BEST PRACTICE OF FOOD SECURITY AMONG AFRICAN CHILDREN, BASE ON FIES AND FOOD SYSTEM APPROACH:

A SYSTEMATIC REVIEW

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ABSTRACT

According to the 2022 Global Food Insecurity Report, nearly 193 million people in 53 countries or territories experienced food insecurity in 2021. This represents an increase of nearly 40 million people on the already record numbers for 2020. Of these, more than half a million people were classified in the acute food insecurity phase (IPC/CH Phase 5). Africa is the continent most affected by malnutrition and food insecurity. Global health and environmental crises have laid bare the fragility of global agri-food systems. According to (FAO 2020), covid-19 has disrupted food supply chains and the war in Ukraine is severely affecting African economies. This study is a systematic review, it presents the existing literature in food security among children, identify and classify best practices, using several search engines that include JSTOR, PubMed, Ebscohost, Science Direct, Web of Science... to the recent (the last 20 years) studies about African countries.

INTRODUCTION

The United Nations Food Systems Summit (UNFSS) propelled food systems transformation onto the mainstage of international discourse in 2021. The concepts of resilience, sustainability and "green growth" have also gained prominence at the international level. There is a growing consensus around the world that our livelihoods, our jobs, and even the health of the planet depend fundamentally on the development of resilient and sustainable economies. Within this framework, Africa need to chart clear paths and identify concrete actions to build food systems to providing sufficient and nutritious food to feed the 256 million food-insecure people (AGRA 2021[1]). The Sustainable Development Goals (SDGs) N°2, as well as the African Union's Agenda 2063 confirm the need for eliminating hunger, ensuring food security, improving nutrition, and promoting sustainable agriculture. Malnutrition is a major obstacle to achieving other SDGs.[2] The African Union likewise made nutrition a priority in its Agenda 2063, specifically its Goal 3 “Citizens are healthy and well-nourished and have a life expectancy over 75 years olds”. The vision shared by African leaders on March 24, 2022, in Abidjan, including representatives of the African Union Commission, the African Development Bank, the Scaling up Nutrition Movement and partners, was based on the resolution of the African Union's nutrition problems. The African Union has designated 2022 as the Year of Nutrition for Africa, the priority of which is to “*Strengthen*

[1] AGRA. (2021). Africa Agriculture Status Report. A Decade of Action: Building Sustainable and Resilient Food Systems in Africa (Issue 9). Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA).

[2] The losses in productivity associated with undernutrition are estimated to curtail GDP growth by more than 10%. Good health, education and quality learning necessarily require good nutrition. Malnutrition remains one of the main determinants of the global burden of disease, with 45% of child mortality due to undernutrition. Between 1990 and 2010, the global burden of disease attributable to overweight and obesity increased from 52 million to 94 million DALYs (disability-adjusted life years). A child with growth retardation at 6 years of age risks losing 4 years of schooling in terms of impaired cognitive development. More than 2 billion people in the world, including around 240 million children, are iodine deficient, and this lack of iodine is associated with a 15-point reduction in the population’s intelligence quotient (United Nations System 2014).

nutritional resilience and food security on the African continent: strengthening agrifood, health and social protection to accelerate human, social and economic development."

Among Children, food insecurity has emerged as a major public health concern and, the obligation to realize the "right to food and basic nutrition" is enshrined in both the United Nations Charter UN 2021[3] Mkhize et al 2022[4]), and African countries' Constitutions (FAO 2021)[5]. For FAO (2021), "food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (Skoet 2006)[6]. Emphasizing that the availability of food must be beyond mere subsistence (Neuman et al 2019). In Sub-Saharan Africa, one in four people experienced undernutrition in the year 2017. This represents about one-third of the global population estimated to have suffered from chronic hunger in the same year (Fraval et al 2019)[7]. According to the WHO (2020), malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is 'undernutrition'—which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related noncommunicable diseases (such as heart disease, stroke, diabetes, and cancer). In that case, food insecurity can lead to malnutrition, which can have serious consequences. Moderate food insecurity can increase the risk of some forms of malnutrition, such as stunting in children, micronutrient deficiencies or obesity in adults (FAO 2024)[8]. The food Insecurity Experience Scale (FIES) measures the food security of household or individual level. These aims to regarding people's access to adequate food by behaviors and experiences associated with increasing difficulties in accessing food due to resources constraints (FAO 2024[9]). The analysis of this study aims to find the best practice for food security among children in Africa, based on FIES and Food system approach.

FIES and Food System approach for better result

The FIES is one of the four experience-based food insecurity scales included in the Data4Diets platform, which also contains the Household Hunger Scale (HHS), the Household Food Insecurity

[3] United Nations Office of the High Commissioner for Human Rights. Fact Sheet No. 34, The Right to Adequate Food [Internet]. Refworld. 2021 [cited 2021 Jun 7]. https://www.refworld.org/docid/4ca460b02.html.

[4] Mkhize S, Libhaber E, Sewpaul R, Reddy P, Baldwin-Ragaven L. Child and adolescent food insecurity in South Africa: A household-level analysis of hunger. PLoS One. 2022 Dec 28;17(12):e0278191. doi: 10.1371/journal.pone.0278191. PMID: 36576919; PMCID: PMC9797094.

[5] Food and Agriculture Organization. The Right to Food around the Globe [Internet]. Food and Agriculture Organization of the United Nations. 2015 [cited 2021 Jun 6]. http://www.fao.org/right-to-food-around-the-globe/countries/zaf/en/.

[6] Skoet J, Stamoulis KG. The state of food insecurity in the world 2006 [Internet]. Food and Agriculture Organization. 2006 [cited 2021 Jun 7]. http://www.fao.org/3/a0750e/a0750e00.pdf.

[7] Fraval S, Hammond J, Bogard JR, Ng'endo M, van Etten J, Herrero M, et al. Food access deficiencies in sub-Saharan Africa: prevalence and implications for agricultural interventions. Front. Sustain. Food Syst. 2019. Nov 19; 3:104. 10.3389/fsufs.2019.00104. [CrossRef] [Google Scholar]

[8] Food and Agriculture Organization (FAO) 2024, Hunger and food insecurity, https://www.fao.org/hunger/en/

[9] Food and Agriculture Organization (FAO) 2024, Policy support and Governance Gateway, https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1236494/

Access Scale (HFIAS), and the Latin American and Caribbean Food Security Scale (ELCSA). The FIES was developed by the Food and Agriculture Organization (FAO) through the Voices of the Hungry (VoH) project, building on the pioneering work to develop the USDA Household Food Insecurity Survey Module, HFIAS, and the ELCSA. The FIES was derived from the adult-referenced questions of the ELCSA to create a shortened, standardized experience-based measure for use across sociocultural contexts (Ballard et al., 2013[10], Data4Diets, 2023[11]).

The FIES is an important complement to the long-established indicator of hunger, the Prevalence of Undernourishment (SDG indicator 2.1.1), and other related food insecurity measures, with unique potential for guiding actions aimed at achieving food security targets outlined in the 2030 Sustainable Development Agenda. The FIES is well-aligned with SDG Target 2.1 because it produces indicators that are measures of people´s access to food. The Concept underlying experience-based food security measurement have a long history grounded in ethnographic studies to understand the experience of hunger. Research in the USA revealed that the experience of food insecurity is characterized by uncertainty and anxiety regarding food access and changes in the quality of the diet, such as a less balanced, more monotonous diet. With increasing severity, the quantity of food consumed decreases as portion sizes are reduced, meals are skipped and at its most severe, people are forced to go without eating. Years after the original research was published, a review of more than twenty studies in countries around the world concluded that these dimensions of the experience of food insecurity appear to be common across cultures (FAO 2017[12]).

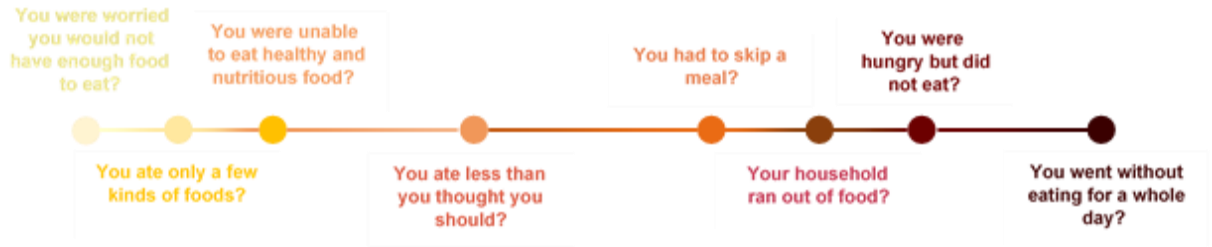


Figure 1. The 8 Food Insecurity Experience Scale issues.

The experiences of FIES, aims to improve the food security not only in terms of access to food, but also in terms of quality and variety. It is an approach that allows us to better consider the realities of the food system.

Indeed, the 'food-systems' that determine the nutritional status of children, covers production but also distribution and sustainability issues. One key feature of the framework is to consider multiple dimensions of distribution, including geographic, economic, demographic and gender to understand the best practices in the fight against child malnutrition. Thus, combined with the FIES methodology, which establishes a rapprochement with empirical and practical reality, a more

[10] Ballard, T.J., Kepple, A.W. & Cafiero, C. 2013. The food insecurity experience scale: developing a global standard for monitoring hunger worldwide. Technical Paper. Rome, FAO. (available at http://www.fao.org/economic/ess/ess-fs/voices/en/).

11 Data4Diets: Building Blocks for Diet-related Food Security Analysis, Version 2.0. (2023). Tufts University, Boston, MA. https://inddex.nutrition.tufts.edu/data4diets. Accessed on 2 February 2024.

