration with several local, regional, and international partners (as detailed here: <https://www.meals4ncds.org/en/fern2021/>) (13).

The first FERN Meeting ("FERN2020") was held in November 2020. The participation of scientists from across Africa and other continents of the world was significant. In line with the goals of FERN, the FERN2020 aimed to do the following:

- Connect researchers in the African subregion and those from the Global North (including Europe and North America) working directly or indirectly on the improvement of food environments in LMICs
- Facilitate capacity building through training on 2 approaches developed by the International Network for Food and Obesity NCDs Research Monitoring and Action Support (INFORMAS): the Healthy Food Environment Policy Index (Food-EPI) (3) and Food Prices (24) Modules; these approaches respectively facilitate benchmarking of food environment actions, and estimation of diet cost
- Provide a platform for deliberating and generating food environment research priorities for Africa

FERN is a networking and capacity-building initiative—with the prime goal of encouraging and facilitating collaborative and novel food environment research for healthier food environments in Africa. The theme of "Connecting Food Environment Researchers across Africa," the first FERN meeting (FERN2020), showcased 26 speakers from Africa, Asia, Australasia, Europe, and North America. Over 600 individuals from 56 countries registered to attend the meeting, with an average daily attendance of 160—via video-conferencing. Livestreaming of the event via social media enabled further engagements—all together reaching approximately 500 individuals.

Presenters on the first day focused on the current food environment research on diets, nutrition, and all forms of malnutrition in the African population. Presentations spanned the various methods used in food environment research in LMICs (34), the development of food environment framework and metrics such as measures of diet quality for women that are specific to Africa and LMICs (30), and experiences from the development of National Food Based Dietary Guidelines (FBDGs). On the second day, updates and lessons from regional and country-specific initiatives to improve diets to prevent undernutrition and food insecurity

were shared. These included the Ending Hunger Initiative of the African Union/FAO Regional Office for Africa, South Africa's SSB tax process (42), Morocco's voluntary salt-reduction strategy in staple foods (17), monitoring the cost of nutritious diets in Ghana, and innovations for safe and sustainable food production applied in some parts of Nigeria. On the third day, a deliberative forum was held aimed at identifying research priorities for Africa and policies to ensure healthy and sustainable food environments to address multiple forms of malnutrition.

Integrated into the meeting were 2 training sessions aimed at strengthening participants' capacity to adopt and adapt 2 of the INFORMAS protocols—from the Food-EPI (3) and Food Prices (24) modules. The Food-EPI Module focuses on measuring the extent of implementation of healthy food environment policies by governments compared with international best practices. The Food Prices Module (24) provides detailed methods on systematically collecting and analyzing information on the price of foods, meals, and affordability of diets in different countries globally. It comprises 3 complementary methods, monitoring the costs of “food,” “meals,” and “diets.”

Lessons learned from FERN2020 and opportunities for food environment research in Africa

Prioritizing food environment research.

While there have been progressive research efforts on understanding food choices and behaviors of consumers, food promotion, and provisioning, African food environments are largely not well researched compared with other components of the food system. Existing research efforts have focused on single aspects of the food environment—home, school, community, and retail settings. There is the need for a more comprehensive approach to studying the food environment and studying the connection between different food environments and in relation to the food system—for instance, establishing the relation between the retail food environment and nutrition/health outcomes, as well as linking eating behaviors with nutritional status and long-term health outcomes.

Developing and harmonizing complementary context-specific approaches to measure food environment drivers and outcomes.

Methods used to measure or assess the food environment have been limited to a selection of metrics. Some of these metrics/instruments/tools have not focused on informal vendors, even though they serve a significant proportion of the African food environment (34). For instance, issues as simple as the classification of food outlets may be a challenge in Africa due to the diverse, mostly informal outlets—traditional marketplaces, informal shops, house shops, street food vendors, mobile vendors, etc. There is a general lack of standardized metrics and methods for assessing, monitoring, and evaluating the African food environment. Instruments specific to the African settings are still under development, with

only a few validated (34). Africa's unique food environments require context-specific studies/tools for measuring food environment elements. Thus, studies to provide insights that go beyond “what” to also exploring “why.”

