Progress in Nutrition 2024; Vol. 26, N. 1: e2024007 DOI: 10.23751/pn.v26i1.15375 

Original article

# Evaluation of public actions on food environments to address the double burden of malnutrition in Benin using the food-EPI tool

*Reynald Santos[1], Charles Sossa Jerome[1], Colette Azandjeme[1], Clémence Metonnou[1], Julien Soliba Manga[2], Stefanie Vandevijvere[3], Jean-claude Moubarac[2], Adama Diouf[4]*

[1]Department of Health Promotion, University of Abomey-Calavi, Ouidah, Benin; [2]Department of Nutrition, University of Montréal, Montréal, Canada; [3]Sciensano, Service of Lifestyle and Chronic Diseases, Brussels, Belgium; [4]Department of Animal Biology, University of Cheikh Anta Diop, Dakar, Senegal

**Abstract.** *Background and aim:* Despite national policies and food-related interventions, Benin still faces a number of nutritional problems. The food environment, which is crucial to health, receives little attention in food policies. Monitoring food environments is essential to combat the double burden of malnutrition (DBM). The objective was to assess the level of implementation of public policies and government actions aimed at creating healthy food environments in BENIN. *Methods:* The evaluation was carried out using the INFORMAS Food-EPI module. Initially, the module contained 47 indicators relating to the prevention of obesity and diet-related non-communicable diseases. This tool was initially adapted to the Benin context. Following its implementation in sub-Saharan Africa (Ghana, Kenya and Senegal), 12 new indicators were added to make the Food-EPI tool more sensitive to the DBM. A group of independent experts (n=22) and government experts (n=21) assessed the level of the implementation of public policies using a Likert scale and identified the priority actions. *Results:* Of the 59 indicators compiled from 61 policy documents, the implementation level of public policies was assessed as "very low" for 27 indicators, "low" for 24 indicators and "medium" for 8 indicators. The inter-rater reliability index was estimated at 0.94 (CI: 0.92-0.97) and considered good. The experts identified 116 actions, 10 of which were prioritized in terms of importance, achievability and effect on the DBM, and recommended to the Beninese government. In the "Policy" component, priority actions focused mainly on food promotion, supply, pricing and retailing. In the "Infrastructure Support" component, priority actions focused on governance, leadership, monitoring and evaluation. *Conclusions*: This study proposes a list of priority actions to the government to transform the food environments towards reducing the DBM in Benin.

**Key words:** public policy, evaluation, food environments, Benin

## Introduction

In recent years, changes in lifestyles and eating habits have been observed mainly in developing countries. These changes, which have rapidly taken root in these countries, have been triggered by factors such as the industrialization of agriculture, globalization, population growth, urbanization and technological advances (1-6). Over the last few decades, highly processed food products, rich in calories but poor in nutrients, have become increasingly accessible and popular. They are now more readily available and often promoted, while being comparatively less expensive than local or minimally processed foods. This trend

has contributed to the formation of obesity-promoting food environments, which hinder access to healthy, economical diets (1-6). These environments result from the low effectiveness or absence of public policies and actions in various areas (7). Food environments are defined as "the collective physical, economic, political and socio-cultural environments, opportunities and conditions that influence food and beverage choices, including food composition, food labeling, food promotion, food provision in schools and other settings, and trade policies affecting food availability, price and quality" (8-10).

These environments influence the dietary patterns of populations, as well as the health and well-being of individuals (11-12). The epidemiological profile once characterized in Southern countries by the prevalence of communicable diseases such as infectious and parasitic affections, has seen the emergence of more and more non-communicable diseases, marking the ongoing process of epidemiological transition (1).

In Benin, the situation of the food environment is not good, and very few studies have focused on it. The food offer is not very diversified in public elementary school, and hygiene practices need to be improved to create a healthy food environment around schools (13). In 2017, 86% of households had acceptable food consumption and 14% of households had inadequate food consumption that did not allow them to lead an active and healthy life. Of the latter, 11.6% had borderline food consumption and 2.4% had poor food consumption. There were more households with inadequate consumption in rural areas (18.5%) than in urban areas (9.2%) or Cotonou (4.3%) (14).

In addition, the nutritional situation is marked by the triple burden of malnutrition (micronutrient deficiencies, chronic malnutrition and diet-related non-communicable diseases). The national co-occurrence prevalence of overweight/obesity and anemia among mothers and their children under five in households was 18.3% in 2018 (15). These problems predominantly affect vulnerable groups, namely women and children. Between 2006 and 2017-2018, the prevalence of stunting declined, but remained high, dropping from 43% to 32%. It remains above the 30% threshold corresponding to a critical situation according to the World Health Organization (WHO). The same applies to anemia, which fell from 78% to 72% in children aged 6-59 months between 2006 and 2017-2018. In the same period, the percentage of women aged 15-49 presenting a state of leanness (Body Mass Index below 18.5 $Kg/m^2$) increased slightly, from 9% to 11%. Between 2006 and 2018, the percentage of overweight or obese women (Body Mass Index greater than or equal to 25 $Kg/m^2$) also increased, but more significantly, from 19% to 26%. The prevalence of anemia among women aged 15 to 49 decreased slightly, from 61% to 58% (3). Despite the improvements seen, these different prevalences remain high. The progress noted is the result of the implementation since 2011 of various projects such as the Community Nutrition Project (PNC; 2011-2015) and the Multisectoral Food, Health and Nutrition Project (PMASN; 2014-2019), which have been carried out nationally in partnership with the communes. In terms of food security, from 2007 to 2017, several billion CFA francs were invested in projects and programs by the Ministry of Agriculture, Livestock and Fisheries aimed at increasing food supply. These include the agriculture development program, the livestock development program, the fisheries and aquaculture development program, etc. (18).

Today, the emergence of risk factors for diet-related chronic diseases such as hypertension, overweight and obesity is having a negative impact on people's health (19,20). Indeed, according to the latest survey on risk factors for non-communicable diseases in Benin, the percentage of overweight or obese adults was 23.2%, including 19.1% of men and 27.2% of women. The prevalence of subjects with high fasting blood sugar levels or currently under medical treatment for high blood sugar levels was 12.4%, including 12.7% of men and 12.2% of women. Furthermore, the percentage of adults with high blood pressure (systolic blood pressure ≥ 140 and/or Diastolic blood pressure ≥ 90 mmHg or currently under medical treatment for high blood pressure is 25.9% including 27.8% in men and 24.3% in women (21). The percentage of deaths attributable to non-communicable diseases was established at 35.7% in 2015 (21). Obesity, which is a risk factor for Non-Communicable Diseases, was 2% in 2017-2018 in children under the age of 5 (16). The percentage of women of childbearing age who were overweight or

obese (BMI greater than or equal to 25) was 26% (21). Among schoolchildren aged 13 to 17, the prevalence of overweight was 9.9%, including 7% among boys and 16.3% among girls. The prevalence of obesity was 1.7%, including 1.2% in boys and 2.9% in girls (22). However, progress has been made over the last few years in improving the nutrition of the Beninese population. Indeed, the political will of the Government of Benin to improve this situation was demonstrated by the establishment in 2009 of the National Council for Food and Nutrition (CAN), with an operational arm, the Permanent Secretariat (18). This led to the drafting of several nutrition policy documents, with the aim of laying the organizational, conceptual and operational foundations for efficient prevention and management of food insecurity and malnutrition in all their forms. The first Strategic Plan for the Development of Food and Nutrition (PSDAN) was drawn up in 2009 (23). The PSDAN was an action plan based on the experience of previous programs. The first national nutrition policy document is currently being drawn up.

In addition to the process of institutionalizing nutrition, local non-governmental organizations and local authorities are becoming involved in nutrition projects and programs. In recent years, we have also seen the training and recruitment of nutritionists at bachelor's and master's level, to strengthen the system of prevention and management of nutrition-related diseases.

Despite these efforts, food and nutrition problems persist. In Benin, there is no framework or data for monitoring food environments, and no studies have been carried out on public policies relating to food environments. Monitoring food environments is an important aspect of reducing the prevalence and preventing nutritional problems, particularly the triple burden of malnutrition (19,20). Indeed, the food environment is a key factor contributing to unhealthy diets, which today constitute an increasingly important risk factor for all forms of malnutrition (24).

It is therefore useful to analyze public policies aimed at improving the country's food environment, in order to identify shortcomings in these policies and subsequent corrective actions. The Food-EPI module is an appropriate tool to meet the country's needs in monitoring food environments (8-10).

The analysis of these public policy documents justifies the present study, which assesses the degree of implementation of said public policies and government actions aimed at creating healthy and sustainable food environments for the prevention of the double burden of malnutrition in Benin through the Food Epi module of the INFORMAS network.

