AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

ajfand SCHOLARLY, PEER REVIEWED
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
Volume 22 No. 2 March 2022
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Afr. J. Food Agric. Nutr. Dev. 2022; 22(2): 19702-19726 https://doi.org/10.18697/ajfand.107.21830

PROCESS AND LESSONS LEARNED IN THE DEVELOPMENT OF FOOD-BASED DIETARY GUIDELINES IN GHANA

Aryeetey R[1]* and AI Ramos[2]

Richmond Aryeetey

*Corresponding author email: raryeetey@ug.edu.gh

[1]University of Ghana School of Public Health, Legon, Ghana
[2]Food and Agriculture Organization, Rome, Italy

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

ABSTRACT

Food-based dietary guidelines (FBDGs) are used, globally, as a tool for promoting awareness of healthy diets and, thereby, to improve dietary behaviour. It is also used as a policy framework for creating a health-promoting food environment. In sub-Saharan Africa, only a few countries have developed FBDGs. In 2016, Ghana commenced the process for developing a national FBDG. Four years down the line, significant progress has been achieved towards developing dietary guidelines for persons living in Ghana. The process for developing Ghana's FBDGs has, generally, follow the plan proposed by the 1998 FAO/WO consultative meeting on development of FBDGs, but with minor deviations. These deviations have been occasioned by the need to adapt the process to accommodate context-relevant circumstances relating to local capacity and financial resources constraints. The first step in developing Ghana's FBDGs was to set up a national Multisectoral Technical Task Team (MTTT) under the policy direction of the Ministry of Food and Agriculture. Thereafter, an evidence review exercise was carried out, involving systematic review of existing literature, complemented by primary data collection, all aimed at understanding the priority foods, nutrition and health issues to be addressed by recommendations in the FBDGs. The key issues identified in the evidence review were validated by the MTTT and subsequently prioritized using an online survey, as well as a prioritization workshop that convened key stakeholders in nutrition and health in Ghana. Subsequently, the priority issues served as the basis for the crafting of technical recommendations. The aim of this paper is to describe the processes, people, data, and resources that have facilitated progress towards development of Ghana's FBDGs. The challenges, and limitations of the process, as well as the solutions that have been employed to overcome them, have also been highlighted here. For the benefit of future FBDGs development in Ghana and elsewhere, the key lessons that have been learned in the development of Ghana's FBDGs have been presented, including lessons on political will, planning and time management, resources, capacity development, and multi-sectoral action.

Key words: Food-based dietary guidelines, Ghana, diet, food system, evidence review

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

BACKGROUND

The Republic of Ghana is located on the coast of West Africa and is considered a model country for several reasons[1]. With a per capita gross domestic product of about 2200 United States Dollars[2], Ghana is a stable democracy[3] and is among the best performing economies in the West Africa sub-region. Since 2010, Ghana has been classified by the World Bank as a lower middle income country (LMIC)[4]. In addition, the country has experienced sustained economic growth and reduction in income poverty[5, 6]. Indeed, Ghana was the first country in sub-Saharan Africa (SSA) to achieve the Millennium Development Goals' poverty reduction target [5, 7]. In addition, there is evidence of significant improvement in availability and access to health services, information technologies, roads, water, and other infrastructure and basic amenities[8].

However, this relatively strong economic and human development performance has not translated into robust health and wellbeing outcomes [9, 10]. Undernutrition, particularly among young children remains at unacceptably high [11, 12]. Anemia, a proxy for chronic micronutrient deficiency, remains high among vulnerable populations (women of reproductive age, and young children) [11]. In addition, there is increasing prevalence of overweight and other diet-related non-communicable diseases[11, 13, 14].

Globally, sub-optimal diets, across the entire lifecycle, constitute an important driver of malnutrition[15]. Currently, child breastfeeding and complementary feeding remain suboptimal in Ghana and does not show any signs of improving [11, 12, 16]. Although the FAO food balance sheet data demonstrate a situation of low prevalence of undernourishment (indicative of food availability)[17, 18], household food insecurity remains high with wide equity gaps among sub-population groups across the country [19, 20].

Food-based dietary guidelines (FBDGs) constitute an important evidence-informed tool and a framework for promoting consumption of healthy diets, as well as guidance for living healthier lifestyles[21, 22]. Traditionally, FBDGs have been designed in a way that enables lay populations to learn about health-promoting food groups, optimal dietary patterns, and lifestyles[21, 23]. In addition, FBDGs can also guide food-related government policies and programs. Because of the important role of FBDGs for populations, the process for design is important[22, 23]. Key aspects of the FBDGs development process, across the globe, are the need to rely on solid evidence as a basis for the guidance, that an open system of broad consultation is implemented across expert stakeholders, and the involvement of end-user groups to improve their effectiveness, ensure appropriateness, and acceptability and to engage the public. This rigorous process is intended to ensure an evaluation of the key nutrition problems, as well as review and use of the best accessible evidence on healthy diets and their relationships with human health and wellbeing.

However, there is a considerable lack of national FBDGs in the Africa sub-region[22]. Currently, the Food and Agriculture Organization's repository of FBDGs shows only

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

seven countries that have developed and published national FBDGs. Ghana has never developed national food- based dietary guidelines. In 2010, the Ministry of Health (MoH) developed a document that was titled, *Dietary and Physical activity guidelines*[24]. However, this document was not intended for use by the general public. It was designed as a technical guide for training program managers. Also in 2009**,** the Ghana Health Service (GHS), in partnership with UNICEF, developed, *Nutrition facts for Ghanaian familie*s, a document intended to provide dietary messages aimed at improving health and wellbeing of Ghanaians[25]. However, similar to the MoH document, it was not designed for the general public, but instead, for extension workers involved in nutrition communication. While these two documents are the closest to FBDGs in Ghana, at the national level, neither of them meets the key quality criteria for a truly food-based dietary guideline[22, 23]. At the subnational level, there has been an attempt to develop district-level food-based dietary guidelines as part of a dietary study of young children[26].

In addition to these documents, multiple agencies have developed initiatives and policies that include guidance on improving diets, although these are not intended to be used as dietary guidelines (see Table 1). Therefore, there still remains an unmet need for evidence-informed recommendations on diets and behaviours, and which targets the general public with the aim of promoting health and well-being. A recent stakeholder review of existing government policies in Ghana has recommended the development of FBDGs in Ghana as a high priority and a feasibly high intervention to improve population diets and health[27].

The absence of national FBDGs has created opportunity for misinformation on diets[28]. In the last few years, there has been increased access to unsubstantiated and, often, inaccurate information promoted widely through various media (radio, television, social media) to unsuspecting and uninformed lay population[29]. Further, there is absence of contextually-appropriate and nationally-mandated standards for diet therapy by trained nutrition and dietetics professionals. As a result, nutrition and dietetics professionals rely on FBDGs from other countries. However, FBDGs from other countries have not been developed using foods and diets from the Ghanaian context; thus, the foods and food groups included are often not culturally suitable to the Ghanaian consumer. This creates a challenge for dietitians when translating such FBDGs for use in Ghana.