12 Food and Agriculture Organization (FAO) 2017, The Food Insecurity Experience Scale: Measuring food insecurity through people's experiences, www.fao.org/in-action/voices-of-the-hungry, I7835EN/1/09.17

integrated range of practice can be created, close to the resolution of the SDGs and above all objective in terms of implementation.
That is the orientation of our study, which is based on an objective and sustained literature review of the two concepts for a better result in the achievement of SDGs # 2.

Figure 2. The food System approach.

This dual focus on production and distribution makes it possible to classify African countries into three main categories that include (a) **cornucopias:** where food insecurity –including among children-- does not appear to be a major issue and therefore the main concern is over higher-order issues of food quality or the emerging obesity crisis; (b) **food-shortage nations**, where agricultural productivity is low because of technical shortcomings (soil fertility, climate, farming technology); and (c) **discrimination nations**, where production is adequate but distribution is limited. The limitations to distribution are further considered in sequence. First are the geographic obstacles associated with transportation and storage infrastructure; then come economic limitation that restrict access to poor families; then are demographic limitations associated with dependency ratios, specifically a high proportion of children to adults in the household, and finally a gender dimension arising from maternal control of domestic resources and possible discrimination against daughters.

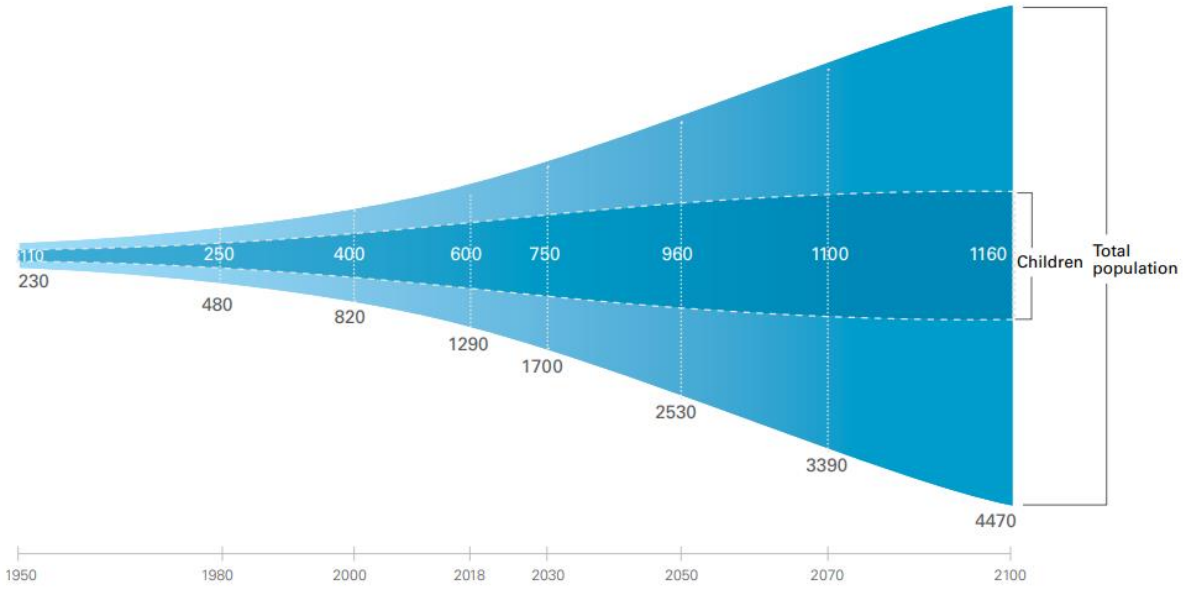
BACKGROWN

According to the FIES and Food System approach achieving food security remains an important challenge in Sub-Saharan Africa. There is a growing gap between consumption, nutrition, and food availability at regional, household, and individual levels. Almost half of the population of this region lives below the poverty line and depends on rain-fed agriculture, animal husbandry, and fishing for their survival. Thus, to ensure its food security, Africa must considerably increase its agricultural production and productivity. This assertion is confirmed by a study which shows that despite the favorable developments in food security throughout the world, the problem

remains very worrying in SSA, where 180 million people were undernourished A third of population (Solagral 2000[13], Goudja and Chen 2021[14]). In Sub-Saharan Africa, food insecurity is due to conflict, climate change, and economic problems. Overall, progress in the fight against malnutrition remains insufficient in Africa. Three quarters of Africans cannot afford a healthy diet according to the Food and Agriculture Organization (FAO). Thus, more than half cannot afford an adequate supply of nutrients (FAO 2020)[15].

The African continent, with all its natural resources and capital (Bouda 2020)[16], is facing a severe food crisis. Home to over 1.2 billion people, the continent hosts more than 600 million children under 18 ages in 2024. This child's population will reach to 1 billion by 2055 and will be the largest among all continents. In 2024, there are 216,024 million children aged 0-4 years in Africa, who will reach to 231,98 million in 2030 (WPP 2022).

Fig 3: Total population and children under age 18 in Africa, 1950-2100 (in millions)



Sources : UN 2017, DESA, WPP 2019, UNICEF 2019

This population is exposed to infant and child mortality of 62.6 per 1000 live births in 2024 and infant mortality of 42.4 per 1000 live births. If nothing is done, infant and child mortality will be 58.1 per 100,000 in 2030 and infant mortality will be 39.1 per 1000 live births, which is far from the target of 25 per 1000 live births mark of SDG 3. Nearly half of all deaths in children under 5 are attributable to undernutrition. Undernutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and delays recovery.

[13] Solagral . The Evolution of the World Food Situation in 1998/99. Tec & Doc. Lavoisier; Paris, France: 2000. [Google Scholar] [Ref list]

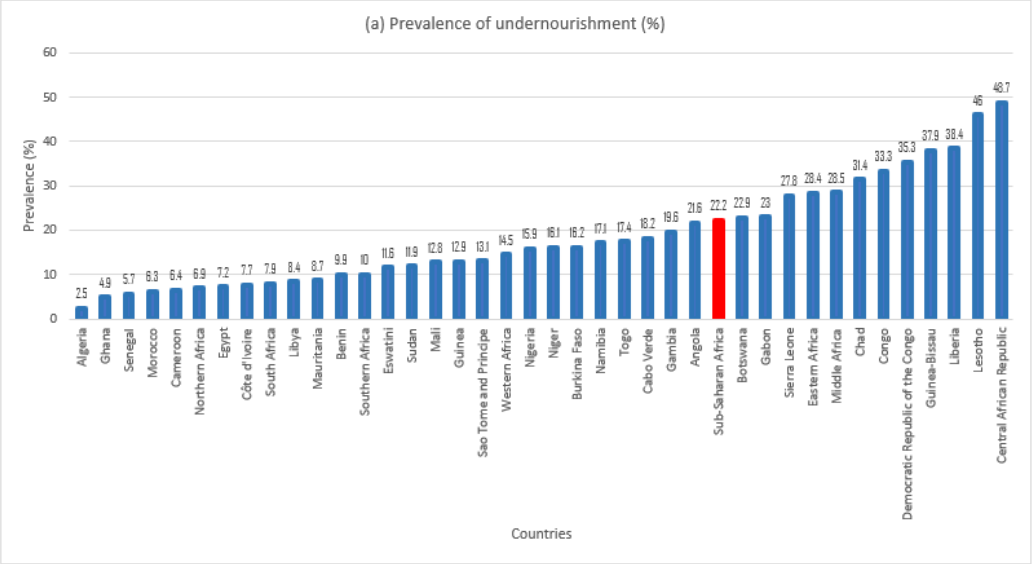
[14] Goudja Gassara and Jihua Chen, 2021 Household Food Insecurity, Dietary Diversity, and Stunting in Sub-Saharan Africa: A Systematic Review, Nutrients. 2021 Dec; 13(12): 4401. Published online 2021 Dec 9. doi: 10.3390/nu13124401

[15] FAO. ECA. AUC . Africa Regional Overview of Food Security and Nutrition 2020: Transforming Food Systems for Affordable Healthy Diets. FAO; Accra, Ghana: 2021. [Google Scholar] [Ref list]

[16] Bouda, Z.HN. (2020). Natural Resource Management and Food Security in Africa. In: Leal Filho, W., Azul, A., Brandli, L., Özuyar, P., Wall, T. (eds) Zero Hunger. Encyclopedia of the UN Sustainable Development Goals. Springer, Cham. https://doi.org/10.1007/978-3-319-69626-3_75-1.

Malnutrition is the main cause of illness and death in children under the age of five (WHO 2018[17]). It affects millions of children worldwide, putting their health and future in jeopardy (Seboka 2021)[18]. Even though the decline has not been consistent worldwide, its prevalence has decreased. In middle- and low-income countries, notably in Sub-Saharan Africa, child malnutrition is still an issue, and many children still suffer from chronic malnutrition (Akombi 2017)[19]. The most common symptom of chronic undernutrition in children is an inadequate intake of the nutrients and energy needed for growth and development.