Adopting a multisectoral and multidisciplinary research approach.

African food environments are undergoing rapid changes as with its food systems, presenting a huge challenge to food environment research. Understanding the effects of changing food environments on different African populations, age cohorts, and in different contexts will help design strategies to improve it. The successes of nations like South Africa have largely been attributed to a multidisciplinary approach and stronger collaboration among stakeholders. Adopting multidisciplinary collaborative research involving stakeholders from the private, public, and civil society sector is necessary for building synergies to better understand and multiplex food environment challenges.

The meeting included a process for identifying and classifying research priorities to further understand the determinants of food acquisition and consumption within food environments. The aim of this article is to present and discuss the research priorities for improving food environments in Africa that were identified by the participants at the meeting. These research priorities focus on the need for new knowledge to understand the key drivers of food acquisition and consumption in food environments and to develop interventions and policies to improve food environments, so as to ensure healthy diets, promote health, and prevent disease.

Top Research Priorities for Improving Food Environments in Africa

The FERN meeting ended with a consultative session aimed at identifying research priorities to guide future research for improving food environments in Africa. The overarching question that guided the discussion was, “What are the top food environment research priorities for Africa?” First, suggestions were solicited from the 26 speakers prior to the meeting. The research priorities proposed by the speakers were shared with over 100 participants during the third day of the meeting, and subsequently augmented with additional suggestions from participants. Following a deliberative process, a collated list of 29 key research priorities were identified; 26 research priorities were retained after harmonization and removal of duplicates (Table 1). Research priorities were categorized into 2 broad themes: 1) those that further the understanding of the key determinants of food consumption/acquisition in the food environment (“drivers”) and 2) those that guide the development of interventions and policies to improve food environments (“solutions”). These priorities are not ranked. However, they have been mapped to the HLPE Food Systems Framework (2)—depicting how they can improve food environments in Africa in the wider food system (Figure 1).

TABLE 1 Research priorities for improving food environments in Africa

Research priorities
Understanding the key drivers of food consumption/acquisition in the food environment's "causes"
a. Conduct more comprehensive research on the commercial determinants of nutrition and health in Africa
b. Conduct research on the broader food environments (including understanding the informal retail sector and its role in shaping local food environments; also the physical and macro levels) and identify pathways through which factors influence food acquisition and consumption
c. Investigate methodological approaches to capture and understand lived experiences of the food environment
d. Develop, test, and validate standardized instruments and metrics to profile food environments
e. Examine associations between food environment exposure and dietary, nutrition, and health outcomes; conduct more rigorous studies to test for associations between food environment exposures (e.g., unhealthy/ultra-processed foods) and dietary, nutrition, and health outcomes
f. Improve measurement of diet quality (including the refinement and validation of associated tools), and research linking diet quality to food environments
g. Develop and validate innovative methods to capture the consumption of ultra-processed foods
h. Measure advertising and exposure to unhealthy foods to the public and in the school environment
Developing interventions and policies to improve food environments: "solutions"
Actions at individual/community level
i. Identify community priorities for their local food environments and how can public–private partnerships best serve these needs
j. Describe how communities can ensure access to safe, healthy, convenient foods and beverages and limit reliance on low-cost unhealthy processed foods, especially for families who have limited time for food preparation
k. Develop strategies to nudge consumers towards healthier diets across the range of commercial and institutional channels
l. Improve nutrition literacy to increase awareness of the importance of dietary quality and to moderate consumption of processed and ultra-processed foods
Actions at the macro level
m. Explore and evaluate existing interventions to promote healthy diets in a way that goes beyond "what works" but also identifies "for whom it works and in what context," particularly for women and adolescents
n. Map urban food environments and identify city-level priorities for sustainable public health nutrition policies
o. Address cost and affordability of healthy and sustainable diets and impact of fiscal and other policies to improve accessibility to healthy sustainable diets
p. Identify innovations that are most promising to stimulate demand for sustainable healthy diets
q. Examine commitments, performance, and corporate political activities of the food industry in Africa
r. Prioritize double-duty actions—tackling the full spectrum of nutrition challenges including undernutrition, overweight, obesity, and diet-related noncommunicable diseases
s. Conduct robust longitudinal and experimental studies at multiple scales to assess the impact of interventions on diets, nutrition status, and health outcomes
t. Research on which food systems interventions and approaches are successful in improving nutrition in low- and middle-income countries
u. Develop innovative interventions and pilot studies to evaluate the efficacy of interventions and policy to intervene in food systems
v. Innovative approaches to improve availability and affordability of healthy diets
w. Develop approaches to transform the food systems to improve productivity, availability, and affordability of nutrient-dense foods such as animal-source foods, legumes, fruits, and vegetables
x. Assess the effect of food taxes and subsidies on triple burden of malnutrition
y. Identify key integrated policy packages most conducive to improved food environments
z. Determine how to best align food environments research with policy transformation