In the Ghanaian context, FBDGs can be useful, not only as a communication tool for the public, but also as a guide for food and nutrition security program implementation across multiple government and non-government institutions. There are already existing population-based government initiatives across multiple agencies (both nutrition-sensitive and nutrition-specific) which are linked to food and diets. Some of the key food-related initiatives that can be influenced and guided by national FBDGs include the Livelihood Empowerment Against Poverty (LEAP) cash grant program[30, 31], school feeding program[32, 33], dietary aspects in basic and high school curriculum, national agriculture investment[34], food fortification[35], infant and young child feeding[36], nutrition information promotion through the health system,

CC BY NC ND

and food regulation legislation (Table 1). The lack of national FBDGs limits consistency and coherence across these programs.

This paper describes the processes employed in the development of Ghana's first, truly food-based, dietary guidelines. This paper provides a basis for understanding the opportunities that have been leveraged for the FBDGs development as well as the challenges that needed to be surmounted in order to develop the FBDGs. This paper also outlines the lessons learned in the implementation of the FBDGs in a way that can serve as guidance for other African countries which will embark on a process of developing national FBDGs.

Process for developing Ghana's Food- based dietary guidelines

The development of Ghana's FBDGs basically followed the process outlined in the FAO/WHO guidance on development of FBDGs (Figure 1)[23, 37]. However, the actual implementation has involved some modifications to this approach, occasioned by an ongoing revision of the FAO FBDGs development process, as well as implementation-related situations and circumstances that were often unanticipated. A significant component of the FBDGs development process that required convening was carried out virtually as part of efforts to contain the SARS-COV-2 pandemic. The remainder of the paper will focus on describing how the process has been followed.

In 2016, a delegation of three persons attended a workshop on FBDGs, organized by the FAO, in South Africa. Participation in this workshop represents one of the earliest indications of the Ghana government's interest to develop a national FBDGs. In the same year, the Ghana Health Service published the National Nutrition Policy, which also indicated the government's interest in developing dietary guidelines for the population[9]. Thereafter, in 2017, the University of Ghana's School of Public Health (UGSPH) partnered with the University of Sheffield, Loughborough University, and the Africa Public Health Research Centre initiated a research project (TACLED) that prioritized FBDGs development as a deliverable. TACLED is an acronym for *Dietary Transitions for African Cities: Leveraging Evidence for interventions and policy to prevent Diet-related noncommunicable diseases*. TACLED was aimed at mapping the factors that are associated with food consumption patterns and how the evidence could be leveraged to address diet-related NCDs.

With the funding provided through TACLED, UGSPH partnered with the Ministry of Food and Agriculture (MoFA) and co-convened selected key stakeholders from government and non-government partner institutions to initiate the FBDGs development process. During this process, a concept note for the FBDGs was prepared, a national multisectoral technical task team (MTTT) established and MTTT commenced meetings to start the process of FBDGs development. Between 2017 and 2018, the MTTT convened four meetings during which the scope and objectives, evidence review, and guiding principles for the FBDGs were established. Also, during these two years, the TACLED project generated primary evidence that contributed to the evidence review process for FBDGs development in Ghana, particularly evidence on dietary intake and food environments [38-41]. The work of the MTTT was, however, stalled by the expiration of the TACLED project in 2018.

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

In 2018, the MTTT reached out to the FAO for technical and financial support to continue the FBDGs development. In response to this request, the FAO organized a capacity building workshop for Ghana's MTTT members, and other selected stakeholders, in 2019. This workshop focused on the preparations for implementing a FBDGs, particularly, the process of evidence review. Following the capacity building workshop, the FAO provided funding and technical support to the Ghana MTTT through the UGSPH.

Establishment of Task team: Ghana's FBDGs MTTT was established under the joint leadership of MoFA and UGSPH. Because the FBDGs need to be anchored in a government entity (a ministry, an agency or an institute), the Ministry of Food and Agriculture (MoFA) led the process of inviting stakeholder institutions to participate in the MTTT. Following the capacity building workshop and funding received from the FAO, additional stakeholders were invited to participate in the MTTT, increasing its membership from seven to 21. In addition to these, other institutions invited themselves to participate in the MTTT. The expanded MTTT had experts representing a broader range of partner institutions (Table 2). The expanded MTTT was given its terms of reference in August 2020 and commenced work immediately. However, it was not until December 2020 when it was formally inaugurated by the Ministry of Food and Agriculture. The MTTT has since completed the process of confirming the objectives and scope for the FBDGs, agreed on guiding principles for the FBDGs, validated the evidence review, and prioritized the key issues that will inform the FBDGs based on the validated evidence.

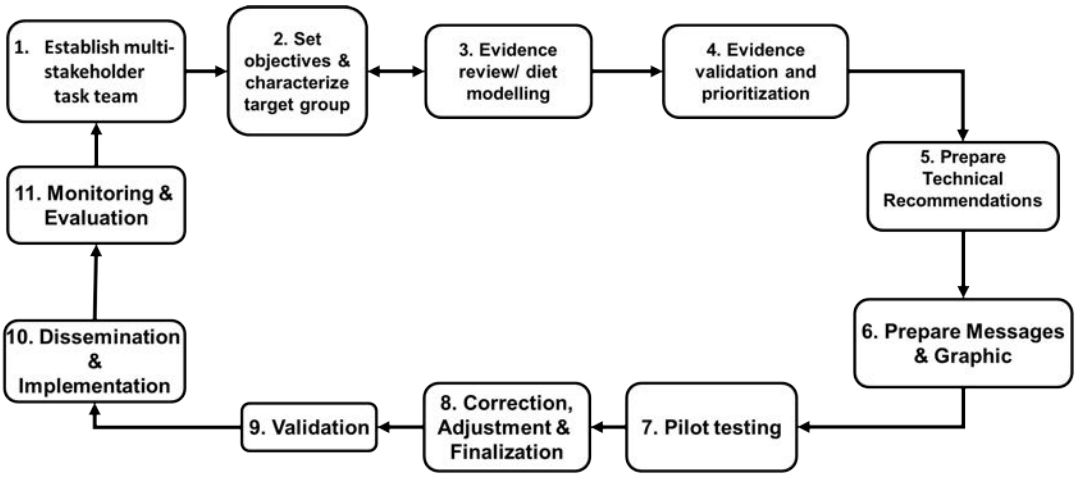
FBDGs objectives and targets: Based on the validated and prioritized evidence, the MTTT discussed and identified the key dietary challenges in Ghana. Based on this, the prioritized issues for the FBDGs were identified as child undernutrition, adolescent and adult overweight and obesity, and micronutrient deficiencies across the general population. In addition, malnutrition among the elderly was also identified, by consensus as a key problem, although there is limited published evidence on this issue. It was suggested that experts on health issues of the aged should be invited to support the work of the MTTT when discussing recommendations for older persons. The MTTT also discussed and agreed on a list of 12 guiding principles for Ghana's FBDGs development, as outlined in Box 1.