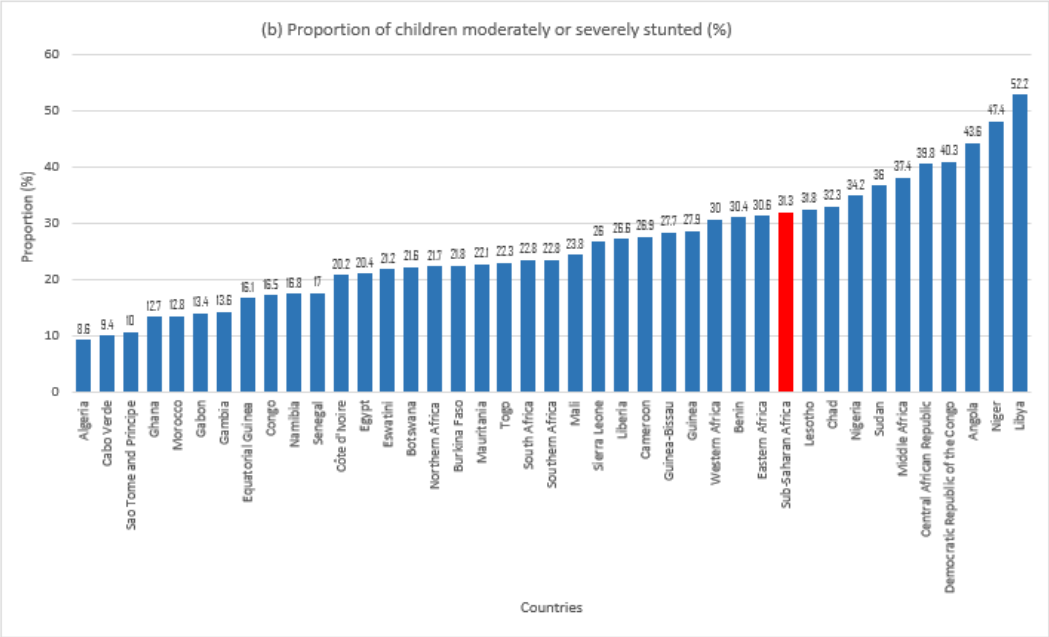
Fig.4 niveau de Food Security selon le FIES

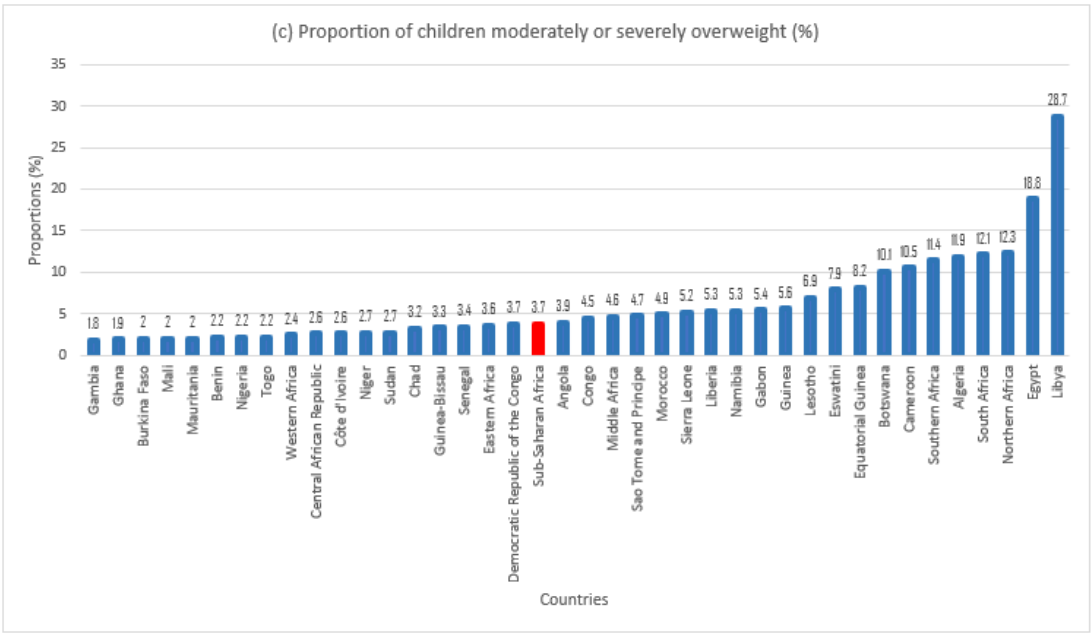


[17] Organisation mondiale de la santé. World Health Statistics 2018: Monitoring Health for the SDGs Sustainable Development Goals. World health organization. 2018.

[18] Seboka BT, et al. Spatial variations and determinants of acute malnutrition among under-five children in Ethiopia: evidence from 2019 Ethiopian Demographic Health Survey. Ann Glob Health. 2021; 87(1).

[19] Akombi BJ, et al. Child malnutrition in sub-Saharan Africa: A meta-analysis of demographic and health surveys (2006–2016). PLoS ONE. 2017;12(5): e0177338.





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Sources: World Bank, FAO, UNICEF, 2021

analysis according to the FIES model allows us to understand several indicators directly related to the measurement of the SDGs. In this context, three indicators for measuring child food insecurity can be considered: the prevalence of undernourishment, the proportion of children moderately or severe stunted and the proportion of children moderately or severely overweight. Micro data from the World Bank, Unicef and FAO (2023), show that 22.2% of children are undernourished in Sub-Saharan Africa (SSA). CAR, Lesotho, Libia, Guinea Bissau, DRC, Congo, Chad, Sierra Leone, Gabon and Botswana have a prevalence above this value. This is concerning given the expected target value of 2.1 of SDG 2 by 2030. As for stunded, the proportion of children with moderate or severe stunded is 31.1% in SSA. This value is slightly lower in North Africa where it shows a value of 21.3% (Fig. 4.a). The countries most affected by child stunded are Libya,

Niger, Angola, DRC and CAR (Fig. 4.b). In terms of childhood obesity, Africa has a low overall level with proportions ranging from 28.7% (Libia) to 1.8% (Gambia), slightly lower than the 2.2% targeted by the SDG2 (Fig. 4.c).

Dietary changes and nutrition transition.

Over the past 30 years, Africa has undergone a major nutritional transition based on profound social change (Abrahams et al. 2011). Hester et al[20] (2011), show that this transition is driven by socio-economic development, urbanization and acculturation and has focused more on the changes in dietary patterns and nutrient. These authors show that it is possible to steer the nutrition transition into a more positive direction, provided that some basic principles in planning public health promotion strategies, policies and interventions are followed. It is suggested that sub-Saharan African countries join forces to study the nutrition transition and implemented interventions on epidemiological, clinical, and molecular (genetic) level for better prevention of both under- and over-nutrition (Hester et al. 2011).

METHODOLOGY

Our methodology is based on a systematic review of literature. This review of the existing literature is meant to identify and classify best practices, using FIES and Food System approach and several search engines that include JSTOR, PubMed, Ebscohost, Science Direct, Web of Science, CAIRN, Health Data Bank public, Google Scholar and reference libraries at Cornell University and IFORD; Eligible studies at this stage has been filtered for their rigor and relevance, and we limit ourselves to recent (the last 20 years) studies about African countries. Selected studies have been coded to describe the magnitude of the estimated effects as well as the type of methods of resilience to child nutrition, and the consequences of food insecurity and malnutrition in the same two approach. The design and elaboration, the issues, the priorities of the country during the period of production of the document, the methods, and the context of the study. The analysis of the gray literature made it possible to answer questions relating to the choices of social policy in terms of local, national, and regional responses to the problems of food insecurity. The literature review has help to construct a typology of common policies (e.g., nutrition monitoring platforms, shared research on food security, advocacy, school canteens, nutrition education, cash transfers, institutional delivery capacity, food supplements, …). We will conclude this review with a meta-analysis, the idea being to help match policies with national context.

In this context, 2320 articles were collected. Their analysis, according to the acceptability criteria, made it possible to retain 79 relevant articles. The summary of the results is presented in Table 1.

RESULT

Nutritional health education.

[20] Hester H. Vorster, Annamarie Kruger, and Barrie M. Margetts, The Nutrition Transition in Africa: Can It Be Steered into a More Positive Direction? Nutrients. 2011 Apr; 3(4): 429–441. Published online 2011 Apr 11. doi: 10.3390/nu3040429 PMCID: PMC3257689PMID: 22254104

Educating children and women about health and nutrition positive attitudes towards food security, and the quality and quantity of food to be consumed are important practices in the fight against food insecurity. Indeed, the nutrition transition has strongly influenced the level of food security in African countries, which in turn is determined by social change, urbanization and socio-economic development (Abrahams et al. 2011, Hester et al. 2011). In this context, Shapu et al (2022), show that education on attitudes and food security has a significant impact on the fight against malnutrition among adolescents. In a context of acculturation experienced in African countries in the midst of urbanization, the promotion of the consumption and preparation of local food and food products (rich in nutrients and available in the local agri-food system, is an effective solution for the fight against food insecurity (Felegush et al, 2018).

Also, nutrition education in the context of school teaching and activities is a practice adapted and closer to the target population, which is the child (Tamiru et al, 2017). This practice has good results in achieving household food security (e.g. reduction in stunting among children), with the impacts being noticeable among students and their families (Mushaphi et al, 2017).