## Materials and methods

This study used the Food-EPI (Healthy Food Environment Policy Index), developed by the international research network INFORMAS (International Network for Food and Obesity/NCDs, Research, Monitoring and Action Support). This index is presented as a tool and approach designed to monitor the implementation of government policies concerning the food environment at country level (24-25). In addition, the Food-EPI module can accelerate the implementation of policy actions by public authorities to combat obesity and diet-related non-communicable diseases (25,26). It assesses the level of local implementation of internationally recommended actions and policies, comparing them with global best practice, and proposes specific actions ranked according to importance and feasibility. Experts assess the degree of implementation on the basis of a factual report validated by government experts. The Food-EPI proposes a set of indicators targeting areas where government action is most needed, while including a collaborative process with multiple stakeholders (Figure 1) (26).

## Food-EPI module description

Food-EPI is a tool and process for monitoring and evaluating public sector policies and actions aimed at creating healthy food environments (25). The Food-EPI tool and process have been designed to answer the following question: What progress has the government made in good practice to improve food environments and implement policies and actions to prevent obesity and non-communicable diseases (NCDs) (14)?

The Food-EPI tool comprises two components, 13 domains and 47 good practice indicators (Figure 1).

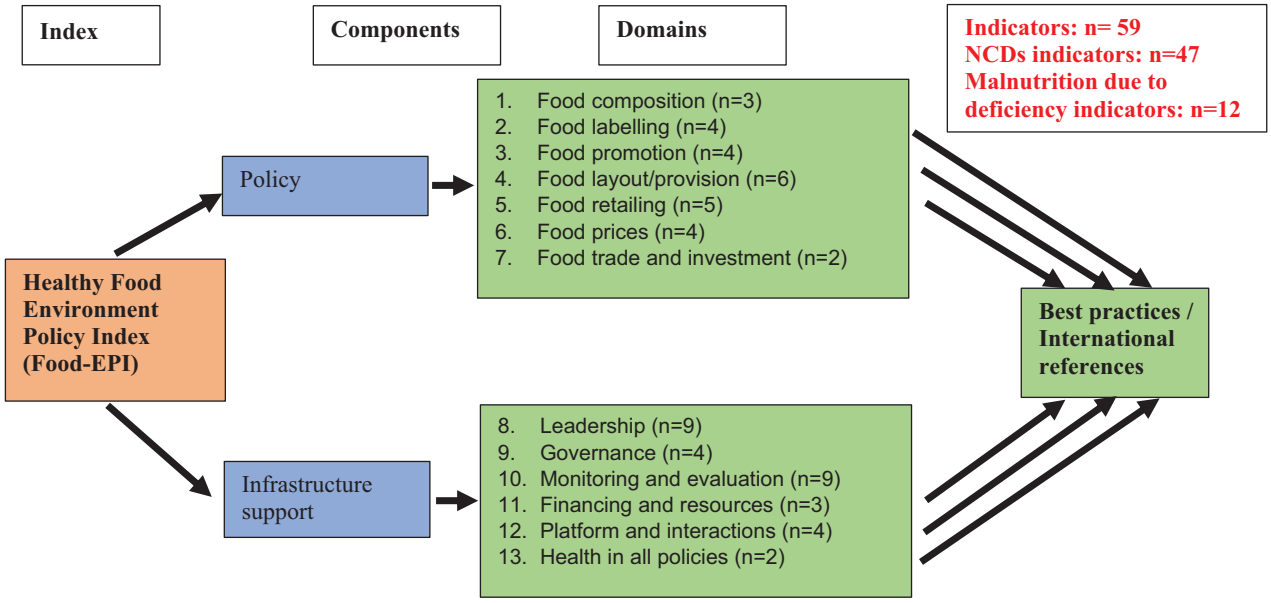


**Figure 1.** Components, domains and indicators (n=59) of the Healthy Food Environment Policy Index (Food-EPI) used in Benin.

The "policy" component presents seven (7) domains which are the specific and fundamental characteristics of food environments. The "infrastructure support" component comprises six (6) areas based on the World Health Organization's (WHO) approach to strengthening health systems and preventing obesity and chronic disease. Because of its validity and reliability, this tool is widely used today in many industrialized countries and in some low- and middle-income countries (27). The Food-EPI indicators were developed with a particular focus on the prevention of obesity and diet-related non-communicable diseases. However, many countries, including Benin, face the complex challenge of the triple burden of malnutrition. As a result, this tool does not take into account other policy areas relevant to nutrition, such as genetically modified organisms, food security, undernutrition, micronutrient deficiencies, breastfeeding, breast-milk substitutes and climate change policies (24-26,28).

## Adaptation of the food-EPI module

The Food-EPI tool highlights food environment actions linked to the prevention of obesity and diet-related NCDs (25). Following the implementation of this tool in a few sub-Saharan countries, notably Ghana, Kenya and Senegal, it has been recommended that Food-EPI indicators be made sensitive to the creation of healthy food environments to combat undernutrition (e.g. micronutrient deficiencies, stunting, acute malnutrition), as they constitute a major public health problem in the sub-Saharan African region (27-29). It is in this context that a team from INFORMAS and researchers involved in research on food environments began a three-stage process in 2020 (gathering evidence, selecting the most relevant indicators and identifying specific areas of the Food-EPI tool to integrate them) aimed at developing relevant indicators of undernutrition, to be included in the Food-EPI tool. Thus, twelve (12) new priority indicators were selected, relating to actions recommended by the WHO on breastfeeding and complementary feeding, marketing regulations, national policies to combat overweight, NCDs and undernutrition, health systems (growth monitoring) (19). In addition, indicators on hygiene, water and sanitation (WASH), food retailers and traders (hygiene and sanitation) and health safety (microbial and chemical contamination) have been added.

## Description of the food-Epi implementation process in Benin

In line with the protocol developed by INFORMAS, the Food-EPI process in Benin involved ten activities grouped into four main stages (Figure 2) (25):

*Stage 1: Elaboration and validation of a review document of all policies aimed at improving the food environment in Benin*

- Sharing the Food- EPI module with stakeholders at national level

  The sharing of the module at national level, and the mobilization and involvement of stakeholders were essential to the success of the data collection. The project's vision, the tool and the Food Epi process were presented during a meeting with members of the National Council for Food and Nutrition (CAN), which is responsible for implementing the project in Benin. The CAN is an institution placed under the patronage of the Head of State, and includes representatives of all the Ministries directly or indirectly concerned by the issue of nutrition, as well as representatives of civil society, the private sector, research and academia. It is responsible for drawing up nutrition policies and coordinating food and nutrition interventions at national level. This step ensured government collaboration and ownership of the results at the end of the project. The project was also presented to the General Secretaries of the Ministries and Directors of the supervisory structures directly or indirectly concerned by the issue of nutrition. The aim of this approach was to facilitate the mobilization of all food and nutrition stakeholders for the collection of documents in the various government structures. A letter of recommendation was therefore obtained from CAN for data collection. Information letters on the project were sent to key players. Meetings were organized with other stakeholders to explain the project and gain their support.
- Collecting relevant data

  This involved collecting relevant documents (policies, plans, strategies, programs, projects, decrees, orders, laws, reports, etc.)

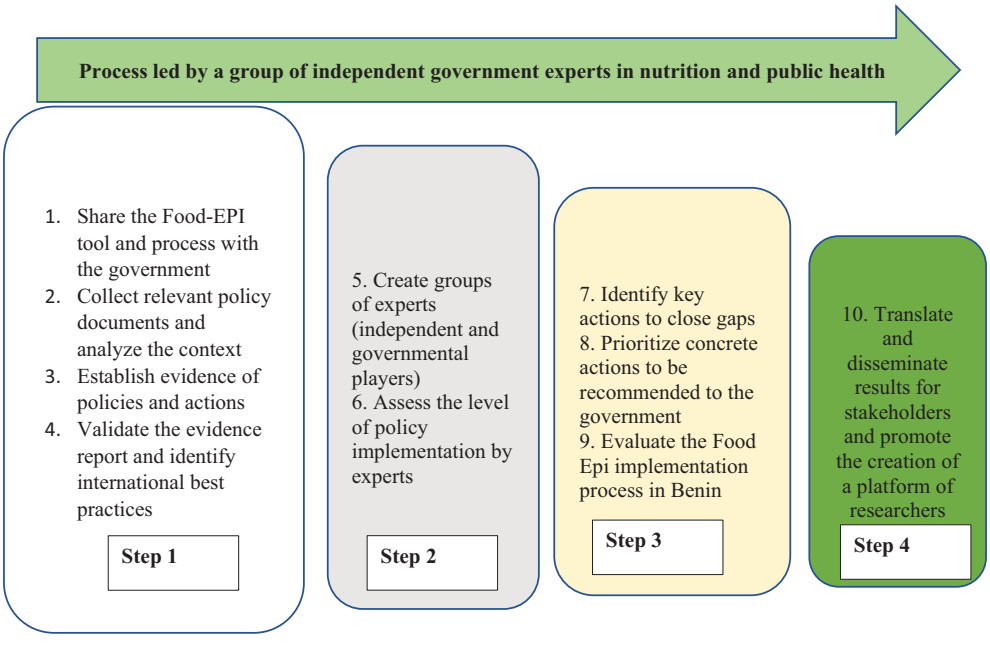


**Figure 2.** Process for assessing the level of implementation of food environment policies and infrastructure support based on international best practice, using the Healthy Food Environment Policy Index (Food-EPI) (11).

from government websites, publications and non-governmental organization websites, as well as through direct contact with representatives of different government sectors to gather information on public policies, budgetary information and government actions to improve the country's food environment. These documents were collected from February 2021 to January 2022. For each document, relevant information was extracted and synthesized.