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Box 1: guiding principles for development of the national Food based dietary guidelines for Ghana
Be evidence-based Focus not just on nutrition but also health Tackle patterns of food intake Be culturally acceptable and sensitive Focus on practicality Be food-based rather than nutrient based Gender sensitive Sensitive to the needs of vulnerable groups Have lifestyle recommendation . Be user friendly . Food groups that Ghanaians will understand . Guidelines on role of family and friends

Figure 1: Proposed pathway for development of Food-based dietary guidelines



Review of evidence: The evidence review covered a wide range of questions that were guided by a list compiled by the FAO for this purpose. The FAO list was altered minimally, and often, based on existing evidence. The review topics were divided into 10 main categories (Box 2). Nine of the topics were focused on evidence about diets in the local Ghanaian context. The tenth topic was focused on international evidence on nutrition/diet and disease relationships as well as recommendations from globally applicable evidence reviews. This topic provided evidence for designing the technical messages for the FBDGs. The evidence for each topic was reviewed by a local experts across various research institutions in Ghana, and in some cases, in partnership with external research partners (Table 3). Graduate students from these institutions were involved in carrying out most of the reviews.

Each of the topics were reviewed using existing evidence from published peer reviewed literature as well as from grey literature, including reports of nationally representative surveys, policy/program documents, as well as program/institutional reports relevant to

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

the topic. A systematic repeatable process was adopted in the review of each topic. The evidence review was restricted to documents that were published in the last 10 years; government policies that were older than 10 years, but which were still applicable beyond 10 years were included. The review methodology and findings of all the topic reviews have been published (**reference supplement editorial**). The reviews were initiated and completed between March and September 2020.

Validation of evidence: Although an initial evidence review was carried out in 2018, it was not as comprehensive and systematic as the one that was carried out in 2020, following the FAO-led capacity building workshop in 2019. The second evidence review was initiated at the peak of the initial outbreak of the novel SARS-COV-2 pandemic. Thus, the validation process, which was intended to be completed within a 4-day in-person meeting, was delayed significantly. This was because the pandemic containment regulations in Ghana did not allow face-to-face meetings. Also, some of the evidence reviews were delayed and thus were not all ready at the time the evidence validation began.

The process of validation was in two stages. The first part was a series of online presentations of the evidence review findings to the MTTT in virtual seminars via the Zoom virtual meeting platform. During these virtual meetings, reviewers of the various topics presented the findings and opportunity was provided for the MTTT members to interact with the reviewers, ask clarification questions and to suggest additional evidence sources, as well as make other input to improve the review reports. The 'breakout room' function of Zoom was useful for creating smaller groups of MTTT members to enable more in-depth discussion of the review findings. Prior to each topic's presentation, the report was shared with MTTT members to enable them read the report prior to presentation of the summary. In addition, all PowerPoint presentations and evidence review reports were shared with MTTT members using google drive virtual folder. Following each presentation, reviewers had opportunity to revise and finalize and submit an updated report. An average of 17 participants (range:14-29) attended the online validation meetings.

In October 2020, a one-day face-to-face meeting was held to allow the MTTT to have a final validation discussion of all the key evidence across all the nine local evidence topics. To facilitate this process, a printed copy of the summary evidence for each topic was provided to participants. Following a PowerPoint presentation of all the evidence, the committee validated the evidence for that topic through a secret poll. This process was continued until all the evidence was validated. The validation process in this meeting also identified further evidence that needed to be addressed; these evidence gaps were filled, subsequently, by the reviewers.

Prioritization of FBDGs issues: prioritization of the validated evidence was carried out in a two-step process. The first step involved an online google forms survey of key issues from the validated evidence. The survey was open only to MTTT members. Following the survey, the summarized responses from the survey were discussed via an online zoom meeting to confirm and finalize the priority issues for Ghana's FBDGs. As part of the prioritization meeting, the MTTT also discussed and finalized decisions on

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

the scope of Ghana's FBDGs. It was agreed that Ghana's FBDGs will be designed to meet the needs of the entire population of Ghana, across all age groups. In addition, the FBDGs will make specific recommendations to cover the dietary guidance needs of pregnant and lactating women. The MTTT also decided that the recommendations will not only focus on behaviour change messages targeting individuals and groups, but will also recommend changes that will influence how diet-related policies and programs are formulated and implemented across government and non-government agencies, including recommendations for food systems, and food environments.

Formulation of Key messages: In November 2020, the MTTT commenced discussions on technical messages for the FBDGs. The FBDGs recommendations developed messages in response to the findings of the prioritized nutrition problems. The technical message development focused an overall message of promoting diet diversity across six main food groups as well as a discretionary food group. The six main food groups were 1. fruits; 2. vegetables; 3. fat and oils; 4. cereals, grains, roots, and tubers; 5. Animal Source foods; and 6. Legumes and nuts. The six food groups were based on evidence of food groups commonly consumed in Ghana as well as stakeholder technical understanding of the food consumption behaviour of persons living in Ghana[40].

Diet Modelling: Two experts have worked together, with support from FAO, to conduct diet modelling aimed at estimating the quantities of each food group that will contribute to an optimal diet for persons living in Ghana. The outcome of the modelling is an information on portion sizes that will be used to inform the development of a food guide communication tool along with the FBDGs.

Summary of evidence review findings

Key Nutrition and Health Problems and Risk factors: Ghana is currently in an advanced stage of nutrition transition with simultaneous occurrence of undernutrition and caloric overnutrition[11, 42]. An estimated 10% of Ghanaian infants are born with a low birth weight. One-fifth of young children under 5 years are chronically undernourished while 7% are acutely undernourished[11]. There are, however, wide disparities of undernutrition among this age group. There is also unacceptably high rates of anemia (>65%), iron, and vitamin A deficiency among children below age five[43]. Among adolescents (ages 10-18), overweight rate is increasing, especially among those living in urban settings[44]. Although there is limited evidence, it is suggestive of high rates of underweight and stunting among adolescents [11, 45]. Adult overweight among women is high and increasing[11, 16]. There is also high and increasing rates of diet-related non-communicable diseases (NCDs) including diabetes mellitus type II, hypertension, and some cancers (particularly breast and cervical)[11, 46, 47]. There is limited evidence on health and nutrition of older persons which suggests high overweight and NCD rates[48].

Diets and food consumption: Based on national food balance sheet data, only 7% of Ghanaians are considered undernourished[17, 18]. However, food security prevalence is much higher from a household perspective[19, 20]. Households typically spend > 40% of annual expenditure on food[6, 49]; in Northern Ghana, an average of 16% of

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

households are moderately or severely food insecure[19]. There is high variability in food insecurity rate across districts, reaching 40% in some districts, while others reported less than 5%. Young children's diets are mainly cereal-based[11]. School-age children and adolescents have preference for energy-dense and high-fat foods; their consumption of dark-green leafy vegetables is low[50, 51]. Street food is frequently reported, and especially for rice-based meals[40, 52].