Table 1. Synthesis of literature review

N°	Author, year,	Practice	Practice's function	Targeted populations	Results/Outcome	Country
1	Shapu et al, 2022,	health education guided by the information, motivation, behavioural skill (IMB) theory in Nigeria.	Education.	Adolescent girls aged 10 to 19 years old in Maiduguri, Borno state, Nigeria.	Significant difference in knowledge, attitude and food security at three and six-months post intervention. The triple benefit health education intervention package employed in this study can serve as an intervention tool to combat malnutrition among adolescent girls in Nigeria at large.	Nigeria
3	Downs et al, 2019,	sessions to improve IYCF behaviours among young children in the short term	Persuasion	Mothers and fathers in all households in the villages' farming group with a child 6 to 24 months in three rural villages in Senegal (n=47)	Three of the eight behaviours increased and one decreased Significant increase in the number of children that consumed fish Significantly higher frequency of egg, fish, and thick porridge consumption, Findings suggest that voice messaging IYCF.	Senegal
4	Kang et al, 2017a,	nutrition session, attempted to improve child feeding and hygiene.		Participants were 2064 mother–child pairs from Habro and Melka Bello districts, Ethiopia	1. Mothers in the intervention area showed higher scores than those in the control area regarding meal frequency and feeding score. 2. There were no differences in the scores of breast-feeding, dietary diversity and hand washing between the two areas.	Ethiopia
5	Kang et al, 2017c,	nutrition session, attempted to improve child feeding and hygiene.	Enablement	Participants were 2064 mother–child pairs from Habro and Melka Bello districts, Ethiopia.	Compared with children 6 to 24 months of age in the control area, those in the intervention area had a greater increase in z scores for lengthfor-age and weight-for-length, At the end of the 12-month follow-up, children in the intervention area showed an 8.1% (P = 0.02) and 6.3% (P = 0.046) lower prevalence of stunting and underweight, respectively	Ethiopia
6	Kang et al, 2017b,	nutrition session, attempted to improve child feeding and hygiene.	Enablement	1987 mothers from Habro and Melka Bello districts, Ethiopia.	The recall survey among participants showed a positive perception of the sessions (~90%) and a moderate level of message recall (~65%). The household survey found that the CPNP participants had higher minimum dietary diversity at the early stage and a higher involvement in the Essential Nutrition Action (ENA) programme over a year of follow-up compared with non-participants within the intervention area.	Ethiopia
8	Felegush et al, 2018,	peer-led nutrition education intervention promoting locally available pulses.	Environmental restructuring, Training.	202 school children in Ethiopia.	1. Mean DDS significantly increased. Increased knowledge, attitude and practice about pulse preparation and consumption. 2. There was no significant difference in nutritional status but there was decreased prevalence of wasting. Peer led education strategy provides an opportunity to reduce	Ethiopia

					malnutrition and its impacts if properly designed, including the use of behavioural change mode.	
9	Becquey et al, 2019,	1. preventive package including age-appropriate behaviour change communication on nutrition, 2. health, and hygiene practices and a monthly supply of small-quantity lipid-based nutrient supplements.	Enablement, Persuasion.	Children 0–59 months and uses both community and health facility platforms in in Burkina Faso's Northern Region.	There were no impacts on either acute malnutrition treatment coverage or incidence. This is discussed as barriers to uptake of preventive and treatment services at the health centre.	Burkina Faso
10	Tamiru et al, 2017	schoolbased nutrition education using peer-led, health promotion through school media and health clubs.	Education. Modelling.	Four primary schools (2 rural, 2 urban) in Jimma Zone, Oromia Regional State, Ethiopia.	Significant improvements in food variety between food secure and insecure households, and improvements in animal dietary intake due to intervention. School based nutrition education program should be implemented in comprehensive school health program to reach students and their families.	Ethiopia
11	Morris et al, 2012,	feeding programme for internally displaced mothers.	Education, Enablement.	237 displaced mothers from Kitgum district in Northern Uganda.	The interventions showed that mothers had greater involvement with their babies, more availability of play materials, and less sadness and worry. A proportion of the mothers chose to continue the intervention spontaneously with other mothers in their neighbourhoods. Further research needs to explore the longerterm impact on child growth and intellectual development as well as maternal mood.	Uganda
12	Antwi et al, 2020,	nutrition education that is incorporated into the existing physical education (PE) lessons	Education, Training	351 school-going children aged 6–12, and their primary homebased caregivers, and PE teachers in the study intervention Accra.	Intervention groups had significantly higher nutrition knowledge scores compared to controls in the lower primary level. A higher proportion of children in the intervention group strongly agreed they enjoyed learning about food and nutrition issues compared to the control group. There was no significant difference in MDD scores or in measured anthropometric indices, with a marginal reduction in stunting in the intervention group. Nutrition knowledge of teachers and caregivers significantly improved.	Ghana
13	Mushaphi et al, 2017	Nutrition Education Intervention, Program meme comprised ten topics emphasising healthy eating, hygiene and sanitation.	Education. Enablement.	Eight villages, Limpopo, South Africa. A total of 129 children aged 3 -5 years and 125 caregivers were included.	Majority of children in both the experimental and control groups were given three meals or more per day, including starchy and protein rich foods at baseline and post intervention. Intake of mixed traditional dishes and some indigenous foods did improve significantly. The intake of mixed traditional dishes as well as the intake of the indigenous foods, stinging nettle, meldar, wild peach, pineapple, dovhi, tshigume and thophi,	South Africa

					increased significantly in both the experimental and control groups.	
14	Mushaphi et al, 2015	Nutrition Education Intervention Program comprised ten topics emphasising healthy eating, hygiene and sanitation.	Education. Enablement.	Eight villages, Limpopo, South Africa. A total of 129 children aged 3 -5 years and 125 caregivers were included.	The nutritional status of children did not change significantly following intervention. According to the categories for indicators of iron status, the number of children who were in the 'adequate' category for serum iron, serum ferritin, serum transferrin and percentage transferrin saturation did not change in both groups at postintervention assessment Authors stated that no significant effect on nutrition status was possibly due to the interventions' short duration (12 months) and that food supplementation was not included.	South Africa
15	DeLorme, et al, 2018	improve infant and young child feeding.	Enablement, Training.	Parents with infants and young children were recruited from rural villages in Kenya's East region as well as other community members (neighbours, grandparents, older parents).	The intervention increased nutrition knowledge and confidence, changed perceptions, and supported infant and child feeding practices at the individual, interpersonal, and institutional levels. Environmental and economic constraints continue to affect food access. Engaging the household's network of interpersonal and community relationships can play a role in addressing structural barriers to improve nutrition.	Kenya
16	Dozio et al, 2016,	implemented food coupons and therapy groups to pregnant and lactating women.	Incentivisation, Education.	900 pregnant and lactating women received food coupons and 199 women who were identified as most psychologically vulnerable received therapy in Central African Republic.	Women's average IDDS significantly increased, households improved their FCS, and psychological wellbeing improved. Multi-sectoral approach strengthens family resilience, and psychological influences should be considered to improve nutrition.	Central Africa Republic
17	Saaka et al, 2011,	infant feeding practices, community health seeking behaviour, food supplies and support groups.	Education, Training.	The programme included women and children living in food insecure households in rural farming communities. in select districts in three northern regions of Ghana covered 221 beneficiary communities.	The program reduced chronic malnutrition by 1.5 percentage points per year, and empowered individuals and communities to adopt positive health behaviours. The program showed improvement over time for health-seeking behaviours, practices and coverage of health and nutrition services. Community involvement and ownership were central to the continuity of health activities, where individuals championed and promoted the program.	Ghana
18	Jemmott, 2011,	Cluster RCT Cognitive behavioural health promotion intervention. Interventions	Enablement, Training, Education.	Participants were 1057 grade 6 learners (mean age =12.4 years), with 96.7% retained at	Participants in the health-promotion intervention met 5-a-day fruit and vegetable and physical activity guidelines. The intervention increased health-	South Africa

		were based on Social Cognitive Theory, and the Theory of Planned Behaviour.		12-month follow-up, from Eastern Cape Province, South Africa.	promotion knowledge, attitude and intention. Theory based and contextually appropriate interventions may increase health behaviours among young adolescents in sub-Saharan Africa.	
19	Jemmott, 2019,	fruit and vegetable consumption over the past 30 days Psychosocial, Health promoting-behaviour attitude and intention and drug-and-alcohol-use attitude. (Interventions were based on Social Cognitive Theory, and the Theory of Planned Behaviour).	Enablement, Training, Education.	Participants were 1057 grade 6 learners (mean age =12.4 years), with 96.7% retained at 12-month follow-up, from Eastern Cape Province, South Africa.	The effect on 5-a-day diet did not weaken at long-term compared with short-term follow-up. The effect on physical activity guidelines was weaker at long-term follow-up, mainly because of a reduced effect on muscle-strengthening physical activity. The intervention also increased health promotion attitude and intention and health knowledge and reduced binge drinking compared with the control group.	South Africa
20	Galasso et al, 2019,	1. weighing infants, providing nutrition counselling to the mothers, 2. promoting behavioural change nutrition and hygiene education sessions, and 3. suppling micronutrient supplementation.	Training, Education, Enablement.	3738 mothers and infants in 1999 in four provinces and expanded to all six provinces in Madagascar in 2000.	There were no main effects of any of the intervention groups on any measure of anthropometry or any of the child development outcomes in the full sample, Compared with children in the intervention group, the youngest children (<6 months at baseline) in the T2 and T3 intervention groups who were fully exposed to the child LNS dose had higher length-for-age Z scores and lower stunting prevalence.	Madagas car
21	Abiyu et al, 2020,	1. complementary feeding behaviour change communication 2. consumption of dairy products, eggs, vitamin Arich fruits and vegetables, other fruits and vegetables and animal-source foods;	Training, Modelling, Enablement	612 mothers of infants aged <6 months at enrolment. Rural communities of West Gojjam Zone, Ethiopia.	The intervention significantly increased consumption of dairy products, eggs, vitamin Arich fruits and vegetables, other fruits and vegetables and animal-source foods. Complementary feeding behaviour change communication intervention delivered through community level actors significantly improved the dietary adequacy of infants.	Ethiopia
22	Walton et al, 2017,	nutrition education intervention was developed to enhance women's nutrition knowledge and food skills.	Modelling, Education, Persuasion.	Study was located, Central Province, Kenya. The Mukurweini study group consisted of 88 women in four dairy membership-duration categories from a previous study and nondairy member women.	The approach for women's nutrition education positively influenced nutrition knowledge, practices and diet quality. Increased dietary diversity was dependent on dairy group membership. Some intervention effects were dependent on poverty reduction, but all women were able to make positive dietary changes when informed. Need to examine long term impacts of nutrition education interventions.	Kenya
23	Passarelli et al, 2020,	chicken production intervention with nutrition-sensitive behaviour change communication.	Environmental restructuring, Enablement, Persuasion.	829 children aged 0–36 months at baseline from rural agricultural villages in 4 regions of Ethiopia: Amhara; Oromia; Southern Nations, Nationalities,	The chicken production intervention without behaviour change communication had higher HAZ and WAZ at end line than the controls. The chicken intervention with behaviour change communication showed similar trends at end line but were not significantly different to	Ethiopia