The documents collected enabled us first to describe the relevant contextual information, namely: demographic and socio-economic data, infrastructure, available resources and capacities, political system, structure and stability, absence of corruption and freedom of the press, potential monitoring constraints, availability and accessibility of government documents and budget information. On the whole, there were no difficulties in accessing the required documents, with the exception of those providing details of the specific cost of nutrition interventions with regard to the "Fund1" indicator in the "financing and resources" domain.

- Establishment of proof and validation of proof reports

  The documents collected according to Food-EPI domains have been classified into three frames:

  (i) Policy: this refers to nutrition or health policy guidelines or legislation (law or decree) in the field of nutrition;
  (ii) Strategic: documents that define strategic axes or operationalize policy orientations;
  (iii) Operational: these are often: activity reports from various nutrition-sensitive or nutrition-specific sectors, reports from national nutrition or health surveys, and nutrition programs.

These documents provided evidence of the "actual" implementation of government actions. This evidence has been documented in detail with references and sources appropriate to the different areas of the food environment. The result of this stage is an evidence data report relating to each of the Food - PPE domains. This evidence report was shared and validated by informed government officials during a workshop.

*Stage 2: Assessment of the level of implementation of public policies*

For each of the fifty-nine indicators, the corresponding international best practices, as defined by INFORMAS, have been identified and translated into French for the assessment.

A two-day workshop was held to assess the level of implementation of public policies aimed at creating healthy food environments in Benin.

Prior to the workshop, the project's research team selected the experts. A panel of experts in the various fields of food and nutrition research and practice, or public health, was selected. Government experts were also invited to take part in the assessment. By involving government players in the process, the project team sought to promote a participatory approach and ownership of the results. Two weeks before the workshop, the evaluators received the terms of reference (ToR) for the workshop, the evidence report validated by the government experts, the scoring form and other supporting documents. This enabled the evaluators to read the report and also to facilitate the scoring process.

During the workshop, all experts completed an informed consent form and declared their interests. Individuals affiliated with the food production industries were excluded from the sample in order to avoid any conflict of interest in the evaluation process. It should be noted that the workshop brought together the two groups of experts in the same room: expert evaluators in nutrition or public health from universities and representatives of non-governmental organizations (Group A) and representatives from different sectors of government (Group B). In addition to these experts, this workshop welcomed an expert from the INFORMAS network, who supervised the activities. First, the evaluators received a brief orientation on the Food- EPI methodology and tool. Then, for each good practice indicator, evidence of implementation of the indicator by the Benin government was presented, followed by the corresponding international reference example. The evaluators then took two to three minutes to assess the current level of implementation of each good practice

indicator. However, after the presentation of certain good practice indicators and Benin's situation in relation to the implementation of these indicators, discussions and clarifications were necessary to harmonize the experts' understanding. The fifty-nine (59) indicators were assessed against international best practice on a Likert scale of 1 to 5, using a scoring form.

The meaning of the scale is:

1. <20% implementation compared to international best practice;
2. 20 to 40% implementation compared with international best practice;
3. 40-60% implementation compared with international best practice;
4. 60-80% implementation compared with international best practice;
5. 80-100% implementation compared with international best practice.

NB: the score 0 (not to be evaluated) was given only when the indicator could not be evaluated.

A score of 1 means that implementation is between 0% and 20% of international best practice, and a score of 5 means that implementation is between 80% and 100% of international best practice.

Assigning evaluators' scores requires expert judgment, taking into account a number of considerations:

- quality of government policies and actions compared with international best practice.
- level of implementation of government policies and actions, taking into account all aspects of the "policy cycle": policy development, policy implementation and policy evaluation.

The evaluators' ratings also take into account the government's intentions and current projects, as well as funding for the implementation of policies and actions.

At the end of the workshop, all the scoring forms were collected and analyzed by the research team.

*Stage 3: Action identification and prioritization process*

The third stage of the Food-EPI process is the identification and prioritization of actions. This took place during a workshop with the same groups of experts as for the evaluation workshop. The first part of the workshop was devoted to identifying actions. At the start of the workshop, a summary of the provisional results of the assessment workshop and the methodology for identifying and prioritizing actions were presented.

The principle was to choose actions to fill gaps, reinforce policy actions already implemented, or choose actions that could address the problems of undernourishment by improving food environments.

This identification of actions was done through the organization of two mixed working groups. Each group was made up of independent and government players. The groups identified actions separately by component (policy component and infrastructure support component), and an indicator could have several or zero actions. The number of actions to be identified was left to the discretion of the working groups. All in all, these interactions helped to generate and foster commitment among participants to the establishment of a local platform of researchers and key players to support food policy research. A plenary session provided an opportunity to pool the results of the groups' work and agree on a common list of actions to be prioritized and submitted to the authority.

The second part of the workshop consisted in prioritizing actions to be recommended to the government to fill the gaps and strengthen existing policies to better combat the double burden of malnutrition. This was done individually. So, after presenting the questionnaire of validated actions, each expert evaluator prioritized them separately according to five criteria described: the importance of the action, the capacity to carry out the action, the effect of the action on the double burden of malnutrition, the effect of the action on gender and the effect of the action on sustainability using a scale of 1 to 5. It is important to emphasize that the initial Food-EPI criteria are the importance of the action and the capacity to carry it out. However, Benin has introduced two new prioritization criteria (the action's effect on gender and the action's effect on sustainability) in addition to the action's effect on the double nutritional burden that was introduced in Senegal when Food-EPI was implemented in 2018-2019 (Table 1) (28).

**Table 1.** Criteria for prioritizing actions to be recommended to the Government.

| Criteria | Description |
|---|---|
| **Criterion 1 (C1): Importance** | 1. Need: Size of implementation gap<br>2. Impact: effectiveness of action in improving food environments<br>3. Equity effects and other positive or negative effects of the action:<br>• Equity: Progressive/regressive effects on reducing health inequalities linked to food and diet.<br>• Other positive effects (example): Protection of children's and consumers' rights<br>• Negative effects (example): regressive effects on household income or violation of personal freedoms |
| **Criterion 2 (C2): Realization capacity** | 1. Feasibility: How easy or difficult will it be to implement the action?<br>2. Acceptability: The level of support from key stakeholders (government, public, public health and industry).<br>3. Affordability: The cost of implementing the action |
| **Criterion 3 (C3): Potential impact of action on the double burden of malnutrition** | 1. Beneficial effect: Does the implementation of the action have a beneficial effect on the double burden of malnutrition?<br>2. Aggravating or neutral effect: Does the action increase the risk of other forms of malnutrition or NCDs? |
| **Criterion 4 (C4): Potential gender impact of action** | 1. Beneficial effect: Implementation of the action has a beneficial effect on gender inequalities.<br>2. Aggravating effect: Implementation of the action increases the risk of other forms of gender inequality.<br>3. Neutral effect: The implementation of the action has no effect on gender inequalities. |
| **Criterion 5 (C5): Potential impact on sustainability** | 1. Beneficial effect: Implementation of the action has a beneficial effect on sustainability.<br>2. Aggravating effect: Implementation of the action increases the risk of adverse effects on sustainability.<br>3. Neutral effect: Implementation of the action has no effect on sustainability. |

Thus, each proposed action in the areas of policy and infrastructure support was ranked from higher to lower importance, from high to low likelihood of achievement, from greater potential effect on the double burden of malnutrition to lower effect, from greater potential effect on gender to lower effect, and from greater potential effect on sustainability to lower effect (i.e. a number assignment from 5 to 1), using the 1 to 5 scale.

*Stage 4: Dissemination of Food-EPI results to stakeholders*

Findings on the level of implementation of priority policies and measures were presented and discussed at a workshop attended by national and regional experts in food and nutrition. These experts came from various sectors, including higher education, civil society, public administration, the private sector and UN agencies. The aim of this presentation was to promote the initial dissemination of results to stakeholders at national level. Subsequently, an exchange of research experiences was orchestrated between the African countries involved in the same project.

*Statistical analysis*

All participants' answers were checked against the original individual scoring form, and data from both groups were entered into EPI-INFO 7 software for descriptive analyses. Each indicator was scored on a Likert scale from 1 to 5. This highlighted the overall level of implementation in relation to international best practice. Indeed, the average rating for each good practice indicator was used to determine an overall percentage of implementation at group level. Implementation levels were then classified according to the following categorization:

≤ 25% = "very low, or non-existent"; 26% to 50% = "low level"; 51% to 75% = "medium level"; > 75% = "high level".

