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Improving Health through Sustainable and Healthy Urban Food System Policy in Nigeria

Onyedika Gabriel Ani^{1,*}  and Isaac Duah Boateng² ¹ Nutrition and Exercise Physiology, University of Missouri-Columbia, Columbia, MO 65211, USA² Certified Group, 199 W Rhapsody Dr., San Antonio, TX 78216, USA; boatengisaacduah@gmail.com

* Correspondence: ogang2@missouri.edu

Abstract: Diet-related diseases and mortalities are assuming epidemic proportions globally. It is more worrisome in the Global South, especially in Africa, where the healthcare system is not resilient to the public health burden. There is a growing effort around the world to foster urban food system policies that would checkmate the failing health of the public and ensure improved quality of life. However, these efforts seem non-existent in many African regions. Therefore, there is a need for heightened efforts in these areas to address the food system and ensure a global healthy society. This study identified Nnewi, Nigeria, in sub-Saharan Africa, a typical urban area in Nigeria, and analyzed the public health challenges attributed to the non-existent food system policy and poor nutritional practices. The Milan Urban Food Policy Pact model, which has been successfully implemented in many cities, was adopted to propose a sustainable food system policy for Nnewi. Key policies proposed include autonomous local government power, government-assisted programs, clean and sustainable amenities, agricultural reforms, nutrition education, and reductions in food wastage to achieve a circular economy. An evaluation tool for implementing the food system policy was also developed. Overall, implementing the food system policies proposed herein would improve the quality of life of Nnewi residents. Other urban areas could also adopt similar food system policies to achieve the Sustainable Development Goals of a healthy and resilient global society.

Keywords: public health; Global South; quality of life; Milan Urban Food Policy Pact; Sustainable Development Goals

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1. Introduction

Health is the prime determinant of the quality of life of any individual and, in turn, that of a population. While the World Health Organization [1] acknowledged that health encompasses social, physical, and mental wholeness, Huber et al. [2] posited that it should imply an individual's ability to adapt and manage oneself in prevailing social, physical, and mental difficulties. However, it takes an empowered and enabled individual to adapt to such challenges [2]. This agrees with the Ottawa Charter's advocacy for enablement so that people can take control and improve their health [3]. It follows that an empowered and enabled population would have the opportunity to make healthier choices and gain adequate satisfaction from living, a concept referred to as "quality of life" [4]. In addition, the British Medical Association [5] posited that the quality of life of a population could be determined by the quality of food accessible to them. Therefore, sustainable and healthy food systems would empower the population to adapt to health challenges.

A sustainable and healthy food system provides a gateway for proper health promotion within a population. It is viewed as a system that ensures an adequate food supply to the population while maintaining the integrity of the economy, society, and environment [6]. To achieve this, a good food policy needs to be in place, and there is a need to adopt a whole-system approach, as food systems are interconnected with other facets of life [7]. Furthermore, evidence supports engagement at the grassroots level as

an effective strategy [8], which could result from an intimate understanding of the local population's needs, situations, and peculiarities.

Nigeria, the most populous country in Africa, is faced with dire health challenges that could be attributed to nutrition. Many diet-related preventable conditions and deaths burden both children and adults—ranging from malnutrition to metabolic diseases such as overweight, obesity, diabetes, hypertension, and so on. To remedy this, there is a need for a sustainable food policy that addresses public health nutrition issues at the urban level. Therefore, this paper adopted the Milan Urban Food Policy Pact (MUFPP) [7], a globally accepted framework for creating a sustainable urban food policy to model in a typical Nigerian urban area, Nnewi. This model has been implemented in many cities worldwide, including some African places; hence, its application in Nigeria is tenable. We also outline different techniques that can be utilized to monitor and evaluate the food policy implementation.

To achieve this, we present the background of Nnewi, the food culture and production, and pertinent public health nutrition issues in this urban area. Briefly, we also provide a background to adopting the bottom-to-top approach in proposing the sustainable food system in the Nnewi urban area.