				and Peoples' Region; and Tigray.	the control, but children had higher MDD and egg consumption. A chicken production intervention with or without nutrition-sensitive behaviour change communication may have benefited child nutrition and did not increase morbidity.	
24	Leroy et al, 2019	food rations, health services strengthening and promotion, and behaviour change communication on nutrition, hygiene, and health practices.	Enablement, Education, Persuasion.	Pregnant women (>4 months of gestation) and mothers of children aged 6-24 months from Burundi.	The intervention significantly improved the percentage of food secure households, increased household energy consumption and micronutrient consumption. Positive effect on maternal dietary diversity (+0.4 food groups, $P < 0.05$) and increased. The effects on many outcomes were attributable to the food rations Post-program effects ($P < 0.05$) were found on household food security, maternal dietary diversity, and younger sibling's complementary feeding practices.	Burundi
25	Huybregts et al 2019,	small-quantity lipid-based nutrient supplements into community-level screening for acute malnutrition.	Enablement, Persuasion, Incentivisation.	Children 6–23 months of age and caregivers. 48 health center catchment areas in Mali.	The intervention significantly increased acute malnutrition screening coverage. No impact on treatment coverage or AM prevalence was found. Children in the intervention arm, however, were 29% less likely to develop a first AM episode (incidence) and, compared to children in comparison arm, their overall risk of AM (longitudinal prevalence) was 30%.	Mali
26	Olney et al, 2019,	food rations, health services strengthening and promotion, and behaviour change communication on nutrition, hygiene, and health practices.	Enablement, Education, Persuasion.	Pregnant women (>4 months of gestation) and mothers of children aged 6-24 months from Burundi.	At first follow-up, Tubaramure positively affected language but not motor development among children aged 4–23.9 months. Among infants 12–23.9 months, the program positively affected language and motor development. At second follow-up, among children aged 24–41.9 mouths, Tubaramure marginally affected motor development Significant positive impacts on diet, health, and nutritional indicators of children aged 12–23.9 months and health and nutritional indicators of children aged 24–29.9 months, supporting the plausibility of program impacts on child development.	Burundi
27	Leroy et al, 2018,	food rations, health services strengthening and promotion, and behaviour change communication on nutrition, hygiene, and health practices.	Enablement,	Pregnant women (>4 months of gestation) and mothers of children aged 6-24 months from Burundi.	Stunting (height-for-age z score) increased markedly from baseline to follow-up, but Tubaramure had a significant beneficial effect. Secondary analyses showed that the effect was limited to children whose mother and head of household had some primary education and who lived in households with above-median assets.	Burundi

28	Leroy et al, 2016,	food rations, health services strengthening and promotion, and behaviour change communication on nutrition, hygiene, and health practices	Enablement, Education, Persuasion.	Pregnant women (>4 months of gestation) and mothers of children aged 6-24 months from Burundi.	Haemoglobin decreased and anaemia increased markedly from baseline to follow-up. Significant beneficial effect on both children and mothers who had given birth in the previous 3 months. Significant ($P < 0.05$) impacts on factors along the hypothesized impact pathways: dietary diversity, consumption of iron-rich foods, morbidity, and fever for child haemoglobin and dietary diversity, consumption of iron-rich foods, and current bed-net use for maternal anaemia.	Burundi
29	Mulualem et al, 2016	education on complimentary feeding practices of mothers.	Education, Training, Incentivisation.	160 households with children 6–18 months of age were selected by a systematic sampling method from 21 rural Kebeles of Ethiopia.	Significant improvements in children's mean weight, weight for height, and weight for age occurred in the intervention site only. The KAP of mothers on pulse-incorporated complementary feeding and the nutritional status of their young children measured in terms of wasting and underweight prevalence were shown to be improved through an actionoriented and recipe-based nutrition education intervention.	Ethiopia
30	Heckert et al, 2020	food rations, health services strengthening and promotion, and behaviour change communication on nutrition, hygiene, and health practices.	Enablement, Education, Persuasion.	Pregnant women (>4 months of gestation) and mothers of children aged 6-24 months from Burundi.	Providing food assistance for the full 1,000 days led to the lowest cost per percentage point reduction in stunting. Reducing the duration of ration eligibility reduced per beneficiary costs but was less effective. A 2-year extension could have saved 18% per person. Programs providing smaller rations or rations for shorter durations, although less expensive per beneficiary, may not provide the necessary dose to improve (biological) outcomes. Delivering effective programme for longer periods can generate cost savings by dispersing start-up costs and lengthening peak operating capacity.	Burundi
31	Ogunsile & Ogundele, 2016	Nutrition education, using a board game, to improuve knowledge of healthy eating.	Environmental restructuring, Enablement, Training.	One hundred and fortythree secondary school. Students selected from 4 local government areas in Ibadan, Nigeria. 143 (84 males and 59 females) adolescents with a mean age of 13.59 years.	Significant improvements on adolescents' knowledge, attitude and practice of healthy eating. Creative strategies should always be incorporated into nutrition education programme for adolescents.	Nigeria
32	Tariku et al 2015,	complimentary feeding practices of mothers.	Education, Training, Incentivisation.	166 households with children 6–18 months of age were selected by a systematic sampling	Diet diversity significantly increased, including improvements in food groups were most noticeable as legumes & nuts. Intervention based on theory are successful at improving complimentary feeding.	Ethiopia

				method from 21 rural Kebeles of Ethiopia.		
33	Galasso et al, 2009,	nutrition programme that included weighing infants, providing nutrition counselling to the mothers, promoting behavioural change nutrition and hygiene education sessions, and suppling micronutrient supplementation.	Training, Education, Enablement.	Mothers and infants in 1999 in four provinces and expanded to all six provinces in Madagascar in 2000.	The programme helped 0–5 years old children in the participating communities to bridge their gap in weight-for-age z-score and the incidence of underweight. The programme had significant effects in protecting long-term nutritional outcomes (height-for-age z-scores and incidence of stunting). Less educated mothers and worse-off households were less placed to benefit from the programme in terms of nutritional outcomes. Less educated mothers and worse-off households were less placed to benefit from the programme in terms of nutritional outcomes.	Madagascar
34	Saaka et al, 2021	health/nutrition education intervention in Ghana.	Persuasion, Modelling, Education.	712 mothers with children aged 6–36 months from Northern Ghana.	Minimum dietary diversity and the minimum acceptable diet improved significantly. Nutrition related knowledge, attitudes and practices scores were significantly higher The intervention did not have significant effects on the nutritional status as measured by heightfor-age Z-score or weight-for-height Z-score	Ghana
35	Yetnayet et al 2017,	nutrition education intervention based on the Health Belief Model, and using pulses, to improve knowledge, attitude and practice of women of reproductive age.	Enablement, Training, Education	200 randomly selected women from Southern Ethiopia. All women of reproductive age (15 – 49 years).	Significant improvement in the mean knowledge, attitude, and practice scores in the intervention group compared to control group. Significant improvement in the scores of Health Belief Model constructs. The success of this intervention may be due to using pulses processing and recipes demonstrations repeatedly, involving peer learning and experience sharing.	Ethiopia
36	Hurley et al, 2021,	gave lipid-based nutrient supplement to infants and social and behaviour change communication to caregivers.	Enablement, Persuasion, Education.	Infants from 6– 23 months of age, accompanied by caregivers in rural, agrarian districts in central Malawi.	Growth velocities favoured program children, such that LAZ (+0.12/y), WLZ (+0.12/ y), and MUAC (+0.24 cm/y) measurements increased. Significant 13.8 pp reductions in the prevalence of malaria and fever at the 18-month follow-up. Significant improvements of 20 pp in minimum dietary diversity and minimum acceptable diet were seen in the programme versus comparison district at 18 months of follow-up.	Malawi
37	Lagerkvist et al, 2018	providing a meal based on orange-fleshed sweet potato, rich in pro-vitamin linked to goal setting.	Education, Training, Enablement.	556 randomly selected children aged 7–12 in Osun state, Nigeria.	Planning by stating intentions increased the amount eaten. Priming of the experimental goals evoked positive feelings after eating. School meals programme should be designed to better align personal motivation with behavioural change in relation to dietary health.	Nigeria