Among young children, breastfeeding practices are suboptimal[11, 12]. For example, exclusive breastfeeding rate is currently estimated at 43%, considerably lower than the national target of 80%. Prevalence of complementary feeding frequency and diversity are both low and declining over time[11]. Early introduction of pre-lacteal feeds, water and other foods limit achievement of breastfeeding standards while misperception and limited maternal support adversely affect complementary feeding of young children. There is infrequent consumption of nutrient-rich fruits, vegetables, and animal source foods. Adult and adolescent dietary consumption is suboptimal and increasingly including nutrient-rich energy-dense foods[52, 53].

Food availability, safety and trade: Net per capita food production was higher than consumption in all food categories, except for vegetables, fish and fishery products[54]. Overall, food imports exceeded food exports in all food categories, except cocoa beans and products, root crops and tubers, oil-bearing crops and nuts, and fruits and fruit products. By weight, the major staple foods produced in Ghana are cassava, yam and maize. However, consumption of foods was driven by location of consumers[6, 55, 56]. Cassava, maize, rice, and yams were the main staple crops consumed in Ghana. Underutilized foods such as palm weevil larvae and turkey berry identified[57]. At the household level, farm production diversification was identified as an important driver of consumption[55, 58, 59]. Fruit and vegetable consumption in Ghana have been declining since 2013[54]. There was also a rise in the importation and consumption of processed foods. Food safety issues identified included contamination with microbes, aflatoxin, polycyclic aromatic hydrocarbons (in smoked fish), heavy metals (particularly mercury in fish), pesticide residues (vegetables and fruits), and food adulteration[54, 60-64].

Food and nutrition policy and programs: there is a wide range of government policies and programs spanning nutrition-specific and nutrition-sensitive sectors[65]. Within the health sector, multiple policies exist including those related to child feeding, rehabilitation of malnourished children and adults, micronutrient nutrition, infection-prevention/management, and family planning[66]. These policies exist in separate documents and are also integrated in the national nutrition policy which is the flagship nutrition policy in Ghana[9]. Outside of the health sector, nutrition-relevant policies and programs exist across ministries, departments and agencies implementing programs in agriculture, local government, trade and industry. A recent stakeholder engagement indicated that there are important gaps government nutrition initiatives and recommended actions to fill the policy and program gaps[27, 67]. Recommended actions include development of food-based dietary guidelines for Ghana.

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Sustainable food system: Although subsistence farming remains a major livelihood for Ghanaians, limited evidence shows that there is declining arable land in both urban and rural settings[68, 69]. Most household production is a combination of crops and animals. Animal farming, typically, employs non-intensive methods. Production of poultry (an important animal source food) has been declining over time in Ghana[70]. Fish capture in Ghana has also drastically declined due to overexploitation[71, 72]. Many rural farmers engage in cash crop farming. There is evidence that cash cropping families consume less diverse/quality diets. Further, the revenue from cash crops does not provide such families with a living or adequate income to purchase food for household consumption. There is high amount of food waste and loss along the value chain[73]. For example, 92 metric tons of fish were lost to inadequate storage facilities over a six year period in Western region alone[74]; in the Ashanti region, 8% of cultivated rice is lost at the harvesting stage, and a further 9% is lost during drying and storage[75]. Packaging along the food results in increased use of plastics; about 90% of urban residents in the Eastern region use single-use plastics for food packaging. However, there are also reports of using renewable packaging (leaves) in the Ashanti region[76, 77]. An estimated 28,000 tons of plastic waste is generated from bagged water consumption, nationally[78]. Other impacts of food system on the ecosystem include excessive hunting, and uncontrolled use of agro-chemicals[79, 80].

Food environment: Although there is increasing growth of supermarkets and other food vending outlets, traditional open markets are the main source of food for Ghanaian households, in both urban and rural areas[81]. Ready-to-eat traditional foods is a major source of foods purchased for consumption by majority of Ghanaian children, adolescents and adults[82, 83]. In urban Accra, availability of traditional markets within a neighbourhood was linked with lower consumption of ultra-processed food. In the same study, increasing number of convenience stores was linked with 90% more likelihood or consuming street food[84]. In urban and rural settings, consumption of energy-dense nutrient-poor foods such as fried yam and sugar-sweetened beverages is common. Key drivers of healthy eating identified include media information, lack of appropriate storage facilities in food value change, cultural perceptions and practices, seasonality of fruit availability, limited awareness of nutrient value of nutrient-rich foods, food safety and low productivity of nutrient-rich foods. The feeding of young children is affected by inadequate resources including lack of breastfeeding rooms at work places [85].

Behaviours and food-related habits: there are not many studies focusing on dietary habits. Generally, location, price, gender roles, and social relationships are the key drivers of eating behavior. In particular, women and children's diets are influenced by food prohibitions, myths, and prescriptions. A wide range of food preparation methods are employed although frying with oil has been identified to dominate across different food groups. Adolescents and young persons were identified as having a higher likelihood to skip meals. Street foods are commonly purchased for meals, especially for breakfast and lunch. However, majority of households eat at home-prepared meals in dinner.

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Non-dietary behaviours: nationally-representative studies and large-subnational studies have reported that almost one-third of adult males and more than half of adult females do not have an active lifestyle. Higher inactivity among females has also been reported among adolescents and young persons. Physical inactivity was more likely among urban dwellers. Subnational studies reported that alcoholic beverage consumption was common among adolescents, adults, and older persons. However, only a small percent of survey respondents was categorized as heavy drinkers (3%-10%). Participation in festivals and the desire to demonstrate belongingness were identified as drivers of alcohol consumption among adolescents. Only one study reported type of alcoholic beverages consumed: drink beer (60%), local beer, *pito* (15%), spirits (11%) palm wine (7.5%) and akpeteshie (7%). In observational studies among adults and older persons, alcohol consumption was associated with elevated blood pressure, overweight, underweight among elderly women, female sexual dysfunction, and depression.

Food and nutrition communication: Television and radio remain the main electronic means of accessing information in Ghana[11, 16, 86]. However, internet and social media has grown rapidly in the past decade and are quickly becoming important sources of information, especially among younger, urban-dwelling, educated Ghanaians[86]. Food and nutrition reporting is uncommon and unstructured through mainstream media sources. Health workers remain the main source of nutrition and health information. The media (TV, radio, outdoor banners, and billboards) is, however, important for advertising of food and nutrition messages; especially advertising of sugar sweetened beverages, noodles, energy-dense nutrient-poor snack foods, and alcoholic beverages[39, 87-90]. Young children are usually exposed to these advertisements and are often featured in advertising and promotions[29, 88]. Most children who are exposed to such advertisement are influenced by, and change their preferences based on the advertisements[29]. There is rapidly growing ownership and access to electronic devices (computers, tablets, mobile phones)[6, 11, 16, 49].

Next steps

Following the completion of the technical messages, the next steps in the process will be translation of the technical messages into a format that is easily understood. Thereafter, the messages will be pre-tested in selected communities across the country among key target groups. Upon successful testing, the feedback will be used to finalize the messages and validated by the MTTT and key stakeholders. Thereafter, the recommendations will be ready for publication, and dissemination. The MTTT anticipates that the final publication and launch of the FBDGs for Ghana will be completed in 2021.