Understanding the key drivers of food acquisition/consumption in the food environment

While the nutrition transition and other changes in the food environments have been closely linked with obesity and DR-NCDs globally, in Africa, knowledge of the extent to which these health outcomes are precipitated by the unhealthy food environment is sparse. Understanding the who, what, when, where, why, and how of food acquisition and consumption within a complex food system is paramount to the design and implementation of targeted, context-specific policies and systems capable of addressing the continent's complex and growing food environment challenges (4, 25–27). Aside from the identified research priorities, delegates of the FERN meeting disseminated insights to facilitate understanding of the key drivers of food acquisition/consumption in the food environment. Among others, participants shared research experience and evidence on understanding the linkages

between food systems, food environments, and food choice as vital components of policy development for improved and sustainable healthy diets. For example, in Ghana and South Africa, the Researching Obesogenic Food Environments Study examined the relations between local food provision with household consumption and poverty in cities in Ghana and South Africa (28). The multicountry NOURICITY Project currently underway in Ghana, South Africa, and Uganda is assessing the drivers of urban nutrition in Africa for comprehensive, effective interventions and policies (29). These efforts may serve as a salient entry point into a deeper understanding of the regional food environments and could consequently foster engagements for policy actions that match the changing food environments. Osei-Kwasi and colleagues (30) developed a culturally adapted framework to understand the drivers of current food acquisition and consumption behaviors in urban African cities by observing