The inter-rater reliability (i.e. level of agreement) of each of the two groups (independent experts and

government experts) was determined using SPSS Statistics 25 software, which was used to calculate the Intra-class Correlation Coefficient (ICC). In this calculation, notations (npe = cannot evaluate) were considered as missing values.

To prioritize the proposed actions, scores were calculated by adding up the points given to each action according to the criteria (importance of the action, feasibility of the action, effect of the action on double nutritional burden, effect of the action on gender and effect of the action on sustainability). The importance and feasibility scores were then added together for each proposed action to determine a single criterion. The actions were then prioritized by considering each of the criteria.

## Results

The evidence document drawn up on the basis of sixty-one (61) documents served as the basis for workshops to evaluate, identify and prioritize actions. Figures 3 and 4 show the list of documents used by domain.

*Participation and assessment reliability*

A total of forty-eight (48) public health and nutrition experts were invited, and forty-three (43) took part in the evaluation workshop, representing a participation rate of 89.58%. Twenty-two (n=22) were nutrition or public health experts from universities and representatives of non-governmental organizations, the United Nations and civil society (Group A) and twenty-one (n=21) were representatives of different government sectors (Group B). Forty-three (43) forms were therefore completed by the expert evaluators. An inter-rater reliability score was calculated to check the consistency of the assessments made by all the evaluators. The inter-rater reliability index was 0.94 (95% CI: 0.92-0.97). This reflects good consistency between the scores given by the experts. Inter-rater reliability was also calculated separately for the two groups. It was 0.90 (CI 95%: 0.86-0.94) in group A and 0.89 (CI 95%: 0.84 - 0.93) in group B. Of the 43 experts, 67.44% (n=29) were men and 32.55% (n=14) were women.

*Level of policy implementation*

Overall, the level of implementation of government actions aimed at creating healthy food environments was assessed as "very low" for twenty-seven (27) indicators (45.76%), "low" for twenty-four (24) indicators (40.67%) and "medium" for eight (08) indicators (13.55%). None of the indicators was assessed with a high level of implementation (Figure 5). Out of the Twelve new indicators of the double burden of malnutrition that were included, six (06) were rated "medium", three (03) "low" and three (03) also "very low". Of the eight indicators judged "average" overall, six were those of the double burden of malnutrition. Thus, of the forty-seven (47) indicators in the initial tool, twenty-four (24) were rated "very low" (51.06%), "low" for 21 indicators (44.68%) and "average" for two (02) indicators (4.25%) (Figure 5). Some indicators (10 out of 59) were assessed differently by the two groups. Government experts tended to give higher ratings to indicators. Among these differently rated indicators, three were rated "Medium" in group B versus zero in group A; seven were rated "Low" in group B versus three in group A (Table 2).

*Identification and prioritization of improvement actions*

The same players who took part in the evaluation workshop were invited to identify and prioritize the actions to be recommended to the government. A total of forty (40) expert evaluators were present, representing an effective participation rate of 80% (40 out of 48). Of the forty (40) expert assessors, twenty-one (21) were from the independent group and nineteen (19) were from the group of stakeholders from different sectors of government. Twenty-six (26) were men and fourteen (14) were women. These stakeholders identified one hundred and sixteen (116) priority actions to improve the food environment in Benin, including fifty-six (54) actions for the "policy" component and sixty-two (62) actions for the "infrastructure support" component.

These actions were prioritized according to the importance of the action, the ability to carry out the action, the effect of the action on the double nutritional burden, the effect of the action on gender and