Lessons Learned

Over the past four years, Ghana has made significant progress towards completing its FBDGs. Implementation of a food based dietary guidelines is not a simple task. Some of the key lessons from the FBDGs development process has been outlined here. These lessons can serve as guideposts for future FBDGs development in Ghana, as well as for other countries.

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Lesson 1 Political will: Broad consultation and sustained effort to involve key stakeholders has been important for ensuring cross-sectoral participation. When institutions were consulted at a high level (usually at the level of the institutional director), technical officers were able to justify the long hours and frequency of MTTT meetings. In addition, the MTTT co-chairs had to build and manage relationships with the technical officers participating in the MTTT. These cordial relationships were a necessary motivation and complementary to the official directives given by directors for their technical staff to participate in the MTTT. During the process, a mini launch of the FBDGs development as well as official inauguration of the MTTT helped to give visibility for the participating institutions and thereby increased their commitment to the FBDGs development process.

Lesson 2 Planning and time management: Long-term planning was important and enabled key activities related to evidence review and validation to be implemented, successfully. To achieve this, the MTTT meeting agendas were prepared ahead and shared with participants usually two weeks ahead, so that they can include it in their plans. Despite efforts to plan ahead, the processes of evidence review, and validation were delayed significantly by the COVID-19 pandemic. Since this pandemic was not anticipated, alternative planning using online meetings were used to mitigate the effect of the pandemic (that is, not being able to meet in person), until it was safe to do so, later in the process. A period of less than 12 months was planned for the evidence review. However, it has become clear that without enough dedicated skilled staff, it is difficult to achieve needed outcomes for FBDGs development within a short period.

Lesson 3 Capacity building: The process in Ghana has been possible because some of the MTTT had participated in the FAO workshop on evidence review and FBDGs development. Without this training, the process of FBDGs development in Ghana will have taken longer. The training also equipped the team with clear guidance on how to carry out important tasks. In addition to the workshop in Accra, FAO staff from Rome participated in some of the MTTT meetings via virtual meeting platforms and through this means, provided useful guidance to the work of the MTTT.

Lesson 4 Multisectoral Action: The MTTT discussions benefitted immensely from the unique capacities and knowledge of members from different government and non-government agencies. This diversity of participation from carefully selected stakeholders enriched the discussions, enabled access to information that will otherwise not be publicly available, and increased awareness of policies and programs there were still in advanced stages of preparation but not yet publicized or were ongoing but were missed in the evidence review. The varied institutional backgrounds also enabled better understanding of the existing institutional coordination and relationships that could be leveraged for development and implementation of the FBDGs in Ghana.

Lesson 5 Resources: Diverse resources were necessary for implementation of Ghana's FBDG including skilled personnel, and funding for procured services. Having adequate resources was critical and allowed the MTTT to focus its attention on the FBDGs development process. Funds provided by FAO was most helpful, especially for the evidence reviews, as well as all the meetings of the MTTT, both virtual and in-person.

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

The current process has provided a useful guide to estimate the resources needed for future FBDGs development in Ghana.

CONCLUSION

A diverse multi-stakeholder technical task team, with the support of FAO has made significant progress in the development of FBDGs in Ghana. Limited funding, lack of capacity and slow response by key agencies were responsible for the slow process. Although this process has taken almost four years since its inception in 2016, the process is currently close to completion. It is anticipated that by the end of 2021, the national FBDGs for Ghana will be completed. The lessons learned will make the process more efficient for future FBDGs development.

CC BY NC ND
https://doi.org/10.18697/ajfand.107.21830

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Table 1: Existing documents that outline dietary guidance for persons living in Ghana

Year of publication	Document title	Institution which published document	Target group	Key dietary guidance	Status of document
2007	Infant and young child feeding strategy	Ghana Health Service	Infants and young children (0-5 years)	Breastfeeding, complementary foods, feeding behavior, food safety	Due for revision
2009	Nutrition facts for Ghanaian families	Ghana Health Service/UNICEF	Families in Ghana	Breastfeeding, complementary feeding, family diets, eating during pregnancy and lactation	In use or usable
2010	Dietary and physical activity guidelines for Ghana	Ministry of health	Families in Ghana		In use or usable
2012	National Policy for the Prevention and Control of Chronic Non-Communicable Diseases in Ghana	Ministry of Health	General Population of Ghana	Regulation of food advertising, guidance on fats, salt, alcohol, non-alcoholic beverages, fruits and vegetables	Expired; new version drafted
2013	National Food Safety Policy	Ministry of Health	Implementing Agencies and nutrition stakeholder institutions	Food safety and quality for the general population	In use or usable
2016	National Nutrition Policy	Ghana Health Service	Implementing Agencies and nutrition stakeholder institutions	Nutrition needs of infants, young children, school-age children, adolescents, women, men and, micronutrient supplementation	In use or usable

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Table 2: List of institutions and number of representatives on the Multi-sectoral Technical Task Team

Institution	Number of participants	Roles
Ministry of Food and Agriculture	1	Co-Chairperson
	1	Member
University of Ghana School of Public Health	1	Co-chairperson
	1	Member
	1	Secretary
World Health Organization	1	Member
Food and Agriculture Organization	2	Members
Council for Scientific and Industrial Research	2	Members
University of Ghana Nutrition Department	1	member
Kwame Nkrumah University of Science and Technology	1	member
The Ministry of Health	1	member
The Ghana health Service	1	Member
University of Health and Allied Sciences	2	members
Ghana Academy of Nutrition and Dietetics	2	Members
Ghana School Feeding program (GSFP)	1	Member
The World Food Programme (WFP)	1	Member
United Nations Children's Fund (UNICEF)	1	Member
Food and Drugs Authority	1	Member
Ghana Standards Authority	1	Member
National Development Planning Commission (NDPC)	1	Member
Ghana Statistical Service (GSS)	1	Member
Ministry of Finance (MoF)	1	Member
International Food Policy Research Institute (IFPRI)	1	Member
Ghana School Feeding Program (GSFP)	1	member
School Health Education Program (SHEP)	1	member
University for Development Studies (UDS	1	member

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Table 3: Topics included in evidence review for Ghana's food based dietary guidelines

Topic	Key questions in the topic	Institution leading topic
1	Nutrition and health outcomes and drivers in Ghana	University of Ghana School of Public Health
2	Dietary intake across diverse population groups in Ghana	University of Ghana School of Public Health
3	Nutrition-relevant policies and programs in Ghana	University of Ghana School of Public Health
4.	Diverse and evolving food environments in Ghana	Kwame Nkrumah University of Science and Technology
5	Sustainability of Food systems in Ghana	Kwame Nkrumah University of Science and Technology
6	Non-dietary behaviors that affect nutrition	University of Ghana School of Public Health and University of Warwick
7	Dietary habits	University of Ghana Nutrition and Food Science Department
8	Dietary communication and promotion in the media in Ghana	University for Health and Allied Sciences
9	Food availability, access, and safety	University of Ghana School of Public Health and McGill University
10	Nutrient, Food, Dietary/lifestyle patterns and health outcomes (Global level recommendations)	Adopted and used evidence from global data compiled by Sokoine University (Tanzania)

CC BY NC ND

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 22 No. 2 March 2022 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

REFERENCES

1. **Fosu AK** Country Role Models for Development Success: The Ghana Case. In: *Achieving Development Success: Strategies and Lessons from the Developing World.* Edited by Fosu AK: Oxford Scholarship Online; 2013: 1-21.