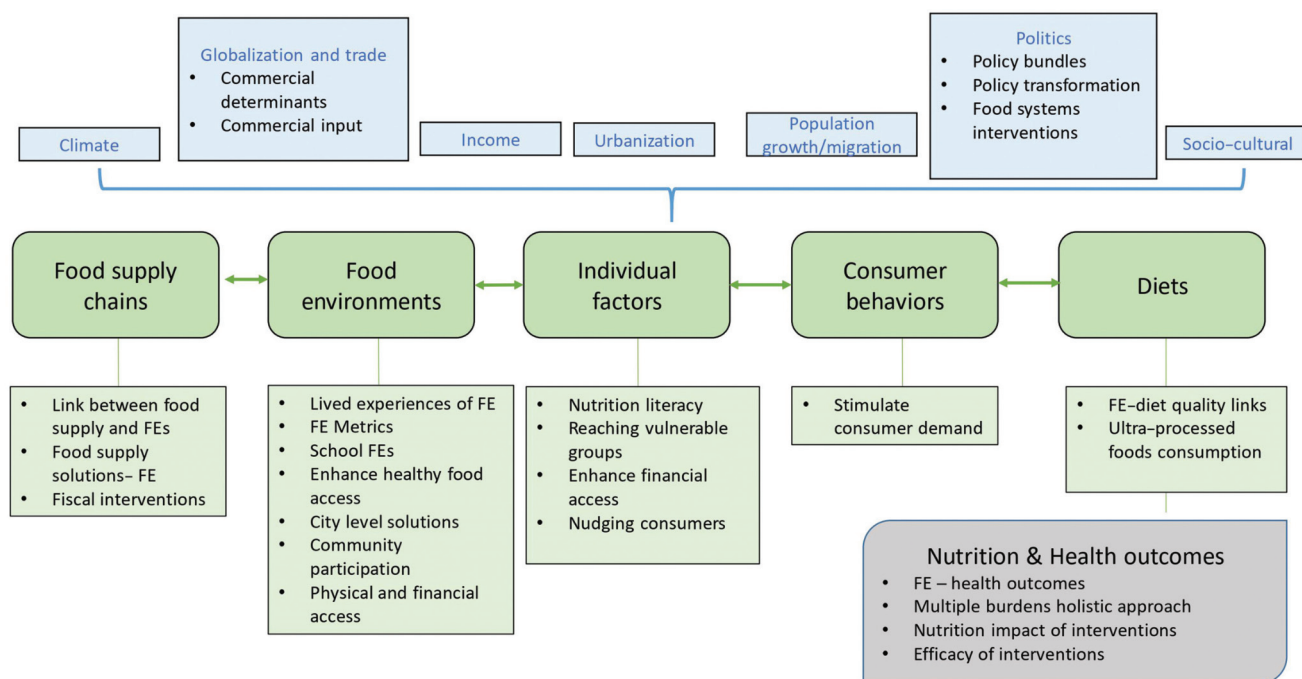


FIGURE 1 Research priorities for improving FEs in Africa in the wider food system. Adapted from HLPE Framework (2). FE, food environment.

approximately 50 additional influences on food choice in the urban African context compared with an existing framework by Story et al. (15) and findings from an earlier systematic review (31). Findings from the Drivers of Food Choice Program’s studies with rural Guinean artisanal miners and Malawian mother–child dyads have also shown that people’s food choice behaviors (e.g., acquisition, storage, preparation, distribution, and consumption) are influenced by a variety of considerations, particularly cost, taste, convenience, and health, which vary widely across settings (32, 33). Meeting delegates recognized that food choices cut across all the levels of the food systems and a good understanding of the drivers of food choices is necessary for promoting sustainable and healthy diets. They further agreed that addressing the interrelated question of what, how, and why people eat the way they do can provide useful insights on context-specific programs and policy actions that are needed at multiple levels—local, national, regional, and even global. Thus, food environment research must be holistic, taking into consideration the social, cultural, biological, economic, and environmental role that food plays in people’s lives (including when purchasing, preparing, and consuming food) (34). Existing “lived-experience” research of this nature already being conducted on the continent may set precedent for future inquiries to this end (35).

Developing interventions and policies to improve food environments

The meeting participants also shared experiences and existing efforts toward developing interventions and policies

to improve food environments in Africa. Some African governments have made limited efforts to promote healthy diets to control NCDs (6, 36). In the context of limited local contextualized evidence, existing policy actions in Africa have relied heavily on research and evidence from other contexts, typically in high-income countries (4, 5, 18). Among the key strategies that have been used to influence consumer dietary behavior, and in some cases influence a range of national food, nutrition, and health policies and programs, are national food-based dietary guidelines (37). At the time of the meeting, these guidelines were available for only 7 countries in Africa: Benin, Kenya, Namibia, Nigeria, Seychelles, Sierra Leone, and South Africa (38). Currently, some African countries (Zambia has launched its national food-based dietary guidelines), and others including Ghana, are developing their first set of food-based dietary guidelines.