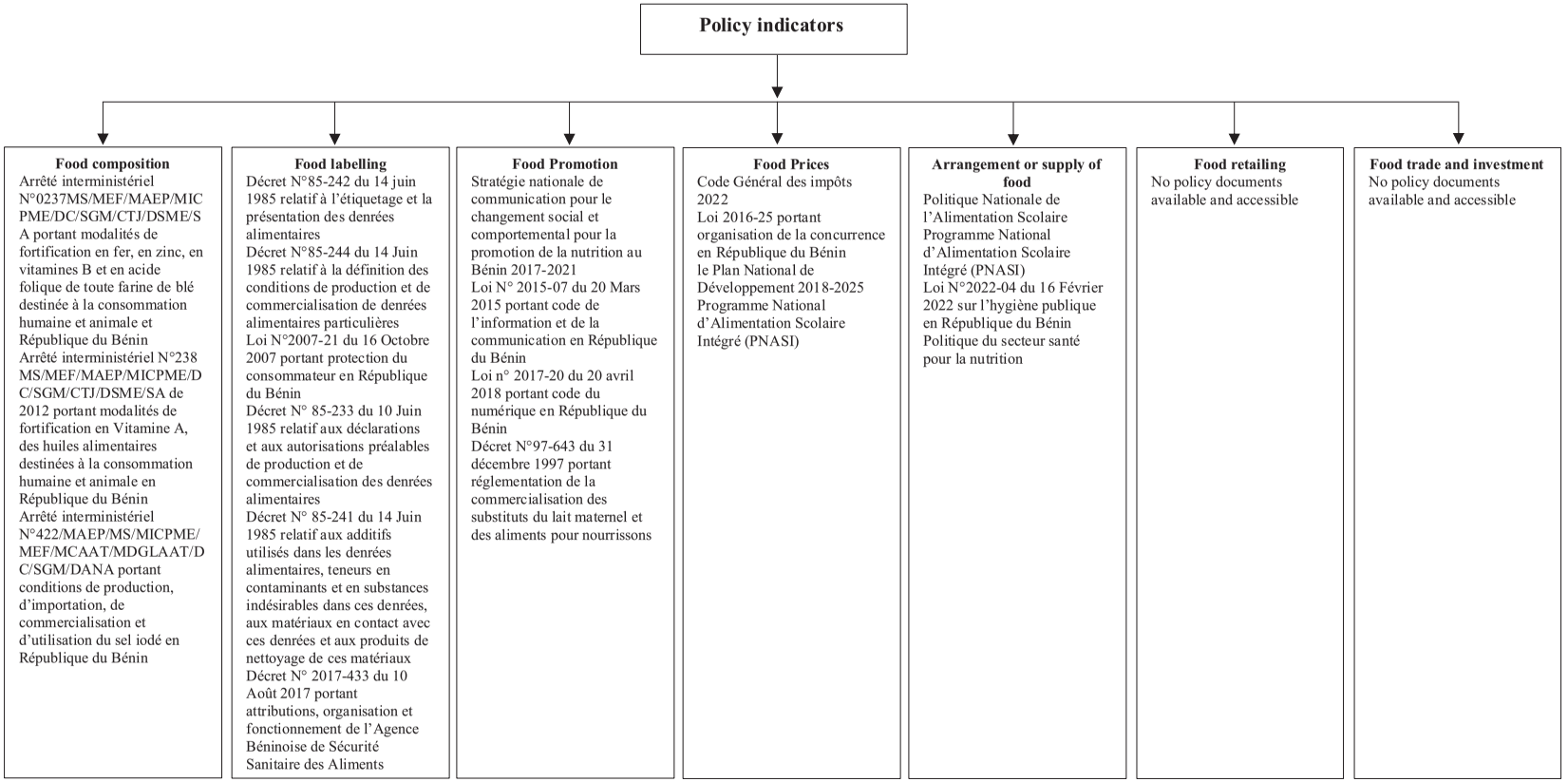


**Figure 3.** Identified evidence mapped to the policy-related indicators of the Food-EPI Domains.

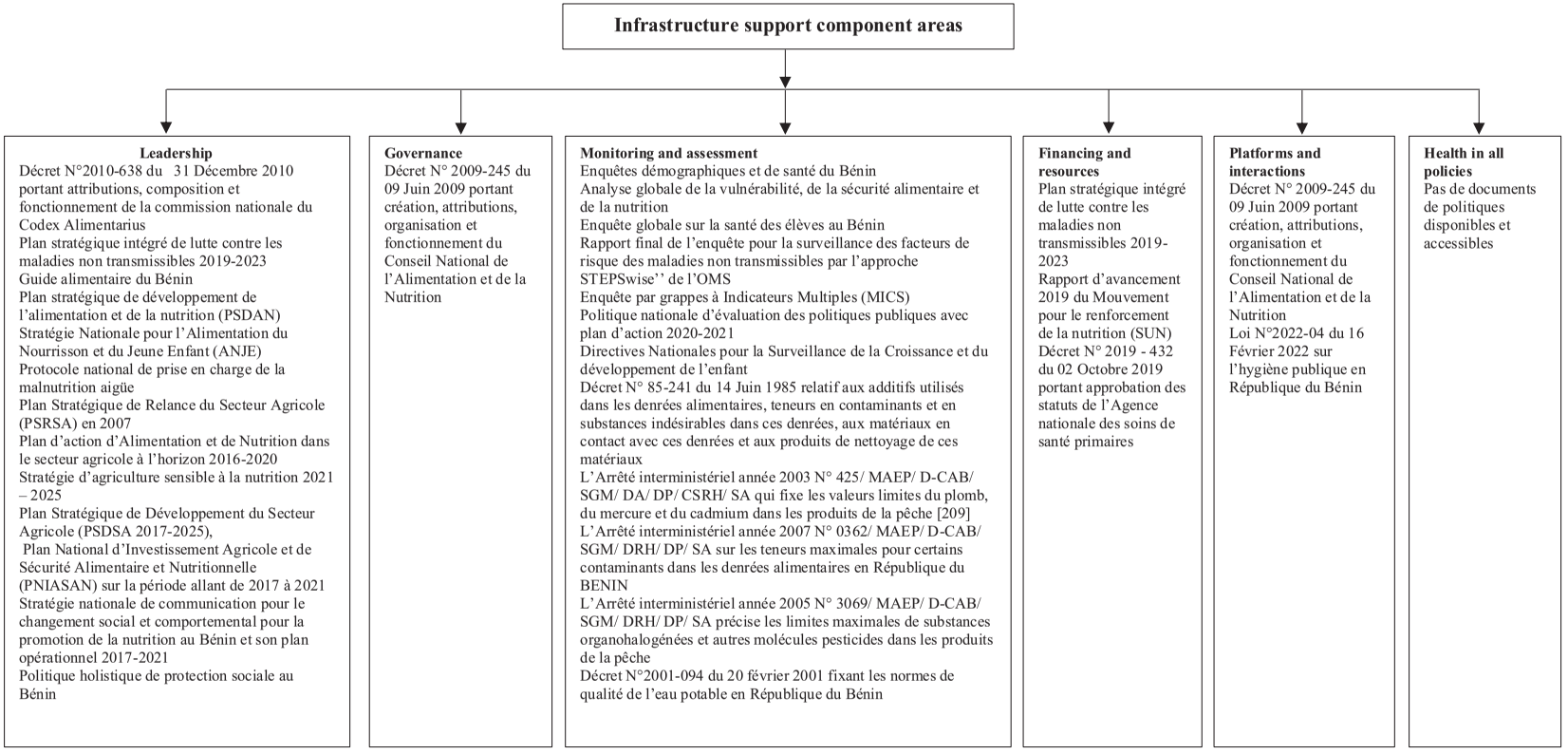


**Figure 4.** Identified evidence mapped to the infrastructure support-related indicators of the Food-EPI Domains.

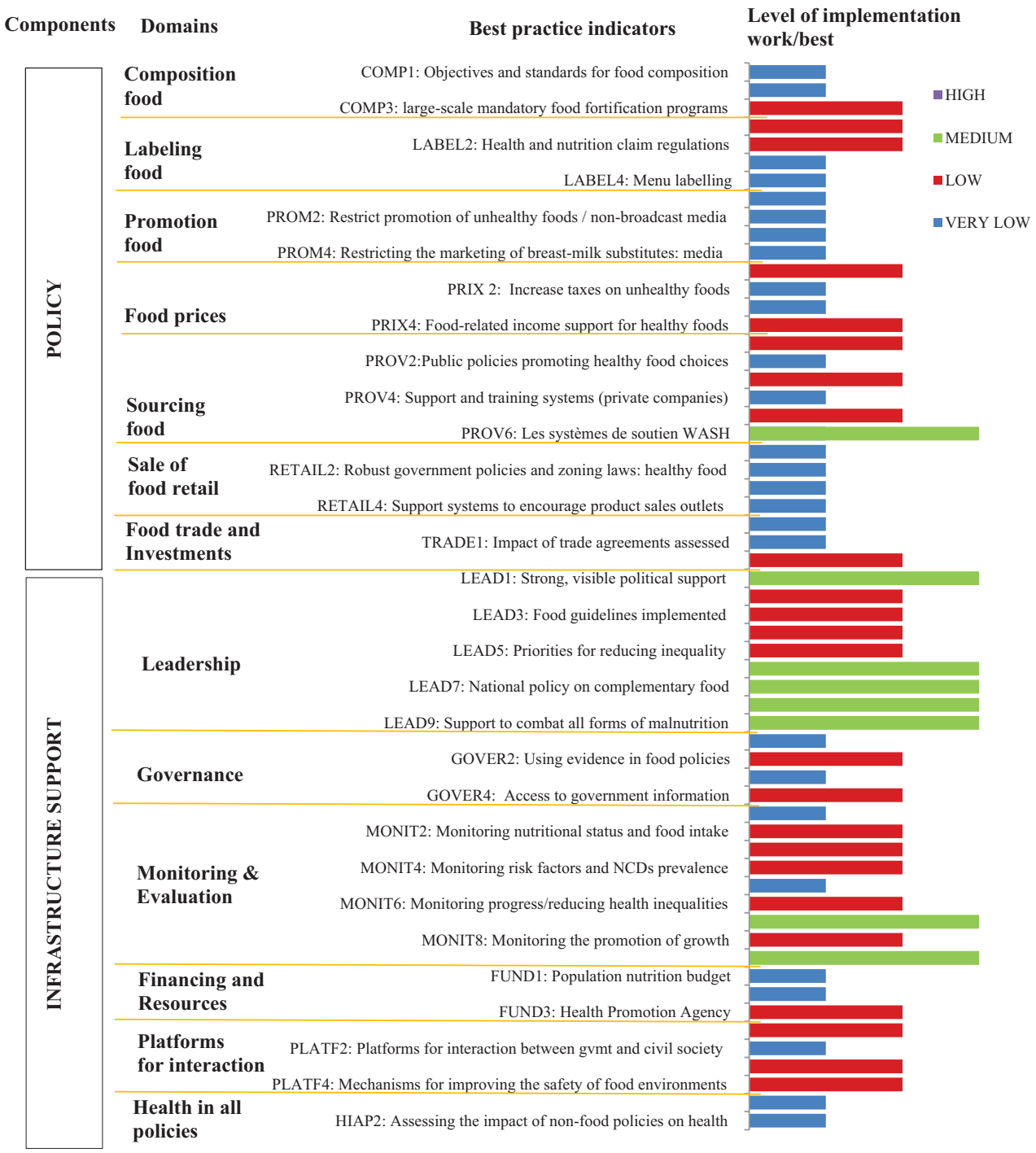


**Figure 5.** Assessment of the level of implementation of food environment policies and infrastructure support, Food-EPI Benin 2022.

**Table 2.** Indicators evaluated differently in the two groups, Food-EPI Benin, 2022.

| Indicators | Independent | Government |
|---|---|---|
| PRICE3: Existing food subsidies promoting healthy foods | Very low | Low |
| PRICE 4: Income support for healthy foods | Very low | Low |
| PROV2: Public policies promoting healthy food choices | Very low | Low |
| PROV5: Breastfeeding support systems | Very low | Low |
| LEAD5: Priorities for reducing inequalities | Low | Medium |
| MONIT5: Evaluation of major programs | Very low | Low |
| MONIT6: Monitoring progress / reducing health inequalities | Very low | Low |
| FUND 1: Population nutrition budget | Very low | Low |
| FUND3: Health Promotion Agency | Low | Medium |
| PLATF1: Coordination mechanisms | Low | Medium |

the effect of the action on sustainability. Table 3 presents the five main actions resulting from the prioritization of these actions according to these criteria.

Finally, the top twenty (20) actions most important, most feasible, most likely to reduce the double burden of malnutrition, most likely to have an effect on gender and on sustainability were highlighted. Of these twenty (20) priorities actions, ten (10) fell under the "policy" component and ten (10) under the "infrastructure support" component (Table 4).

## Discussion

Through this study, we have assessed the government's efforts to combat the double burden of malnutrition. This is the first evaluation of government policies and actions aimed at creating a healthy food environment in Benin, using the Food-EPI module of the INFORMAS network of researchers. Of the 59 indicators filled in from 61 policy documents, the implementation of actions was assessed as "very weak" for twenty-seven (27) indicators (45.76%), "weak" for 24 indicators (40.67%) and average for eight (08) indicators (13.55%). The experts identified 116 priority actions, ranking 10 of them as relatively most important, most achievable, most likely to reduce the double burden of malnutrition, most likely to have an impact on gender and on sustainability.

The strength of the present study lies in the adaptation of the Food-EPI tool, in particular by taking into account indicators of the double nutritional burden. Moreover, the introduction of two new criteria in the action prioritization process, in addition to the criterion of the effect of the action on the double burden of malnutrition introduced by Senegal, constitutes an important innovation in the implementation of Food-EPI, unlike other studies which used only two prioritization criteria (31). The actions identified as priorities are the most important, the most feasible, the most likely to reduce the double burden of malnutrition, and the most likely to have an effect on gender and sustainability. They will therefore make it possible to take into account several gaps identified by the experts and to meet expectations. Furthermore, the implementation of Food EPI in Benin involved both independent experts and representatives of government sectors, and this was a key point in prioritizing the actions to be recommended to the government. Such an approach would facilitate ownership of the results and future implementation of the recommendations. In addition, the diversity of the players involved greatly facilitated the process. The debates generated during the various workshops on food, nutrition and the health of Benin's populations would draw the attention of government players to the impact of food environments on the population's nutritional status.