2. **The World Bank.** Ghana http://data.worldbank.org/country/ghana *Accessed 31 March 2021.*

3. **Atta Mills C** Politics, policy, and implementation: The 'Ghanaian Paradox' https://www.brookings.edu/blog/africa-in-focus/2018/07/18/politics-policy-and-implementation-the-ghanaian-paradox/ *Accessed 31 March 2021.*

4. **Quandzie E** World Bank formally classifies Ghana's economy as middle-income. In: *Ghana Business News.* Ghana Business News; 2011.

5. **National Development Planning Commission (NDPC)**. Ghana Millenium Develop Goals 2015 Report. In. Accra: NDPC; 2015.

6. **Ghana Statistical Service (GSS)**. Ghana Living Standards Survey Round 7: Poverty Trends in Ghana (2005-2017). In. Accra, Ghana: GSS; 2018.

7. **United Nations Development Program (UNDP)** About Ghana https://www.gh.undp.org/content/ghana/en/home/countryinfo.html#:~:text=In%20fact%2C%20Ghana%20is%20the,become%20a%20middle%20income%20country.&text=The%20IMF%20said%20the%20Ghanaian,prices%20of%20cocoa%20and%20gold *Accessed 31 March 2021.*

8. **Nketiah-Amponsah E and PW Aidam** State of Ghana's Infrastructure and its Implications for Economic Development. In: *The Economy of Ghana Sixty Years after Independence.* Edited by Aryeetey E, Kanbur R: Oxford Scholarship Online; 2017: 1-27.

9. **Government of Ghana.** National Nutrition Policy. In. Edited by Health Mo. Accra: Government of Ghana; 2016.

10. **Aryeetey R, Atuobi-Yeboah A, Van Den Bold M and N Nisbett** Understanding the Differences between Child Stunting and Anemia Reduction and Identifying Outstanding Challenges. In: *Stories of Change in Nutrition.* IFPRI; 2020: 1-8.

11. **Ghana Statistical Service (GSS), Ghana Health Service (GHS), ICF International**: Demographic and Health Survey 2014. In. Rockville, Maryland, USA: GSS, GHS, ICF International; 2015.

12. **Ghana Statistical Service (GSS).** Multiple Indicator Cluster Survey (MICS 2017/2018): Survey Findings Report. In. Accra, Ghana GSS; 2018.

CC BY NC ND

13. **Bosu WK** Epidemic of hypertension in Ghana: a systematic review. *BMC Public Health* 2010, 10:418.

14. **Ofori-Asenso R, Agyeman AA, Laar A and D Boateng** Overweight and obesity epidemic in Ghana-a systematic review and meta-analysis. *BMC Public Health* 2016, 16(1):1239.

15. **Afshin A, Sur PJ, Fay KA, Cornaby L, Ferrara G, Salama JS, Mullany EC, Abate KH, Abbafati C and Z Abebe** Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet* 2019, 393 (10184):1958 - 1972.

16. **Ghana Statistical Service (GSS), Ghana Health Services (GHS), ICF Macro**. Ghana Demographic and Health Survey 2008. In. Accra: GSS, GHS, ICF Macro; 2009.

17. **Food and Agriculture Organisation (FAO), International Fund for Agricultural Development (IFAD), United Nations Children's Fund (UNICEF), World Food Programme (WFP, World Health Organization (WHO).** The State of Food Security and Nutrition in the World 2019: Safeguarding against economic slowdowns and downturns. In. Rome: FAO; 2019.

18. **FAO, IFAD, UNICEF, WFP, WHO**. The State of Food Security and Nutrition in the World 2020: Transforming food systems for affordable healthy diets. In. Rome: FAO; 2020.

19. **World Food Programme (WFP), Ghana Statistical Service (GSS)**. Comprehensive Food Security & Vulnerability Analysis GHANA 2012 Focus on Northern Ghana. In. Accra: WFP; 2012.

20. **World Food Programme (WFP), Ghana Statistical Service (GSS)**. Comprehensive Food Security and Vulnerability analysis. In. Accra: WFP; 2009.

21. **Sandström B** A framework for food-based dietary guidelines in the European Union. *Public Health Nutr* 2001, 4(2A):293-305.

22. **Herforth A, Arimond M, Álvarez-Sánchez C, Coates J, Christianson K, and A Muehlhoff** A Global Review of Food-Based Dietary Guidelines. *Adv Nutr* 2019, 10(4):590-605.

23. **Pan American Health Organization (PAHO), Institute of Nutrition of Central America and Panama (INCAP)**: 1999. In. Washington, DC: PAHO and INCAP; Food-based Dietary Guidelines and Health Promotion in Latin America.

24. **Ministry of Health**: Dietary and physical activity guidelines for Ghana. In. Accra: Ministry of Health; 2010.

CC BY NC ND

25. **Ghana Health Service (GHS), United Nations Children's Fund (UNICEF)**. Nutrition Facts for Ghanaian Families. In. Edited by Department N. Accra: GHS; 2009.

26. **Brouwer ID, de Jager I, Borgonjen K, Azupogo F, Rooij M, Folson G and R Abizari** Development of food-based dietary recommendations for children, 6-23 months old, in Karaga District and Gomoa East District, Ghana. In. Washington, DC: GAIN; 2017.

27. **Laar A, Barnes A, Aryeetey R, Tandoh A, Bash K, Mensah K, Zotor F, Vandevijvere S and M Holdsworth** Implementation of healthy food environment policies to prevent nutrition-related non-communicable diseases in Ghana: National experts' assessment of government action. *Food Policy* 2020, 93(101907):1-12.

28. **Aryeetey RN, Boateng L and D Sackey** State of dietetics practice in Ghana. *Ghana Med J* 2014, 48(4):219-224.

29. **Amegashie EK** Marketing of Foods and Non-Alcoholic Beverages to Children in the Accra Metropolitan District of the Greater Accra Region of Ghana. . Accra, Ghana: University of Ghana 2017.

30. **Centre for Social Protection (CSP) Institute of Development Studies (IDS), Family for Every Child CH.** Researching the linkages between social protection and children's care in Ghana: LEAP and its effects on child well-being, care and family cohesion. In.; 2014.

31. **Ministry of Gender CaSPM.** Livelihood Empowerment Against Poverty (LEAP). In. Accra: MGCSP; 2020.

32. **Government of Ghana (GoG)**. Draft National School Feeding Policy. In. Accra, Ghana: GoG; 2015.