Delegates shared insights and lessons from policymaking processes in Ethiopia and routine data generation relating to food commodity pricing in Ghana was shared by country representatives. Experiences from these processes indicate that more innovations are needed in governments’ response to existing dietary situations, especially on interventions that modify the price and accessibility of healthy foods. Other examples of efforts to generate local evidence to influence policies for combating unhealthy food environments in Africa included the Research on Obesity and Diabetes among African Migrants (RODAM) Study (39), the MEALS4NCDs Project (23), and the Dietary Transitions in African Cities Project (40), which have provided useful insights into the

food environment's influence on unhealthy food consumption and consequently NCDs (28, 41). In Morocco, research efforts led to reduced salt addition to staple foods (17). South Africa's SSB tax process, motivated by inclusion of taxation as a policy goal in the National Department of Health's strategic plan for NCD prevention and control, led to the introduction of the levy, which imposes high taxes on these products (42) and led to changes in beverage purchases (43). Since 2019 in Ghana, the Ministry of Food and Agriculture, Statistics, Research, and Information Directorate has been monitoring the cost of nutritious diets by collecting data on food prices on a weekly basis of agricultural commodities in 170 markets nationwide. The data have served as a critical tool to track access to nutritious food that, in turn, informs decisions on food availability and accessibility. In West and East Africa, there are ongoing efforts to generate effective context-specific evidence for intervening in and improvement of the local food environments (44, 45). Francophone West Africa's Réseau de Recherche sur les Politiques et les Systèmes Alimentaires en Afrique de l'Ouest (REPSAO), headquartered in Senegal, is leading an effort to provide a platform for various stakeholders including researchers, public policymakers and community actors in the region to develop research and action on healthy food environment policies and stimulate a regional dialogue on this issue.

Additionally, meeting delegates called for increased high-quality research using mixed methods to explore the formality and informality that characterizes Africa food environment settings to provide relevant insights to guide policy actions that are more culturally sensitive, equitable, and effective in improving population diets, nutrition, and health. Furthermore, delegates recognized that several opportunities exist to create new ideas for novel interventions and policies that prevent DR-NCDs as well as multiple burdens of malnutrition in Africa.

Key Considerations toward Implementing Identified Research Priorities

The principles deemed necessary for efficient implementation of the identified priorities, and adoption of the lessons from the region, have been discussed elsewhere (46). Briefly, these include the need to “integrate and coordinate these into other regional and international efforts; exploiting existing approaches to generating evidence; and facilitating effective transmission and translation of food environment research evidence into sustainable policy actions.” While “trade-offs,” power differentials, and political economy (all of which are pertinent challenges in food environment research, policy, and practice) were not extensively deliberated upon during the meeting, participants' references to the commercial determinants of health (defined as the conditions, actions, and omissions by corporate actors that affect health) (47) emblemize these concerns. It has long been recognized that local economies, but also the power asymmetries between “public” and “private” interests, sometimes confound

promulgation and implementation of these policies (48–50). Conversely, the development and implementation of the policies may also pose economic harm to some private sector actors (e.g., food industry actors including retailers). In this regard, Laar (48) has argued that the peculiar heterogeneity of the African food environments and their variegated political economies need to be recognized and addressed in the formulation and implementation of such policies. Given that Africa is facing a syndemic of undernutrition, the obesity epidemic, and other DR-NCDs, enforcing policies that disincentivize consumption of unhealthy/calorie-dense foods, but also those that avail healthy/nutrient-rich foods, is needed.

Conclusions

This paper articulates research priorities to advance the food environment research agenda in Africa, and thus contribute to the promotion of healthier food environments to prevent obesity and other forms of malnutrition. The paper has reiterated the need to generate policy-influencing and policy-impacting research evidence on African food environments. Both local and regional policymakers need this contextually relevant evidence to confront unhealthy food environments in Africa. Such contextually relevant evidence needs to take into account true costs and “trade-offs,” power asymmetries, and the peculiar heterogeneity of the African food environments and their variegated political economies.