38	De Villiers et al, 2016	Knowledge, Self-Efficacy and Behaviour (KAP)	Training, Education.	Participants were year four children, 9 years old (n=500) at eight schools in the intervention group and eight in the control group (n=498), in the Western Cape Province of South Africa.	The intervention improved nutrition knowledge and self-efficacy significantly in primary school children, but it did not improve their eating behaviour. A programme mostly driven by school staff and with specific guidelines on how to integrate it with the curriculum could improve nutrition knowledge and self-efficacy in children.	South Africa
39	Steyn et al, 2015	Knowledge, Self-Efficacy and Behaviour (KAP)	Training, Modelling, Education.	Participants were year four children, 9 years old (n=500) at eight schools in the intervention group and eight in the control group (n=498), in the Western Cape Province of South Africa.	The estimated dietary diversity score intervention effect over the two years was not significant. Food groups least consumed were eggs, fruit and vegetables. Unhealthy snack consumption in terms of frequency of snack items consumed did not improve significantly in intervention or control schools.	South Africa
40	Grant et al, 2022	incorporation of biofortified orange fleshed sweet potato into children's diets) on caregiver health and nutrition knowledge and practices.	Education, Enablement, Persuasion.	Primary caretakers of children aged 6-59 months in households in eastern and southern highland zones of Tanzania (all seven VISTA Tanzania project intervention districts).	Participation in nutrition group meetings was significantly associated with the health and childcare knowledge score (HKS), HDD and CDD scores, and household and young child VA intake; the magnitude of the associations was greater for caregivers who attended at least four meetings, Findings emphasize the need for programs that seek to address the issues present in the use of nutrition SBCC at the community level to improve maternal or caregiver knowledge and practices and subsequently the nutrition status, of infants and young children	Tanzania
41	Tomlinson et al, 2020	improve infant feeding to promote maternal sensitivity and maternal– child attachment.	Training, Enablement, Modelling.	449 women assessed during pregnancy, and then when their infant was 2, 6, 12 and 18months old in a periurban area with high levels of poverty, near Cape Town, South Africa.	During a feeding interaction, maternal sensitivity was significantly improved among non-breastfeeding mothers who received the intervention. Particularly, maternal responsiveness to infant cues and synchronous interactions was higher among non-breastfeeding intervention mothers compared to control group mothers. The results also show that non-breastfeeding mothers who received the intervention were significantly less intrusive in their interactions with their infants. This suggest that the intervention offered a protective effect for non-breastfeeding mothers.	South Africa
42	Mutiso et al, 2018	IYFC practices among different women for nutrition education and psychosocial	Education, Persuasion, Enablement.	665 women of different categories: (1) pregnant women who were also caregivers of children below 2 years, (2) mothers of 0–5 months old	Nutrition education participation mother-tomother club health talks had the greatest effect on the extent to which IYCF practices are used, likely because these platforms provide opportunity to discuss, and overcome, some of barriers with peers within the	Kenya

				children, (3) mothers of 6–23 months old children, and (4) potential mothers in Kenya.	communities. This study also finds strong evidence that these nutrition education strategies jointly affect the expected number of IYCF practices used.	
43	Workicho et al, 2021	Minimum Dietary Diversity, (MDD), Minimum Meal Frequency (MMF) Minimum Acceptable Diet (MAD) Women's diet diversity	Modelling, Persuasion, Education.	Pregnant and/or lactating women from Amhara and Oromia regions of Ethiopia.	13.6% change in iron folic acid (IFA) intake for 3 months. Not statistically significant but large to moderate positive changes in child minimum diet diversity (20%), minimum acceptable diet (18%) and women diet diversity (7.9%).	Ethiopia
44	Skar et al, 2019	Psychosocial support intervention integrated with a health and nutritional supplement.	Training, Enablement, Modelling,.	350 children aged 1–18years were recruited from 12 child centers for orphans and other vulnerable children in the Maputo area, Mozambique.	Improvement among 93.5 percent of the children categorized as malnourished before the intervention. Children's self-reported data on strengths and difficulties (N = 79) suggest significant increases in prosocial behaviour in the intervention group. Caregivers (N = 40) reported strengthened relationships, improved communication, and improved nutritional menus within the intervention centers.	Mozambique
45	RuelBergeron et al, 2019b	1. Daily, fortified, small-quantity lipid-based nutritional Supplement and 2. behaviour change messages around optimal infant and young child feeding (IYCF); 3. water, sanitation, and hygiene.	Training, Persuasion, Enablement.	Mother and their children aged 6–23 months in two neighbouring, rural districts in Malawi.	Half (49.5%) of eligible children redeemed programme benefits by 8 months of age during th first 4 years of programme implementation. Knowledge of IYCF, WASH, and SQ-LNS messages by volunteers was >85% for most messages, except ability to list the 6 food groups (35.7%). Structured direct observations of SQ-LNS distributions indicated high fidelity to programme design, whereas those of householdlevel counselling sessions revealed lack of ageappropriate messaging. Programme reach showed participation in monthly distribution sessions of 81.0%, group counselling of 93.3%, and individual-level counselling of 36.9%.	Malawi
46	Ezezika et al, 2018	gamification of nutrition through board games, clubs and vouchers. (eating behaviour, attitudes and knowledge about nutrition).	Enablement, Training, Education.	Three secondary schools in Abuja, Nigeria. 31 adolescents 13-17 years participated in the focus groups.	Participants perceived that the intervention shifted their perceptions and preferences, and altered their behaviour by eating nutritious foods, increasing physical activity, and improving overall well-being. Gamification has short-term positive influences on adolescent dietary and physical activity behaviours, but more research needs to explore the long-term improvements.	Nigeria
47	Fernandes et al, 2016	1. School Meals Planner Package; 2. behaviour change communication campaigns introduced in Ghana. 3. Developing menus for home-grown school feeding programmes.	Education. Enablement, Persuasion.	Intervention introduced in 42 districts in Ghana, reaching more than 320 000 children.	Monitoring and evaluation approaches found positive findings including that the tool was easy to use but called for more capacity building. Complaints included that correct ingredient usage estimates made meals too expensive. The tool is valued by Ghana's government at	Ghana

					the highest levels as it is adopted as an official policy, due to supporting nutritious, locally sourced menus for the school feeding programme in Ghana.	
48	RuelBergeron et al, 2019a	1.Daily, fortified, small-quantity lipid-based nutritional Supplement; 2. behaviour change messages around optimal infant and young child feeding (IYCF) and water, sanitation, and hygiene.	Training, Persuasion, Enablement.	Mother and their children aged 6–23 months in two neighbouring, rural districts in Malawi. MMF, MDD. Caregivers' IYCF knowledge related to breastfeeding, complementary feeding, and feeding during illness was assessed and a knowledge score calculated.	The absence of inclusion of an older cohort of children (24–41 months) in the impact evaluation limited ability to measure programme impact on children who had received full exposure. Ongoing training, motivation, supervision, and encouragement of care group volunteers is critical to programme success and a key element for high retention of participants throughout the life of the programme. Investing in understanding the country and programme context, including the behavioural patterns of the population is necessary for implementing the most efficient M&E systems and reaching the target population.	Malawi
49	Christian et al, 2020	1. Daily, fortified, small-quantity lipid-based nutritional supplement; 2. behaviour change messages around optimal infant and young child feeding (IYCF); 3. water, sanitation, and hygiene.	Training, Persuasion, Enablement.	Mother and their children aged 6–23 months in two neighbouring, rural districts in Malawi.	No differences in mean LAZ or prevalence of stunting were found at end line. However, mean weight, WLZ, and MUAC were higher at end line by 150 g, 0.22, and 0.19 cm, respectively, in the programme compared with the comparison district (all $P < 0.05$). Weekly reports of high fever and malaria were also lower by 6.4 and 4.7 percentage points, respectively, in the programme compared with the comparison district. There was no impact on anaemia. Children's dietary diversity score improved by 0.17, and caregivers' infant and young child feeding and hand-washing practices improved by 8–11%in the programme compared with the comparison district.	Malawi
50	Muehlhoff et al, 2017	1. provided agricultural support; 2. Community based nutrition education on improved infant and young child feeding.	Incentivisation, Education, Environmental restructuring.	Focus groups in Malawi were conducted in selected villages involving a total of 170 stakeholders – mothers, caregivers, project stakeholders and government staff.	Barriers included availability and access to nutritious, affordable foods, and adverse effects on mothers' time and childcare needs. Integrated programme can ensure that caregivers with young children benefit from multiple sectors' work. Volunteers are a crucial resource for community-based interventions.	Malawi (and Cambodia)
51	Kim et al, 2019a	1. Interventions through 4 platforms: interpersonal communication (IPC), 2. nutrition-sensitive agricultural activities (AG), 3. community mobilization (CM), 4. mass media (MM).	Persuasion, Environmental restructuring, Modelling, Enablement.	Households with children aged 6–23.9 months in Ethiopia.	Significant differential declines in stunting prevalence were observed in children aged 6–23.9 months, decreasing from 36.3% to 22.8% in the intensive group. Dose–response analyses showed higher odds of MDD and MMF and higher HAZ among women exposed to 3 or 4 intervention platforms. Strong relation between	Ethiopia