33. **Ghana School Feed Program (GSFP).** Programme Coverage http://schoolfeeding.gov.gh/?page_id=1773 *Accessed 31 March 2021.*

34. **Ministry of Food and Agriculture (MoFA)**. Medium Term Agricultural Sector Investment Plan (METASIP): 2011-2015. In. Accra, Ghana: MoFA; 2010.

35. **Nyumuah RO, Hoang TC, Amoaful EF, Agble R, Meyer M, Wirth JP, Locatelli-Rossi L and D Panagides** Implementing large-scale food fortification in Ghana: lessons learned. *Food Nutr Bull* 2012, 33(4 Suppl):S293-300.

36. **Ghana Health Service**. National Infant and Young Child Feeding for Ghana: Strategy Document. In. Accra: GHS; 2007.

37. **Food and Agriculture Organisation (FAO)**. Developing Food-based Dietary Guidelines: a manual from the English-speaking Caribbean. In.: FAO; 2007.

CC BY NC ND

38. **Pradeilles R, Marr C, Laar A, Holdsworth M, Zotor F, Tandoh A, Klomegah S, Coleman N, Bash K, Green M and PL Griffiths** How ready are communities to implement actions to improve diets of adolescent girls and women in urban Ghana? *BMC Public Health* 2019, 19(1):646.

39. **Green MA, Pradeilles R, Laar A, Osei-Kwasi HA, Bricas N, Coleman N, Klomegah S, Wanjohi M, Tandoh A, Akparibo R, Aryeetey R, Griffiths PL, Kimani-Murage EW, Mensah K, Muthuri S, Zotor F and M Holdsworth** Investigating foods and beverages sold and advertised in deprived urban neighbourhoods in Ghana and Kenya: a cross-sectional study. *BMJ open* 2020, 10(6):e035680.

40. **Rousham EK, Pradeilles R, Akparibo R, Aryeetey R, Bash K, Booth A, Muthuri SK, Osei-Kwasi H, Marr CM, Norris T and M Holdsworth** Dietary behaviours in the context of nutrition transition: a systematic review and meta-analyses in two African countries. *Public Health Nutr* 2020, 23(11):1948-1964.

41. **Osei-Kwasi H, Mohindra A, Booth A, Laar A, Wanjohi M, Graham F, Pradeilles R, Cohen E and M Holdsworth** Factors influencing dietary behaviours in urban food environments in Africa: a systematic mapping review. *Public Health Nutr* 2020, 23(14):2584-2601.

42. **Ecker O and P Fang** Economic Development and Nutrition Transition in Ghana: Taking Stock of Food Consumption Patterns and Trends. In: *Achieving and Nutrition Revolution for Africa: The Road to Healthier Diets and Optimal Nutrition.* Edited by Covic N, Hendriks SL, vol. ReSAKSS Anual Trends and Outlook Report: International Food Policy Research Institute (IFPRI); 2016.

43. **University of Ghana, GroundWork, University of Wisconsin-Madison, KEMRI-Wellcome Trust, UNICEF**. Ghana Micronutrient Survey 2017. In. Accra, Ghana; 2017.

44. **Aryeetey R, Lartey A, Marquis GS, Nti H, Colecraft E and P Brown** Prevalence and predictors of overweight and obesity among school-aged children in urban Ghana. *BMC Public Health* 2017, 4;38.

45. **Danquah AO, Amoah AN and C Opare-Obisaw** Nutritional Status of Upper Primary School Pupils in a Rural Setting in Ghana. *International Journal of Nutrition and Food Sciences* 2013, 2(6):320-326.

46. **Asamoah-Boaheng M, Sarfo-Kantanka O, Tuffour AB, Eghan B and JC Mbanya** Prevalence and risk factors for diabetes mellitus among adults in Ghana: a systematic review and meta-analysis. *Int Health* 2019, 11(2):83-92.

47. **International Agency for Research on Cancer (IARC)**. Ghana. In.: IARC; 2018.

CC BY NC ND

48. **Badasu DM, Aryeetey R, Bitugu BB and R Ocansey** (eds.) Aging in Ghana: A public health and culture perspective. Oxon: Routeledge; 2018.

49. **Ghana statistical Service (GSS)**. Ghana Living Standards Round 6: Main Report. In. Accra: Ghana; 2014.

50. **Amo-Adjei J and A Kumi-Kyereme** Fruit and vegetable consumption by ecological zone and socioeconomic status in Ghana. *J Biosoc Sci* 2015, 47(5):613-631.

51. **Amoateng AY, Doegah PT and C Udomboso** Socio-demographic factors associated with dietary dehaviour among young Ghanaians aged 15-34 Years. *J Biosoc Sci* 2017, 49(2):187-205.

52. **University of Ghana (UG), University of Health and Allied Sciences (UHAS), African Public Health Research Center (APHRC), The University of Sheffield (TUOS), Loughborough University (LU), University of Liverpool (UL), CIRAD**. Dietary Transitions in African Cities: Leveraging evidence for policy and intervention to prevent diet-related non-communicable diseases. In. Accra: University of Ghana; 2019.

53. **Agyapong NAF, Annan RA, Apprey C, Aduku LNE and EC Swart** The association between dietary consumption, anthropometric measures and body composition of rural and urban Ghanaian adults: a comparative cross-sectional study. *BMC Nutr* 2020, 6:21.

54. **Food and Agriculture Organisation (FAO)**. FAOSTAT Statistical Database. In. Rome: FAO; 2020.

55. **de Jager I, Giller KE and ID Brouwer** Food and nutrient gaps in rural Northern Ghana: Does production of smallholder farming households support adoption of food-based dietary guidelines? *PloS one* 2018, 13(9):e0204014.

56. **Armar-Klemesu M, Osei-Menya S, Zakariah-Akoto S, Tumilowicz A, Lee J and C Hotz** Using Ethnography to Identify Barriers and Facilitators to Optimal Infant and Young Child Feeding in Rural Ghana: Implications for Programs. *Food Nutr Bull* 2018, 39(2):231-245.

57. **Agbemafle I, Francis SL, Jensen HH and MB Reddy** Influence of Food Security Status and Anemia-Related Knowledge on Perceptions About 2 Nutritious Underutilized Foods Among Ghanaian Caregivers. *Food Nutr Bull* 2019, 40(4):488-503.

58. **Bellon MR, Kotu BH, Azzarri C and F Caracciolo** To diversify or not to diversify, that is the question. Pursuing agricultural development for smallholder farmers in marginal areas of Ghana. *World Dev* 2020, 125:104682.

CC BY NC ND

59. **Saaka M, Osman SM and I Hoeschle-Zeledon** Relationship between agricultural biodiversity and dietary diversity of children aged 6-36 months in rural areas of Northern Ghana. *Food Nutr Res* 2017, 61(1):1391668.

60. **Saba CK, B Gonzalez-Zorn** Microbial food safety in Ghana: a meta-analysis. *J Infect Dev Ctries* 2012, 6(12):828-835.

61. **Bempah CK and A Ewusi** Heavy metals contamination and human health risk assessment around Obuasi gold mine in Ghana. *Environ Monit Assess* 2016, 188(5):261.