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References

1. The High Level Panel of Experts on Food Security and Nutrition (HLPE). Food security and nutrition: building a global narrative towards 2030. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security (CFS). Rome (Italy): Committee on World Food Security; 2020.
2. The High Level Panel of Experts on Food Security and Nutrition (HLPE). Nutrition and Food Systems—a report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome (Italy): Food and Agriculture Organization of the United Nations, Committee on World Food Security; 2017.
3. Swinburn B, Vandevijvere S, Kraak V, Sacks G, Snowdon W, Hawkes C, Barquera S, Friel S, Kelly B, Kumanyika S, et al. Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: a proposed Government Healthy Food Environment Policy Index. *Obes Rev* 2013;14(4):24–37.
4. Turner C, Aggarwal A, Walls H, Herforth A, Drewnowski A, Coates J, Kalamatianou S, Kadiyala S. Concepts and critical perspectives for food environment research: a global framework with implications for action in low-and middle-income countries. *Glob Food Security* 2018;18:93–101.
5. Holdsworth M, Landais E, editors. Urban food environments in Africa: implications for policy and research. Proceedings of the Nutrition Society. Cambridge (UK): Cambridge University Press; 2019.
6. Reardon T, Tschirley D, Liverpool-Tasie LS, Awokuse T, Fanzo J, Minten B, Vos R, Dolislagher M, Sauer C, Dhar R, et al. The processed food revolution in African food systems and the double burden of malnutrition. *Glob Food Security* 2021;28:100466.
7. The United Nations Industrial Development Organization (UNIDO). Sustaining employment growth: the role of manufacturing and structural change. United Nations Industrial Development Organization Report. Vienna (Austria): UNIDO; 2013.
8. Steyn NP, Mchiza ZJ. Obesity and the nutrition transition in sub-Saharan Africa. *Ann NY Acad Sci* 2014;1311(1):88–101.
9. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. *Nutr Rev* 2012;70(1):3–21.
10. Popkin BM, Gordon-Larsen P. The nutrition transition: worldwide obesity dynamics and their determinants. *Int J Obes* 2004;28(S3):S2–S9.
11. Kaynak E, Kucukemiroglu O, Aksoy S. Consumer preferences for fast food outlets in a developing country. *J Euromarketing* 1996;5(4):99–113.
12. Monteiro CA, Cannon GJ. The role of the transnational ultra-processed food industry in the pandemic of obesity and its associated diseases: problems and solutions. *World Nutr* 2019;10(1):89–99.
13. Downs SM, Ahmed S, Fanzo J, Herforth A. Food environment typology: advancing an expanded definition, framework, and methodological approach for improved characterization of wild, cultivated, and built food environments toward sustainable diets. *Foods* 2020;9(4):532.
14. Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, Gortmaker SL. The global obesity pandemic: shaped by global drivers and local environments. *Lancet North Am Ed* 2011;378(9793):804–14.
15. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health* 2008;29(1):253–72.
16. Cairns G, Angus K, Hastings G. The extent, nature and effects of food promotion to children: a review of the evidence to December 2008. Geneva (Switzerland): World Health Organization; 2009.
17. Noubiap JJ. The implementation of salt reduction strategies should be sped up in Africa: a shout from Morocco. *Pan Afr Med J* 2020;37:340.
18. Booth A, Barnes A, Laar A, Akparibo R, Graham F, Bash K, Asiki G, Holdsworth M. Policy action within urban African food systems to promote healthy food consumption: a realist synthesis in Ghana and Kenya. *Int J Health Policy Manag* 2021;10:824–44.
19. African Union Commission. African Union declaration on agriculture and food security in Africa. Addis Ababa (Ethiopia): African Union Commission; 2003. Contract No.: Assembly/AU/Decl.4-11 (II).