					agricultural intervention and egg consumption, which led to increased child dietary diversity and HAZ.	
52	Byrd et al, 2019	1. Optimal infant and child feeding practices, 2. children 6–24 months of age were provided with small quantity lipid based nutrient supplements.	Enablement, Training, Education, Persuasion.	10 districts within in Kenya, with one to two villages with a minimum of six women per cluster.	Compared to controls, there were no differences for MDD, MMF, and MAD for nutrition counselling or supplementation arms. To improve complimentary feeding practices, a higher intensity and frequency of behaviour change communication may see more sustained results.	Kenya
53	Mlinda et al, 2018	practical nutrition programs on feeding skills in caregivers of children with cerebral palsy.	Education, Training, Enablement, Environmental restructuring.	110 children under 5 with cerebral palsy in Dar es Salaam, Tanzania.	The intervention significantly improved feeding skills of caregiver such as feeding children slower and involved the child during the feeding process. Strengthening nutrition education and services for caregivers of children with cerebral palsy improves the health outcomes of children and reduce stress among parents/caregivers.	Tanzania
54	Kumar et al, 2018	1. Realigning Agriculture for Improved Nutrition (RAIN) 2. intervention in a multisectoral approach integrating agricultural diversification, promotion of gender equality, women's empowerment 3. nutrition behaviour change communication.	Modelling, Education, Enablement, Persuasion.	Mother's groups who were pregnant or lactating in rural Zambia.	Positive effects on women's empowerment, infant and young child feeding knowledge, child morbidity and WHZ scores, but no impact on stunting. Fostering higher participation rates could support greater impacts on child nutrition outcomes.	Zambia
55	Rosenberg et al, 2018	1. Realigning Agriculture for Improved Nutrition (RAIN) 2. intervention in a multisectoral approach integrating agricultural diversification, 3. promotion of gender equality, women's empowerment and nutrition behaviour change communication.	Modelling, Education, Enablement, Persuasion.	Mother's groups who were pregnant or lactating in rural Zambia.	The programme increased diversity in crops grown and the number of months in which various food groups were harvested. The programme substantially increased the percentage of households producing three nutritious crops it promoted (groundnuts, rape and tomatoes). Modest increases in household access to diverse food groups. Despite modest increases in the proportion of children consuming pulses, legumes and nuts, ultimately there were no significant improvements in the overall dietary diversity of young children or their mothers.	Zambia
56	Flax et al, 2021	Social and Behaviour Change Communication (SBCC) intervention to promote the consumption of Animal source foods (ASFs).	Enablement, Education, Training, Persuasion.	The mother was 18–49 years of age and had a child who was 12–29 months of age Nyabihu and Ruhango Districts, Rwanda.	More mothers in the intervention group compared with the control group knew they should feed their children Animal source foods and give them 1 cup of cow's milk per day. Children's consumption of fresh cow's milk 2 or more times per week increased in the intervention group, although not significantly and minimum dietary	Rwanda

					diversity was unchanged. In poor households receiving a livestock transfer, strategies to further tailor, SBCC and increase cow's milk production may be needed to achieve larger increases in children's frequency of milk consumption	
58	Briaux et al, 2020	unconditional cash transfer (UCTs) with behaviour change communication.	Persuasion, Incentivisation, Enablement, Training.	Women > 3 months, pregnant and mothers of children aged 0–23 months 5 districts in Burkina Faso.	UCTs had a protective effect on HAZ scores, which deteriorated in the control arm while remaining stable in the intervention arm but had no impact on stunting. UCTs positively impacted both mothers' and children's (18–23 months) consumption of animal source foods and household food insecurity. The UCT arm did not impact on reported child morbidity 2 week's prior to report but reduced the financial barrier to seeking healthcare for sick children. Women who received cash had higher odds of delivering in a health facility and lower odds of giving birth to low-birth-weight babies. Positive effects were also found on women's knowledge and physical intimate partner violence.	Togo
59	Lion et al, 2018	1. the use of green leafy vegetables (greens) and iron-fortified bouillon cubes in stews to improved iron intake. 2. behaviour change program	Enablement, Education, Persuasion, Incentivisation.	527 mother-daughter pairs (daughters aged 12–18) from Ile-Ife (Intervention town). Osogbo (Control town) in Nigeria.	Change in iron-fortified cubes added to stews did not significantly differ between towns. Increase in cubes added to soups was significantly larger in the Intervention town compared to the Control Town. Change in greens added to soups was significantly larger in the Control town compared to the Intervention town. The intervention positively influenced awareness of anaemia and the determinants of behaviour in the Intervention town, with hardly any change in the Control town.	Nigeria
60	KatengaKaunda et al, 2022	maternal education trial was used to conduct a thematic analysis using a social ecological framework to describe the factors that influenced dietary adherence	Modelling, Enablement Education, Persuasion.	Ten pregnant women from the intervention arm of the original RCT, 22 significant family members to the women (husbands and mothersin-law) from the same intervention communities and twelve counsellors who had conducted the educational trainings and who had some influence in their local communities Nankumba	Main barriers of adherence to the intervention were taste, affordability, and poverty Use of powders and one-pot dishes, inclusion of both women and significant family members and a harmonisation with local food practices enabled adherence to the intervention It is crucial to focus the dietary education and counselling intervention on locally available ingredients and food processing methods Use of contextualised food-based solutions to combat maternal malnutrition was observed to be relatively cheap and sustainable	Malawi

				area in Mangochi, Southern, Malawi		
61	KatengaKaunda et al, 2020	nutrition education and dietary counselling with regard to improvements in quality of diet and use of the Theory of Planned Behaviour to explain changes in their dietary behaviour.	Modelling, Enablement, Education, Persuasion.	257 pregnant women in twenty villages in the Namkumba area in Mangochi, Southern Malawi	The intervention achieved improvements in DDS and the Six Food Group Pyramid (SFG) score, especially in intakes of micronutrient-rich foods The theorised behaviour mediators (i.e., nutrition attitudes, nutrition behaviour control and subjective norm) that had improved were significantly associated with high DDS Attainment of high DDS was a consequence of the women's belief in the effectiveness of the proposed nutrition recommendations.	Malawi
62	Kim et al, 2016	1.Alive & Thrive (A&T) provided intensive behaviour change interventions through 4 platforms: interpersonal communication (IPC); 2.nutrition-sensitive agricultural activities, community mobilization, and mass media.	Persuasion, Environmental restructuring, Modelling, Enablement.	Households with children aged 6–23.9 months in Ethiopia.	Early BF initiation and exclusive BF increased by 13.7 and 9.4 percentage points. Complementary foods, minimum dietary diversity, minimum meal frequency increased significantly in the intensive group but remained low at end line. Timely introduction and intake of foods promoted by the interventions improved significantly, but anthropometric outcomes did not.	Ethiopia
63	Flax et al, 2022,	a complementary feeding SBCC intervention which engaged parents through community meetings, religious services, home visits from community health extension workers, mobile phone messages (fathers only), and mass media	Enablement, Education, Training, Persuasion.	Fathers and mothers with a child aged 6–23 months in 6 of 12 wards in the Igabi local government area of Kaduna State, Nigeria	Children's MDD did not change, children's consumption of fish and eggs and MMF increased The intervention improved complementary feeding practices, fathers' and mothers' knowledge of complementary feeding, and fathers' support for complementary feeding, despite low levels of reported exposure	Nigeria
64	Jacobs et al 2013	educational visits to stores, suppliers and distribution centres, and talks for learners and parents by a network of trained dietitians.	Enablement, Education Training, Persuasion	Four intervention and five control schools (n = 325 students) were selected in Western Cape, South Africa.	Small significant improvement in eating vegetables and taking lunch boxes to school but not explained by improvements in healthy eating, self-efficacy or knowledge. As small significant results, the programme may need further evaluation to assess if this a worthwhile scheme.	Africa Africa
65	Kim et al, 2019b	1. Alive & Thrive's intervention programs to improve IYCF practices were used to examine the extent of and factors associated with intervention exposure 2. (IPC with or without other SBCC interventions [MM, CM, and nutritionsensitive agricultural (AG) activities])	Persuasion, Environmental restructuring, Modelling, Enablement.	Mothers with children aged <2 years in Bangladesh (n = 1001), Ethiopia (n = 1720), and Vietnam (n = 1001)	In Ethiopia, exposure to IPC with other interventions was associated with higher odds of achieving MMF, MDD and consumption of iron-rich foods Near-monthly visits were associated with 2–3 times higher odds of IYCF practices Exposure matters for impact, but the combination of behaviour change interventions and number of IPC contacts required to support IYCF behaviour change are context specific	Ethiopia
66	Nordhagen and Klemm, 2018,	nutrition-sensitive poultry production; egg consumption in the last 7 days for	Training, Environmental	Households in four diverse African contexts - three rural	Despite project-provided training and inputs, there was only limited uptake of many "best practices" Egg	urkina Faso,

		young children and in the past 24h for women	restructuring, Persuasion, Modelling.	and one urban (Burkina Faso, Tanzania, Senegal, and Cote d'Ivoire)	consumption remained low; however, children whose mothers were exposed to project messages on nutrition were more likely to eat eggs, and consumption was consistently higher among households with chickens Key lessons learned from implementation: (a) strong behaviour change communication is needed to encourage egg consumption, (b) nutrition-sensitive village poultry programmes should often focus more on improved practices than improved breeds, (c) supporting women's chicken production is not a route to empowerment without complementary activities that directly support women's ownership and decision making	Cote d'Ivoire, Senegal, Tanzania
67	Kim et al, 2015	Alive & Thrive provided intensive behaviour change interventions through 4 platforms: interpersonal communication (IPC), nutrition-sensitive agricultural activities, community mobilization, and mass media.	Persuasion, Environmental restructuring, Modelling, Enablement.	Households with children aged 6–23.9 months in Ethiopia.	Job aids were used regularly by most supervisors and HEWs, but only 54% of volunteers in Tigray and 39% in SNNPR received them. Quality of programme message delivery was lower among volunteers, and aided recall of key messages among mothers was also low Although FLW supervision exposure was high, content and frequency were irregular.	Ethiopia
68	Mukuria 2016	engaging fathers or grandmo**thers in improving mother child feeding practice**. This included peer education dialogue groups with fathers and grandmothers.	Education, Incentivisation, Training, Modelling.	177 fathers and 156 grandmothers in intervention. For evaluation, four focus groups were held with fathers and four with grandmothers.	As the number of social support actions increased, the likelihood of a mother reporting that she had fed her infant the minimum number of meals in the past 24 hours also increased between baseline and end line. When taking into account the interaction effects of intervention area and increasing social support over time, a significant association was found in the grandmother intervention area on dietary diversity No significant effects were found on minimum acceptable diet.	Kenya
69	Thuita et al 2015	engaging fathers or grandmothers in im**proving mother child feeding practice.** This included peer education dialogue groups with fathers and grandmothers.	Education, Incentivisation, Training, Modelling. Enablement Education, Modelling, Persuasion, Environmental restructuring	177 fathers and 156 grandmothers in intervention. For evaluation, four focus groups were held with fathers and four with grandmothers. leaders, women's group leaders, and community health extension workers.	Men typically provide advice on starchy foods, such as maize and maize meal, and animal protein while mothers and grandmothers often give advice on fruits and vegetables to families. Recommendations for future interventions should make use of existing community level structures allowing groups to select their leaders, and design interventions informed and guided by gender roles. Engaging father, grandmothers and mother would enhance the impact.	Kenya