62. **Gbogbo F, Otoo SD, Huago RQ and O Asomaning** High levels of mercury in wetland resources from three river basins in Ghana: a concern for public health. *Environ Sci Pollut Res Int* 2017, 24(6):5619-5627.

63. **Agbetiameh D, Ortega-Beltran A, Awuah RT, Atehnkeng J, Cotty PJ, and R Bandyopadhyay** Prevalence of Aflatoxin Contamination in Maize and Groundnut in Ghana: Population Structure, Distribution, and Toxigenicity of the Causal Agents. *Plant Dis* 2018, 102(4):764-772.

64. **Bomfeh K, Jacxsens L, Amoa-Awua WK, Tandoh I, Afoakwa EO, Gamarro EG, Ouadi YD and B De Meulenaer** Reducing polycyclic aromatic hydrocarbon contamination in smoked fish in the Global South: a case study of an improved kiln in Ghana. *J Sci Food Agric* 2019, 99(12):5417-5423.

65. **Nwafor M** Review of Nutrition Policy Environment and Implementation Effectiveness in Ghana. In., vol. Draft Report. Accra; 2018.

66. **Strengthening Partnerships Results and Innovations in Nutrition Globally (SPRING)., Ghana Health Service (GHS).** Ghana: Landscape Analysis of Anemia and Anemia Programming. In. Arlington, VA: Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING); 2016.

67. **University of Ghana School of Public Health (UG), University of Health and Allied Sciences (UHAS), kwame Nkrumah University of Science and Technoology (KNUST), National Development Planning Commission (NDPC), International Food Policy Research Institute (IFPRI), SNV Netherlands Development Organization (SNV), (GAND) GAoNaD**. National Multi Stakeholder Nutrition Forum and 1st National Nutriton Conference: Evidence-informed nutrition policies and programs, now and beyond. In. Accra: University of Ghana School of Public Health; 2019.

68. **Braimoh AK and PL Vlek** Land-cover dynamics in an urban area of Ghana. *Earth Interactions* 2004, 8(1):1-15.

69. **Yaro JA** Is deagrarianisation real? A study of livelihood activities in rural northern Ghana. *The Journal of Modern African Studies* 2006, 44(1):125-156.

CC BY NC ND

70. **Sumberg J, Awo M, Fiankor D, Kwadzo G and J Thompson** Ghana's Poultry Sector: Limited data, conflicting narratives, competing visions. In: *STEPS Working Paper.* Brighton: Steps Center; 2013.

71. **Antwi-Asare TO and EN Abbey** Fishery value chain analysis—Ghana. In. Rome, Italy: FAO; 2011.

72. **Agyekum GA** Light Fishing Operations in Small-scale Fishing in Ghana–A case study of the Chorkor and Teshie–Nungua fishing communities in the Greater Accra Region of Ghana. , 2016. Norway: UiT The Arctic University of Norway; 2016.

73. **Rutten M and M Verma** The Impacts of Reducing Food Loss in Ghana: A scenario study using the global economic simulation model MAGNET. In. Wageningen, Netherlands: LEI Wageningen UR; 2014.

74. **Gyan WR, Alhassan EH, Asase A, Akongyuure DN and Y Qi-Hui** Assessment of postharvest fish losses: The case study of Albert Bosomtwi-Sam fishing harbour, Western Region, Ghana. . *Marine Policy* 2020, 120(104120).

75. **Appiah F, Guisse R and P Dartey** Post harvest losses of rice from harvesting to milling in Ghana. *Journal of stored products and postharvest research* 2011, 2(4):64-71.

76. **Awusi E and S Kyei** Environmental effects and waste management practices of materials for local food packaging in the Birim Central Municipal, Ghana. *Journal of Environment and Waste Management* 2017, 4(3):244-252.

77. **Mensah J, Adei E, Adei D and M Ashie** Perceptions of the use of indigenous leaves as packaging materials in the ready-to-eat cornmeals. *International Journal of Biological and Chemical Sciences* 2012, 6(3):1051-1068.

78. **Wardrop NA, Dzodzomenyo M, Aryeetey G, Hill AG, Bain RE and J Wright** Estimation of packaged water consumption and associated plastic waste production from household budget surveys. *Environmental Research Letters* 2017, 12(7):074029.

79. **Afari-Sefa V, Asare-Bediako E, Kenyon L and JA Micah** Pesticide use practices and perceptions of vegetable farmers in the cocoa belts of the Ashanti and Western Regions of Ghana. *Advances in Crop Science and Technology* 2015, 3(3):1-10.

80. **Saba CK and B Gonzalez-Zorn** Microbial food safety in Ghana: a meta-analysis. (1972-2680 (Electronic)).

81. **Aryeetey R, Oltmans S and F Owusu** Food retail assessment and family food purchase behavior in Ashongman Estates, Ghana. *African Journal of Food, Agriculture, Nutrition and Development* 2016, 16(4):11386-11403.

CC BY NC ND

82. **Micah EB, Colecraft E, Lartey A, Aryeetey R and G Marquis** Street foods contribute to nutrient intakes among children from rural communities in Winneba and Techiman municipalities, Ghana *African Journal of Food, Agriculture, Nutrition and Development* 2012, 12(1):5789-5801.

83. **Mensah JO, Aidoo R and AN Teye** Analysis of street food consumption across various income groups in the Kumasi Metropolis of Ghana. . *International Review of Management and Business Research* 2013, 2(4):951.

84. **Dake FA, Thompson AL, Ng SW, Agyei-Mensah S and SN Codjoe** The Local Food Environment and Body Mass Index among the Urban Poor in Accra, Ghana. *Journal of urban health : bulletin of the New York Academy of Medicine* 2016, 93(3):438-455.

85. **Idrissu S, Abdul-Lateef A, Hushie M and A Bashiru** Workplace support for breastfeeding employees in educational and healthcare settings in Ghana. . *South African Journal of Child Health* 2019, 13(4):187-191.

86. **Isbell T and J Appiah-Nyamekye** AD250: Ghanaians rely on radio and TV, but support for media freedom drops sharply. AfroBarometer 2018; 250. In: *Afrobarometer.* Afrobarometer; 2018: 1-11.

87. **Amevinya GS, Quarpong W and A Laar** Commercial food advertising on the campus of Ghana's largest University. World Nutr. 2020; 11(2), 57-73. *World Nutrition* 2020, 11(2):57-73.

88. **Bragg MA, Hardoby T, Pandit NG, Raji YR and G Ogedegbe** A content analysis of outdoor non-alcoholic beverage advertisements in Ghana. *BMJ open* 2017, 7(5):e012313.

89. **Kumi IA** Healthiness of Foods and Beverages Advertised on Ghanaian Television Programmes Targeting Children. Accra, Ghana: University of Ghana; 2018.

90. **Kubaloe LA** The Nature and Content of Television Food Advertising and Children's Food Preferences. . Tamale, Ghana: University of Development Studies; 2018.

CC BY NC ND