The main limitations of our study relate to the members of our sample. Participants were identified on the basis of their skills, and we cannot claim that the sample was representative, although experts from the various government sectors included in this study

**Table 3.** Priority policy actions recommended to the government by the experts according to the Importance and achievability of the action, their effect on the double burden of malnutrition, their effect on gender and on sustainability, Food-EPI, Benin, 2022.

| Domains | Importance and Capacity to Carry Out the Action | Impact of Action on the Double Burden of Malnutrition | Effect on Gender | Effect on Durability |
|---|---|---|---|---|
| **Policy** | **PROMO 3** Integrating healthy food choices into the preschool curriculum<br>**PROV 1** Strengthening the school feeding program by: sourcing food from local producers, developing menus and nutritional standards based on local products, institutional, technical and financial support.<br>**PROV 3** Strengthening staff by recruiting nutritionists, particularly in hospitals and health facilities<br>**PROV 2** Evaluation of the quality of food service provision in structures: school canteens (military services, prison services, university services, hospitals etc.) to promote healthy food choices<br>**PROV 3** Updating and popularizing food guides | **PROV 3a:** Strengthen staff by recruiting nutritionists, particularly in hospitals and health facilities<br>**PROV 3b**: Updating and popularizing food guides<br>**PROMO 3**: Integrating healthy food choices into the preschool curriculum<br>**PRICE 3:** Initiation of subsidies for healthy food production<br>**PROV 5**: Development of strategies to promote exclusive breastfeeding by women in local communities | **PROV 5.1** Strengthening the institutional and legal framework for breastfeeding (maternity leave and breastfeeding facilities in the workplace).<br>**PROV 5.2** Development of strategies to promote exclusive breastfeeding by women in local communities<br>**RETAIL 3** Setting up a mechanism for storing and selling healthy food at a cost accessible to the masses<br>**PRICE 3** Introduction of incentives to facilitate the transport and distribution of products from large production areas to less-favoured areas.<br>**PROV** 3a Strengthening staff by recruiting nutritionists, particularly in hospitals and health facilities | **PROMO 3** Integrating healthy food choices into the preschool curriculum<br>**PROV 3** Strengthening staff by recruiting nutritionists, particularly in hospitals and health facilities<br>**PROV 1** Reinforcement of the school feeding program through: food procurement from local producers, development of menus and nutritional standards based on local products, institutional, technical and financial support.<br>**PROMO 3** Nationwide rollout of the "Nutrition-Friendly School" initiative to complement the school canteen program<br>**PROV 5** Strengthening the institutional and legal framework for breastfeeding (maternity leave and breastfeeding facilities in the workplace). |
| **Infrastructure support** | **MONIT 1** Implementation by CAN of a monitoring system for food environments: food composition and nutrients of concern, promotion of child nutrition and nutritional quality of food in schools and other public-sector establishments<br>**LEAD 5** Intensification of communication actions on NCDs<br>**LEAD 4** Finalization of the nutrition policy document.<br>**LEAD 2** CAN to conduct a national food consumption survey to establish specific targets for nutrients of concern<br>**GOVER 2** Dissemination of research results | **LEAD** 5 Intensification of communication actions on NCDs<br>**MONIT 7** Strengthening nutritional surveillance at community level<br>**LEAD 2** CAN to conduct a national food consumption survey to establish specific targets for nutrients of concern<br>**LEAD 9** Strengthening actions to combat stunted growth<br>**MONIT 1** Implementation by CAN of a monitoring system for food environments: food composition and nutrients of concern, promotion of child nutrition and nutritional quality of food in schools and other public-sector establishments | **MONIT 7** Strengthening nutritional surveillance at community level<br>**LEAD 5** Evaluation of government actions to reduce inequalities in order to protect vulnerable populations with regard to diet, nutrition, obesity and NCDs.<br>**HIAP 1** Development of a guide for integrating nutrition, health and gender into food policy documents<br>**LEAD 6** Development of a new breastfeeding reinforcement plan<br>**MONIT 8** Scaling up coverage of the child growth monitoring program in 77 municipalities | **GOVER 2** Popularizing research results<br>**LEAD 4** Finalization of the nutrition policy document<br>**LEAD 5** Integration of NCDs diagnosis concepts into training curricula<br>**LEAD 8** Update targets for exclusive breastfeeding set at national level<br>**GOVER 2** Strengthening of the CAN structure responsible for collecting evidence from studies carried out by universities and research organizations. |

**Table 4.** Ten (10) priority actions of the "Policy" and "Infrastructure Support" components recommended to the government according to all criteria, Food-EPI Benin, 2022.

| Domains | Policy | Infrastructure Support |
|---|---|---|
| Actions | **PROMO 3** Integrating healthy food choices into the preschool curriculum.<br>**PROV 3b** Strengthen staff by recruiting nutritionists, particularly in hospitals and health facilities.<br>**PROV 1** Strengthening the school feeding program by: sourcing food from local producers, developing menus and nutritional standards based on local products, institutional, technical and financial support.<br>**PROV 5b** Development of strategies to promote exclusive breastfeeding by women in local communities.<br>**PROV 3a** Updating and popularizing food guides.<br>**PROV 5a** Strengthening the institutional and legal framework for breastfeeding (maternity leave and breastfeeding facilities in the workplace).<br>**PROV 2** Evaluation of the quality of food service provision in structures: school canteens (military services, prison services, university services, hospitals etc.) to promote the choice of healthy foods.<br>**RETAIL 2** Improving the production of healthy food by promoting access to inputs and financial resources for producers (market gardeners, fruit growers, etc.).<br>**RETAIL 3** Setting up a mechanism for storing and selling healthy food at a cost accessible to the masses.<br>**PRICE 3** Introduction of incentives to facilitate transport and distribution of products from large-scale production areas to less-favored areas. | **GOVER 2** Popularizing research results.<br>**MONIT 1** Implementation by the National Food and Nutrition Council of a monitoring system for food environments: food composition and nutrients of concern, promotion of child nutrition and nutritional quality of food in schools and other public sector establishments.<br>**LEAD 5** Intensify communication campaigns on NTMs.<br>**LEAD 4** Finalization of the nutrition policy document.<br>**MONIT 7** Strengthening nutritional surveillance at community level.<br>**LEAD 2** CAN to conduct a national food consumption survey to establish specific targets for nutrients of concern.<br>**LEAD 8** Update of national targets for exclusive breastfeeding.<br>**LEAD 1** Advocacy to strengthen the budget line allocated to the fight against diet-related non-communicable diseases (NCDs).<br>**MONIT 8** Scaling up the coverage of the child growth monitoring program in the 77 communes.<br>**MONIT 2** Implementation by CAN of a nutritional surveillance system for school-age children (6-13 years), adolescents (14-19 years) and students. |

were invited. Some government players were unable to attend the workshops and were replaced by others. Participants pointed out that some of the indicators were difficult to assess in the Benin context. One of the proposals is to better adapt the tool by adding even more indicators that take sub-nutrition into account.

*Evaluation of government policies and actions*

The workshop to evaluate government policies and actions aimed at creating healthy food environments in Benin was attended by forty-three (43) experts out of the forty-eight (48) invited, representing a participation rate of 89.58%. This rate is higher than that of other African countries such as Senegal, Kenya, Ghana and South Africa, which respectively had participation rates of 50%; 35.71%; 46.34% and 28% (28, 29, 31, 32). This rate is also higher than those obtained in countries such as Australia (70.1%), Thailand (58.7%), Chile (46%), Canada (64%)[20]. In Europe, response rates were around 50% in most countries. However, Germany (76%) and Portugal (66%) recorded higher rates, while Poland (33%), Slovenia (27%) and Estonia (20%) had lower rates (33).

Inter-rater reliability was good at 0.94 (95% CI: 0.92-0.97). This result is higher than those found in Senegal, Kenya and Ghana, where rates varied between 0.73 and 0.75 (28, 29, 32). It is also higher than those found in Thailand, Mexico and New Zealand which also involved government experts in the rating process (31). However, some indicators (10 out of 59) were rated differently by the two groups of experts. Government experts tended to give higher ratings to indicators than government experts. This may be due to their position of responsibility. On the other hand, inter-rater reliability was virtually the same in the independent expert group (0.90; 95% CI: 0.86-0.94) as in the government expert group (0.89; 95% CI: 0.84 - 0.93). Our results are similar to those from Ghana, where no difference was found between

government and non-government experts (32). On the other hand, in Senegal, Thailand, Mexico and New Zealand, the inter-rater reliability of the group of independent experts was higher than that of government experts. This could be justified by the fact that, before each indicator was rated in Benin, discussions and clarifications were carried out to harmonize the experts' understanding. Moreover, the difference between the number of governmental and non-governmental experts was only one (21 governmental experts and 22 non-governmental experts). There was good homogeneity between the two groups.