70	Gelli et al, 2020	1. early childhood development centre–based agriculture and nutrition intervention, including behaviour change communication training. 2. DDS, MDD, Knowledge of infant and young child feeding . WAZ, HAZ, and WHZ.		60 community-based childcare centres, covering 1248 preschool children (aged 36–72 months) and 304 younger siblings (aged 6–24 months), in the Zomba district of Malawi.	Positive impacts were found for several individual micronutrient intakes: vitamin A, vitamin C, riboflavin, zinc. These impacts were driven by effects on younger children (aged 3–4 years). Using a preschool platform to implement a nutrition-sensitive BCC intervention is an effective strategy to improve the adequacy of micronutrient intake of preschool children in food-insecure settings.	Malawi
71	Gelli et al, 2018	1. Child dietary diversity (for preschoolers) and household dietary diversity. 2. IYCF knowledge and practices	Enablement Education, Modelling, Persuasion, Environmental restructuring.	1248 preschool children (aged 36–72 mo) and 304 younger siblings (aged 6–24 mo) from n 60 community-based childcare centers in the Zomba district of Malawi since 2008.	Compared with the control group, preschool children in the intervention group had greater increases in nutrient intakes and in dietary diversity. No impacts on anthropometric measures were seen in preschoolers. Younger siblings in the intervention group had greater increases in height-for-age z scores than did children in the control group and greater reductions in the prevalence of stunting	Malawi
72	Olney et al, 2016	agricultural production and behaviour change communication by dedicating land to women's production and consumption of nutrientrich foods and to generate additional income.	Education, Training, Persuasion, Environmental restructuring, Modelling.	55 in eastern Burkina Faso with 55 all women with children 3–13months.	Significant increases in mothers' fruit intake, small increases in meat/poultry intake, and dietary diversity. Prevalence of underweight was significantly reduced. Although the changes in BMI did not differ between mothers in treatment and control villages, there was a marginally significant interaction indicating that underweight mothers had a greater increase in BMI than did mothers who were not underweight. Mothers' overall empowerment score increased: meeting with women, purchasing decisions and health care decisions.	Burkina Faso
73	Olney et al, 2015	agricultural production and behaviour change communication by dedicating land to women's production increase production and consumption of nutrientrich foods and to generate additional income.	Education, Training, Persuasion, Environmental restructuring, Modelling.	55 in eastern Burkina Faso with 55 all women with children 3–13months.	The intervention significantly improved several child outcomes, including wasting (marginal), diarrhoea, Hb, and anaemia, especially among the youngest children. No significant impacts on stunting or underweight prevalence. Specifically, the behaviour change communication, that enabled women's empowerment, and are likely to be transformational and to have long-lasting benefits for women and their families.	Burkina Faso
74	McKune et al, 2020	increase child egg consumption in rural Burkina Faso.	Modelling, Enablement, Education, Persuasion, Training.	260 mother-child dyads with children aged 4 to 17 months from 18 villages in Kaya Department in Burkina Faso.	Intervention significantly increased egg consumption and women's decision-making about eggs. Intervention significantly decreased infant wasting and underweight. When coupled with the gift of chickens, the behaviour change intervention yielded a greater increase in egg	Burkina Faso

					consumption and significantly reduced wasting and underweight.	
75	Nielsen et al, 2018	agricultural production and behaviour change communication by dedicating land to women's production increase production and consumption of nutrientrich foods and to generate additional income.	Education, Training, Persuasion, Environmental restructuring, Modelling.	55 in eastern Burkina Faso with 55 all women with children 3–13months.	Gaps included input constraints, knowledge gaps among community agents in agriculture and young child nutrition practices, and lower than expected activity by community volunteers. In response, staff developed measures to overcome water constraints and expand vegetable and poultry production, retrained volunteers in certain techniques of food production and counselling for nutrition behaviour change, added small incentives to motivate volunteers, and shaped both immediate and long-term changes to the programme model.	Burkina Faso
76	Han et al, 2021	BCC and food vouchers	Enablement Education, Modelling, Persuasion, Incentivisation, Training.	Mothers with at least one child aged between 4 and 20 months in Ejere district (woreda) located in the Oromia region of central Ethiopia.	Improvements in child-feeding practices and a reduction in chronic child undernutrition only when BCC and vouchers were provided together. BCC or voucher alone had limited impacts. Importance of adding an effective educational component to existing transfer programmes	Ethiopia
77	Becquey et al, 2022	nutrition- and gendersensitive poultry value chain intervention (SELEVER) with and without a hygiene and sanitation component (WASH). SELEVER combined poultry revenue generation, women's empowerment, and nutrition Behaviour Change Communication (BCC).	Enablement, Training, Persuasion, Modelling, Environmental reconstructing, Education.	Women and children aged 2 to 4 years in Burkina Faso	Both intervention arms (SELEVER with and without WASH) increased the probability of adequacy of iron intakes in women; no further impact on primary outcomes	Burkina Faso
78	Santoso et al, 2021	1.Dietary Diversity score, minimum meal frequency HAZs and WHZs Household Food Insecurity Access Scale. 2. Women's Empowerment in Agriculture Index Perceived Social Support Scale. nutrition-sensitive agroecology education Intervention in Tanzania.	Education, Environmental restructuring, Persuasion, Training, Incentivisation, Modelling.	One man and one woman "mentor farmer" were elected from each intervention village. 591 households from Singida Rural District, in Tanzania. Surveyed infants 2 years and younger.	After 2 growing seasons, the intervention improved children's dietary diversity score by 0.57 food groups. The percentage of children achieving minimum dietary diversity (4 food groups) increased by 9.9 percentage points during the postharvest season. The intervention significantly reduced household food insecurity. No significant impact on child anthropometry. The intervention also improved a range of sustainable agriculture, women's empowerment, and women's wellbeing outcomes.	Tanzania
79	Aubel et al, 2004,	communication and empowerment education approach with grandmothers, including songs, stories, group discussions.	Modelling, Education, Persuasion Enablement, Training, Education.	Participants were grandmothers in 13 of the 60 rural villages in western Senegal supported by the child health programme.	Grandmother's nutrition knowledge and advice to reproductive women improved 12 months post intervention. Nutrition-related practices of younger women improved as a result of grandmother's advice for both pregnancy and infant feeding. Future maternal	Senegal

		and child health programmes should involve grandmothers and build their intrinsic commitment to family health.

Source: Authors

Raising awareness on behaviour change

Faced with the context of nutritional transition, behaviour change is a necessity that makes it possible to reconcile children's nutrition with the reality of the nutritional system present in the country or locality. The social changes aggravated by globalization lead to a behavioral change among young adolescents and mothers that deviates them from the food available and accessible for their food security and that of their children (in the case of mothers) and creates an imbalance in the food system. It is in this sense that Downs et al (2019) present the promotion of Infant and Young Child Feeding (IYCF), exclusive breastfeeding for the first six months. This practice yields significant results for children's food security. The means of awareness-raising are diverse, such as awareness-raising telephone messages (Downs et al, 2019), nutrition sessions (Kang et al, 2017b), community sensitizations through community workers (Abiyu et al, 2020).
This awareness is also based on persuasion techniques, on eating attitudes (Minimum Dietary Diversity, (MDD), Minimum Meal Frequency (MMF), Minimum Acceptable Diet (MAD), Women's diet diversity) (Workicho et al, 2021). Awareness-raising can be combined through training sessions (Kumar et al, 2018). Women's focus groups with grandmothers are examples of transmission of nutrition practices to young mothers for children's food security (Aubel et al, 2004).

Food production and accessibility.

Production is arguably one of the most plausible practices, as it directly affects the accessibility of nutritious food. Passarelli et al (2020) show, for example, the effect of chicken production, without behavioural change in children's nutritional health and food security. Production practices remove barriers to the accessibility and availability of nutrients, affordable foods. The provision of agricultural assistance (inputs, techniques, etc.) are practices adapted to and even integrated into the local food system (Muehlhoff et al, 2017). Agricultural practices have a significant influence on child and household nutrition (Kim et al, 2019a). Beyond production, the intervention in the distribution chain of foods relevant to children's food security must also be considered.

Consumption and environmental protection.

One of the important elements of the nutrition system is the consumption of food necessary for its food security of children. The FIES approach (eight questions) presents situations of refusal to consume food, despite its availability and accessibility. It is in this context that Abiyu et al, (2020) argue for consumption of dairy products, eggs, vitamin Arich fruits and vegetables, other fruits and vegetables and animal-source foods that give significant results for children's food security.

CONCLUSION

Faced with the problems of food insecurity among children on the African continent, several best practices can be identified and implemented for change. These are mainly education on nutritional health, awareness-raising on behavior change and good food practices, agricultural and food production and product accessibility, effective consumption of food products and environmental protection for the perpetuation of countries' productive capacities. These practices can be implemented at different levels of action such as national and federal policies, international, national and regional plans and programs, and local or community projects to enable the achievement of the Sustainable Development Goals.

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