20. African Union Commission. Malabo declaration on accelerated agricultural growth and transformation for shared prosperity and improved livelihoods. Addis Ababa (Ethiopia): African Union Commission; 2014.
21. African Union Commission. African Regional Nutrition Strategy 2015–2015. Addis Ababa (Ethiopia): African Union Commission; 2015.
22. African Union Commission. Agenda 2063: The Africa We Want. Addis Ababa (Ethiopia): African Union Commission; 2015.
23. Laar A, Kelly B, Holdsworth M, Quarpong W, Aryeetey R, Amevinya GS, Tandoh A, Agyemang C, Zotor F, Laar ME, et al. Providing measurement, evaluation, accountability, and leadership support (MEALS) for non-communicable diseases prevention in Ghana: project implementation protocol. *Front Nutr* 2021. doi: 10.3389/fnut.2021.644320.
24. Lee A, Mhurchu CN, Sacks G, Swinburn B, Snowdon W, Vandevijvere S, Hawkes C, L'Abbé M, Rayner M, Sanders D, et al. Monitoring the price and affordability of foods and diets globally. *Obes Rev* 2013;14:82–95.
25. World Health Organization. Global nutrition policy review: what does it take to scale up nutrition action? *Obes Rev* 2013;14:82–95.
26. WCRF International. NOURISHING framework policy databases. 2014. Available from [Internet]: <https://www.wcrf.org/int/policy/policy-databases/nourishing-framework>.
27. Neve K, Hawkes C, Brock J, Spires M, Isaacs A, Squires CG, Sharpe R, Bradbury D, Battersby J, Chaboud G, et al. Understanding lived experience of food environments to inform policy: an overview of research methods. London: City University of London; 2021.
28. Kroll F, Swart EC, Annan RA, Thow AM, Neves D, Apprey C, Aduku LN, Agyapong NA, Moubarac JC, Toit AD, et al. Mapping obesogenic food environments in South Africa and Ghana: correlations and contradictions. *Sustainability* 2019;11(14):3924.
29. Fongar A, Ekesa B, Dijkxhoorn Y, Linderhof V. NOURICITY—technical report on qualitative data collection [Focus Group Discussions], Kampala, Uganda; 2020. Available from: <https://cgsp.space.cgiar.org/handle/10568/110491>.
30. Osei-Kwasi HA, Laar A, Zotor F, Pradeilles R, Aryeetey R, Green M, Griffiths P, Akparibo R, Wanjohi MN, Rousham E, et al. The African urban food environment framework for creating healthy nutrition policy and interventions in urban Africa. *PLoS One* 2021;16(4):e0249621.
31. Osei-Kwasi HA, Nicolaou M, Powell K, Terragni L, Maes L, Stronks K, Lien N, Holdsworth M. Systematic mapping review of the factors influencing dietary behaviour in ethnic minority groups living in Europe: a DEDIPAC study. *PLoS One* 2016;16(4):1–7.
32. Flax VL, Thakwalakwa C, Schnefke CH, Phuka JC, Jaacks LM. Food purchasing decisions of Malawian mothers with young children in households experiencing the nutrition transition. *Int J Behav Nutr Phys Activity* 2016;13(1):104855.
33. Zhang LX, Koroma F, Fofana ML, Diallo S, Lamilé Songbono J, Stokes-Walters R, Klemm RD, Nordhagen S, Winch PJ. Food security in artisanal mining communities: An exploration of rural markets in northern Guinea. *Appetite* 2021;156(4):104855.
34. Turner C, Kalamatianou S, Drewnowski A, Kulkarni B, Kinra S, Kadiyala S. Food environment research in low-and middle-income countries: A systematic scoping review. *Foods* 2020;9(4):387–97.
35. Spires M, Delobelle P, Sanders D, Puaone T. Using photography to explore people with diabetes' perspectives on food environments in urban and rural South Africa. *Health Promot Int* 2021;36(1):120–31.
36. Rousham EK, Pradeilles R, Akparibo R, Aryeetey R, Bash K, Booth A, Muthuri SK, Osei-Kwasi H, Marr CM, Norris T, et al. Dietary behaviours in the context of nutrition transition: a systematic review and meta-analyses in two African countries. *Health Promot Int* 2021;36(1):120–31.