In this study, 64.28% (18 out of 28) of good practice indicators in the "Policy" component recorded a level of implementation ≤ 25% i.e. "very low, or non-existent", compared with 29.03% (9 out of 31) in the "Infrastructure Support" component compared with international best practice (Figure 3). Elsewhere in West Africa, such as in Senegal, 48% of the good practice indicators in the "policy" component recorded a level of implementation that was "very low, or non-existent", compared with 5% in the "infrastructure support" component compared with international best practice (28). On the other hand, in Ghana, no good practice indicator in the "policy" component was rated as "very weak or non-existent" (32). In Kenya, 12.5% of good practice indicators were rated as "very low or non-existent" for the "policy" component, and none for the "infrastructure support" component (29). In Guatemala 84.61% of good practice indicators were rated as "very low or non-existent" for the "policy" component and 20.83% of indicators for the "infrastructure support" component (34). In Europe, in most countries, implementation of policy indicators was either "very low or non-existent" or "low" (33).

In Benin, 32.14% (9 out of 28) of the good practice indicators in the "Policy" component recorded a "low" level of implementation, i.e. between 26% and 50%, compared with 48.38% (15 out of 31) in the "Infrastructure support" component compared with international best practice (Figure 3). In Senegal, 52.38% of good practice indicators in the "Policy" component recorded a "low" level of implementation and 90% in the "Infrastructure Support" component (28). In Kenya, 81.25% of good practice indicators in the "Policy" component recorded a "low" level of implementation, and 86% in the "Infrastructure Support" component (29). In Guatemala, 11.53% of good practice indicators in the "Policy" component recorded a "low" level of implementation, and 75% in the "Infrastructure support" component " (34).

In our study, only one indicator (3.57%) in the "Policy" component recorded an "medium" level of implementation, i.e. between 21% and 75%, compared with seven (07) indicators (22.58%) in the "Infrastructure support" component. It should be noted that twelve new indicators of the double burden of malnutrition have been included in the tool in Benin. If we consider the initial Food Epi tool, two indicators (4.25%) have recorded an "medium" level of implementation i.e. between 21% and 75%: one indicator from the "Policy" component and one indicator from the "Infrastructure support" component. In Senegal, on the other hand, 2.32% of indicators (1 out of 43) recorded an "medium" level of implementation: no indicator in the "Policy" component, compared with one indicator in the "Infrastructure support" component (28). In Kenya, 10.52% of indicators (4 out of 38) recorded an "medium" level of implementation: one indicator for the "Policy" component and three indicators for the "Infrastructure Support" component (29). In Ghana, 22.22% of indicators (8 out of 36) recorded a "medium" level of implementation: two indicators for the "policy" component and six indicators for the "infrastructure support" component (32). In Guatemala, 4% of indicators (2 out of 50) recorded a "medium" level of implementation: one indicator for the "Policy" component and one indicator for the "Infrastructure support" component (34).

None of the indicators was assessed with a "high" level of implementation, i.e. over 75% in Benin (Figure 3). The same applies to Senegal and Kenya in Africa (28,29). In Ghana, on the other hand, one indicator in the "Policy" component was judged to have a high level of implementation, compared with none in the "Infrastructure support" component. In Singapore and New Zealand, 29% and 21%, respectively, of the "Infrastructure Support" indicators were rated "high" compared with international best practice (31). None of the indicators were rated as "high" in Germany, Ireland, the Netherlands and Poland (33).

The results obtained in Benin provide ample evidence that much remains to be done to improve the

country's food environments in order to combat the double burden of malnutrition. Of the twelve new indicators of the double burden of malnutrition that were included, six (06) were judged "average", three (03) "low" and three (03) also "very low" in relation to international best practice. This shows that significant efforts are being made to combat the various forms of deficiency malnutrition. Indeed, for several years now, most of the interventions implemented in Benin and West Africa have targeted problems of undernutrition. Very few interventions have addressed the problems of obesity and nutrition-related non-communicable diseases. Efforts are being made in Benin through the National Program for the Control of Non-Communicable Diseases, whose experts played an active part in carrying out this study. The identification and prioritization of actions based on the results of the assessment have enabled subsequent corrective actions to be proposed, particularly in relation to the problems of obesity and nutrition-related non-communicable diseases. This will help improve policies to help individuals and families adopt healthier diets to reduce diet-related chronic diseases. In addition, the results of this study could contribute to the development of other more specific research into the impact of food environments on the incidence of obesity and chronic disease in Benin and the West African sub-region. The Food-EPI module makes it possible to measure the progress made over time by the various countries. The creation of a reference document for each of the countries that have completed it provides a resource for governmental and non-governmental sectors wishing to examine policy gaps and coherence. Expert assessment of the level of implementation of policies on the food environment and infrastructure support has shown that there is considerable potential for European countries to improve their policies and infrastructures influencing the food environment (31).

*Identification and prioritization of actions*

The study identified numerous gaps in the implementation of food environment policies compared with international best practice, and recommends clear actions, prioritized by the experts, to improve the food environment in Benin. For the prioritization of actions, Benin has introduced two new prioritization criteria, which are the effect of the action on gender and the effect of the action on sustainability in addition to the effect of the action on the double nutritional burden that was introduced in Senegal during the implementation of Food-EPI in 2018-2019 (28). This is an innovative approach to implementing Food-EPI in low- and middle-income countries where the double burden of malnutrition is a real public health problem and gender inequalities are widespread. Sustainability is a parameter that must now be taken into account in all interventions. Taking all these criteria into account, the main policy actions recommended to the government are: (I) Integrate the choice of healthy foods into children's education programs from pre-school onwards; (II) Strengthen staffing by recruiting nutritionists, particularly in hospitals and health facilities; (III) Strengthen the school feeding program by: (IV) Developing strategies to encourage exclusive breastfeeding by women in local communities; (V) Updating and popularizing food guides. In the area of "Infrastructure support", the experts recommended that the government: (i) popularize research findings; (ii) set up a system for monitoring food environments: food composition and nutrients of concern, the promotion of child nutrition and the nutritional quality of food in schools and other public-sector establishments; (iii) the intensification of communication actions on food-related NCDs, (iv) the finalization of the nutrition policy document and the strengthening of nutritional surveillance at community level. These actions are perfectly in line with those recommended by the World Health Organization for the fight against the double burden of malnutrition (30). Benin is in the final stages of drafting its National Food and Nutrition Policy. This document represents a great expectation for all players in the sector. It will have to take into account the issue of healthy food environments and outline the steps to be taken to improve the nutritional situation of Benin's populations. Furthermore, the implementation since 2018 of the integrated National School Feeding Program (PNASI) by the World Food Program (WFP) with funding from the Benin government, continues to be a reason for hope and satisfaction. Since 2021, 3 out of 4 schoolchildren have benefited from this program. The quality of this

program lies, among other things, in its integrated aspect relating to the consideration of agriculture, small-scale livestock farming, health, hygiene around school canteens (35). It was with a view to further improving this program that recommendations were made. In addition, the experts recommended that CAN set up a system to monitor food environments: food composition and nutrients of concern, promotion of child nutrition and nutritional quality of food in schools and other public-sector establishments. The committee is expected to take steps in this direction. For example, several countries have taken steps to regulate maximum sodium levels in various food categories (36,37). In New Zealand and the United Kingdom, the addition of sugar is no longer permitted in fruit juices (38, 39). More than forty jurisdictions in over twenty countries have introduced taxes on sugary drinks, and at least eight countries have restrictions on advertising of unhealthy foods to children, whether or not directed at children (40). The UK's obesity strategy includes action to ban advertising of high-fat, high-salt and high-sugar foods on TV and online, before 9 p.m (41).

## Conclusion

This study has helped to determine the level of implementation of public policies and government actions in relation to international best practices for healthy food environments in Benin. In addition, it has brought together and raised awareness among national stakeholders around crucial public nutrition issues, and will provide avenues for potential action research. It emerged that, although the country has a set of policy documents in the nutrition sector, these documents do not yet take into account all aspects of guaranteeing a healthy food environment. Numerous efforts are being made in the fight against deficiency malnutrition, as evidenced by the levels achieved by the evaluation of these indicators. However, much remains to be done to combat the problems of overnutrition. The commitment and involvement of national stakeholders in implementing the recommendations arising from the prioritization of actions to promote healthy eating environments in Benin will be one of the major challenges in appropriating the results of this study.

**Acknoledgements:** This project is part of the implementation of the regional project "Evaluation of public policies for healthy and sustainable food environments to prevent the triple burden of malnutrition in West Africa". It involves four countries: Benin, Burkina Faso, Côte d'Ivoire and Togo. The implementation of this research project in Benin is the fruit of collaboration between the Human Nutrition and Food Research Laboratory (LARNAH) of the University Cheikh Anta Diop of Dakar (UCAD), the Department of Nutrition of the Université de Montréal (UdeM), the Regional Public Health Institute Comlan Alfred Quenum (IRSP-CAQ) of Ouidah in Benin, and the National Council for Food and Nutrition (CAN). The project received technical support from the INFORMAS network via Dr Stefanie Vandevijvere. Many thanks to the group of national experts from governmental and non-governmental organizations who took part in the assessment, identification of actions, prioritization of actions and dissemination of results.

**Funding Support:** The research project was funded by Canada's International Development Research Centre (IDRC).

**Conflict of Interest:** The authors declare that they have no conflict of interest.

**Ethics of Human Subject Participation:** this study was reviewed by the Local Ethics Committee for Biomedical Research of the University of Parakou, Benin. Informed consent was obtained from all participants.

## References

1. Food and Agriculture Organization of the United Nations, World Health Organization. Africa Regional Symposium on Sustainable Food Systems for Healthy Diets and Improved Nutrition in Africa; 16 November 2017; Abidjan, Cote d'Ivoire.
2. Ajong AB, Kenfack B, Ali IM, et al. Hypocalcaemia and calcium intake in pregnancy: A research protocol for critical analysis of risk factors, maternofoetal outcomes and evaluation of diagnostic methods in a third-category health facility, Cameroon. PloS One 2020; 15: e0241812.
3. Ajong AB, Kenfack B, Ali IM, et al. Ionised and total hypocalcaemia in pregnancy: An analysis of prevalence and risk factors in a resource-limited setting, Cameroon. PloS One 2022; 17: e0268643.
4. Ajong AB, Kenfack B, Ali IM, et al. Adverse maternofoetal outcomes associated with ionised calcaemia, total calcaemia, albuminaemia, and calcium supplementation in pregnancy: Analysis from a resource-limited setting. PloS One 2022; 17: e0271525.
5. Ajong AB, Kenfack B, Ali IM, et al. Calcium supplementation in pregnancy: An analysis of potential determinants in an under-resourced setting. PloS One 2023; 18: e0292303.

6. Ajong AB, Yakum MN, Aljerf L, et al. Association of hypertension in pregnancy with serum electrolyte disorders in late pregnancy among Cameroonian women. Sci Rep 2023; 13: 20940.
7. Food And Agriculture Organization Of The United Nations. Influencing food environments for healthy diets. 2016
8. Moodie R, Stuckler D, Monteiro C, et al. Profits and pandemics: prevention of harmful effects of tobacco, alcohol, and ultra-processed food and drink industries. The Lancet 2013; 381: 670-679.
9. Cecchini M, Sassi F. Tackling obesity requires efficient government policies. Isr J Health Policy Res 2012; 1: 18
10. Thow AM. Trade liberalisation and the nutrition transition: mapping the pathways for public health nutritionists. Public Health Nutr 2009; 12: 2150-2158.
11. Aljerf L, Aljerf N. Food products quality and nutrition in relation to public. Balancing health and disease: Food safety & hygiene promotion. Prog Nutr 2023; 25: e2023024–e2023024.
12. Melese AT, Ayele DT, Aljerf L, et al. Investigating the phytoavailability of metals in roots of Croton macrostachyus and Phytolacca dodecandra: induced rhizosphere processes. Biometals Int J Role Met Ions Biol Biochem Med 2023; 36: 1347–1359.
13. Bello FMY, Koukou E, Bodjrenou SF, et al. Towards adequate food environment in Benin public primary schools, the challenge of food supply and hygiene practices: a case study of three municipalities. Prog Nutr 2023; 25: e2023043.
14. Programme Alimentaire Mondial, Service de l'Analyse de la Sécurité Alimentaire (VAM). Analyse globale de la vulnérabilité, de la sécurité alimentaire (AGVSA 2017). 2017.
15. Irache A, Gill P, Caleyachetty R. Intra-household double burden of overweight/obesity and anaemia: Evidence from 49 low-and middle-income countries. Matern Child Nutr 2022; 18: e13298.
16. Institut National de la Statistique et de l'Analyse Économique (INSAE). Enquête démographique et de santé (EDSB-III) 2006. Bénin, 2006.
17. Institut National de la Statistique et de l'Analyse Économique (INSAE). Enquête démographique et de Santé (EDSB-V) 2017-2018. Bénin, 2018.
18. Programme Alimentaire Mondial. Examen stratégique national " faim zéro" au Benin à l'horizon 2030. 2018.
19. Shelf L. Development of a method for classification of hospitals based on results of the diagnosis-related groups and the principle of case-mix index. East Mediterr Health J Rev Sante Mediterr Orient Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit 2016; 22: 327–334.
20. Aljerf L, Alhaffar I. Salivary Distinctiveness and Modifications in Males with Diabetes and Behçet's Disease. Biochem Res Int 2017; 2017: 9596202.
21. Programme National de Lutte contre les Maladies Non Transmissibles. Rapport final de l'enquête pour la surveillance des facteurs de risque des maladies non transmissibles par l'approche STEPSwise" de l'OMS. Benin, 2015.
22. Programme National de Lutte contre les Maladies Non Transmissibles. Enquête globale sur la santé des élèves au Bénin en 2016 Fact Sheet. Bénin, 2016.
23. Conseil de l'alimentation et de la nutrition. Plan Stratégique de Développement de l'Alimentation et de la Nutrition. 2009.
24. Swinburn B, Vandevijvere S, Kraak V, et al. Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: a proposed G overnment Healthy Food Environment Policy Index. Obes Rev 2013; 14: 24-37.
25. Swinburn B, Sacks G, Vandevijvere S, et al. INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): overview and key principles. Obes Rev Off J Int Assoc Study Obes 2013; 14 Suppl 1: 1-12.
26. Vandevijvere S, Swinburn B, International Network for Food and Obesity/non-communicable diseases (NCDs) Research, Monitoring and Action Support (INFORMAS). Pilot test of the Healthy Food Environment Policy Index (Food-EPI) to increase government actions for creating healthy food environments. BMJ Open 2015; 5: e006194.
27. Laar A, Barnes A, Aryeetey R, et al. 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.
28. Manga JS, Diouf A, Vandevijvere S, et al. Evaluation and prioritisation of actions on food environments to address the double burden of malnutrition in Senegal: perspectives from a national expert panel. Public Health Nutr; 25: 2043-2055.
29. Asiki G, Wanjohi MN, Barnes A, et al. Benchmarking food environment policies for the prevention of diet-related non-communicable diseases in Kenya: National expert panel's assessment and priority recommendations. PLoS ONE 2020; 15: e0236699.
30. World Health Organization. Double-duty actions for nutrition [Online]. Available at: https://apps.who.int/iris/bitstream/handle/10665/255414/WHO-NMH-NHD-17.2-eng.pdf?ua=1. Accessed March 20, 2023.
31. Vandevijvere S, Barquera S, Caceres G, et al. An 11-country study to benchmark the implementation of recommended nutrition policies by national governments using the Healthy Food Environment Policy Index, 2015-2018. Obes Rev 2019; 20: 57–66.
32. Laar A, Barnes A, Aryeetey R, et al. 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.
33. Pineda E, Poelman MP, Aaspõllu A, et al. Policy implementation and priorities to create healthy food environments using the Healthy Food Environment Policy Index (Food-EPI): A pooled level analysis across eleven European countries. Lancet Reg Health - Eur; 23. Epub ahead of print 1 December 2022. DOI: 10.1016/j.lanepe.2022.100522.

34. Sánchez-Nóchez CM, Ramirez-Zea M, Vandevijvere S, et al. Benchmarking public policies to create healthy food environments compared to best practice: the Healthy Food Environment Policy Index in Guatemala. Arch Public Health 2022; 80: 174.
35. Government of the Republic of Benin. School feeding - Meeting of WFP representatives in West and Central Africa: Benin shares its experience with country directors. [Online]. Available at: https://www.gouv.bj/article/2211/alimentation-scolaire-reunion-representants-afrique-ouest-centre-benin-partage-experience-avec-directeurs-pays/. Accessed August 14, 2023.
36. Allemandi L, Tiscornia MV, Ponce M, et al. Sodium content in processed foods in Argentina: compliance with the national law. Cardiovasc Diagn Ther 2015; 5: 197-206.
37. Hofman KJ, Tollman SM. Population health in South Africa: a view from the salt mines. Lancet Glob Health 2013; 1: e66-e67.
38. Gov.UK. Food standards: labelling and composition, [Online]. Available at: https://www.gov.uk/guidance/food-standards-labelling-durability-and-composition. Accessed April 11, 2022.
39. Ministry of Health New Zealand. A Focus on Pacific Nutrition, [Online]. Available at: https://www.health.govt.nz/publication/focus-pacific-nutrition. Accessed April 11, 2022.
40. Hawkes C, Jewell J, Allen K. A food policy package for healthy diets and the prevention of obesity and diet-related non-communicable diseases: the NOURISHING framework. Obes Rev Off J Int Assoc Study Obes 2013; 14 Suppl 2: 159-168.
41. Gov.uk. Tackling obesity: government strategy, [Online]. Available at: https://www.gov.uk/government/publications/tackling-obesity-government-strategy. Accessed April 20, 2022.

Received: 9 November 2023
Accepted: 24 January 2024
**Correspondence:**
Reynald Santos, MPh
Regional Public Health Institute,
Phone: 00229 66694093
E-mail: santosreynald09@hotmail.fr