37. Herforth A, Arimond M, Álvarez-Sánchez C, Coates J, Christianson K, Muehlhoff E. A global review of food-based dietary guidelines. *Public Health Nutr* 2020;23(11):1948–64.
38. FAO. Food-based dietary guidelines FAO home page. 2019 [cited 2021 Mar 2021]. Available from [Internet]: <http://www.fao.org/nutrition/education/food-dietary-guidelines/regions/africa/en/>.
39. Agyemang C, Beune E, Meeks K, Addo J, Aikins AD, Bahendeka S, Danquah I, Mockenhaupt FP, Schulze MB, Klipstein-Grobusch K, et al. Innovative ways of studying the effect of migration on obesity and diabetes beyond the common designs: lessons from the RODAM study. *Ann NY Acad Sci* 2016;1391(1):54–70.
40. Holdsworth M, Pradeilles R, Tandoh A, Green M, Wanjohi M, Zotor F, Asiki G, Klomegh S, Abdul-Haq Z, Osei-Kwasi H, et al. Unhealthy eating practices of city-dwelling Africans in deprived neighbourhoods: evidence for policy action from Ghana and Kenya. *Glob Food Security* 2020;26:100452.
41. Agyemang C, Meeks K, Beune E, Owusu-Dabo E, Mockenhaupt FP, Addo J, de Graft Aikins A, Bahendeka S, Danquah I, Schulze MB, et al. Obesity and type 2 diabetes in sub-Saharan Africans—is the burden in today's Africa similar to African migrants in Europe? *Glob Food Security* 2020;26(1):1–12.
42. Stacey N, Mudara C, Ng SW, van Walbeek C, Hofman K, Edoke I. Sugar-based beverage taxes and beverage prices: evidence from South Africa's health promotion levy. *Soc Sci Med* 2019;238:112465.
43. Stacey N, Edoke I, Hofman K, Swart EC, Popkin B, Ng SW. Changes in beverage purchases following the announcement and implementation of South Africa's health promotion Levy: an observational study. *Lancet Planet Health* 2021;5(4):e200–8.
44. Asiki G, Wanjohi MN, Barnes A, Bash K, Muthuri S, Amugsi D, Doughman D, Kimani E, Vandevijvere S, Holdsworth M. Benchmarking food environment policies for the prevention of diet-related non-communicable diseases in Kenya: national expert panel's assessment and priority recommendations. *Lancet Planet Health* 2021;5(4):e200.
45. Laar A, Barnes A, Aryeetey R, Tandoh A, Bash K, Mensah K, Zotor F, Vandevijvere S, Holdsworth M. Implementation of healthy food environment policies to prevent nutrition-related non-communicable diseases in Ghana: national experts' assessment of government action. *PLoS One* 2020;15(8):e0236699.
46. Tandoh A, Aryeetey R, Agyemang C, Holdsworth M, Asiki G, Zotor F, Mensah K, Laar ME, Laryea D, Sellen D, et al. The Food Environment Research Network (FERN) in Africa—a concept paper. *Glob Health Promot* 2022 (in press).
47. West R, Marteau T. Commentary on Casswell (2013): the commercial determinants of health. *Addiction* 2013;108(4):686–7.
48. Laar A. The role of food environment policies in making unhealthy foods unattractive and healthy foods available in Africa. *EClinicalMedicine* 2021. doi: 10.1016/j.eclinm.2021.100908.
49. Thow AM, Annan R, Mensah L, Chowdhury SN. Development, implementation and outcome of standards to restrict fatty meat in the food supply and prevent NCDs: learning from an innovative trade/food policy in Ghana. *BMC Public Health* 2014;14(1):249.
50. Walls H, Nisbett N, Laar A, Drimie S, Zaidi S, Harris J. Addressing malnutrition: the importance of political economy analysis of power. *Int J Health Policy Manag* 2021;10(12):809–16.