2. Method

To support the premise of this study, which centered on creating a sustainable urban food policy, a literature search was conducted on the Google Scholar, CINAHL, Medline, PubMed, Science Direct, and Web of Science databases using the keywords “Global South”, “Africa”, “Nigeria”, “Nnewi”, “Public Health Policy”, “Food Policy”, “Quality of Life”, “Sustainable Development Goal”, and “Milan Urban Food Policy Pact”. The tenets of the MUFPP emerged as the structural pillars of formulating a sustainable food policy. The urban area Nnewi was selected because of the basic features present in the area that are common in most urban areas in Nigeria and, to a larger extent, Africa. As such, it is presented in this paper as a model to implement the MUFFP, which could be replicated in other areas with similar public health challenges.

3. Nnewi: An Urban Area in Anambra, Nigeria

In sub-Saharan Africa lies Nigeria, dubbed the most populous black nation with an estimated population of over 210 million [9]. About 194,000 of this population live in Nnewi [10], an urban town in Anambra, one of the five states of south-eastern Nigeria [11], which is culturally regarded as Igbo [12]. This implies that the town has a cultural identity, which could influence the food choice in this locality. Furthermore, there is a nearly equal proportion of males and females in the town, with an average of five persons per household [13]. Hence, it could be inferred that they are mainly family settlements, and as such, people's food choices could also be determined by their family orientations and circumstances.

Nnewi is an industrialized town [14] with an annual population growth of ~3.66%, making it one of Nigeria's fastest population growth rates [13]. This population growth could result from, among other things, human migration to the town due to employment opportunities created by industrialization. Anoliefo et al. [12] argued that the people's way of life in Nnewi, which includes the type of food, the mode of cooking, and feeding, is typical of the Igbo. The Igbo food system is traditionally styled in that it utilizes raw foodstuffs to make various meals, as highlighted in Table 1 [15], instead of processed and packaged foods. Some of these raw foodstuffs, especially vegetables and seed oils, have been reported to possess therapeutic properties such as glucose- and lipid-lowering potentials [16,17]. Fruits and vegetables (FVs) form the basis of adequate dietary patterns globally. However, FV consumption is considered a luxury in regions like Nigeria, where the household income rather than the benefits determine their preference and demand [18]. Across Europe, the per capita consumption of FVs is also below the recommended minimum intake, being mainly determined by the freshness and taste of such products [19]. Okeke et al. [15] also

noted that while the tropical palm oil prominently used by Igbos provides provitamin A, it also has a high saturated fat content, and most of their diets are deficient in calcium and B vitamins required by the population, which could be a result of inadequate knowledge of food combinations to achieve a balanced meal. With the upsurge in population, it could be argued that the existing food system in Nnewi may not be appealing to migrants from different cultural backgrounds, such as the indigenous Hausas and Yorubas and even from the neighboring Ghana, Cameroun, and Chad, presenting a further need for a sustainable food system that would address the demand of the growing and diverse population.

Table 1. Some traditional Igbo diets in Nnewi (Adapted from [15]).

Diets	Main Ingredients and Preparation	Major Micronutrients
Ofe Ogbono, egusi, bitter leaf vegetable or Okra (Soup)	Vegetables, meat/fish, crayfish, pepper, palm oil, condiments (melon/cocoyam/other soup thickeners)	Iron, β -carotene, zinc
Ayaraya oka	Corn, oil bean, palm oil, pepper, and vegetables	Vitamin A, iron, zinc
Achicha	Dried cocoyam mixed with pigeon pea, oil bean, palm oil, and green leafy vegetables.	Iron, zinc, β -carotene, vitamin C
Moimoi	Wet or dry milled dehulled beans paste mixed with palm oil, pepper, onion, crayfish, pieces of meat, fish, or egg (optional), steamed into a pudding.	Iron, zinc, β -carotene, folate, copper
Akara (Bean cake)	Wet or dry milled dehulled beans paste, whipped, and mixed with pepper, onion, salt, and deep-fried in balls in vegetable oil.	Iron, zinc
Yam pottage	Yam cubes boiled with palm oil crayfish, fish/meat, green leafy vegetables	Iron, β -carotene
Ukwa (Breadfruit)	Breadfruit, fish or meat, bitter, scent or other green leafy vegetables, salt, pepper, and other local spices	Iron, zinc, β -carotene
Bean pottage	Cowpea or other legumes mixed with palm oil, salt, pepper, onion,	Iron, zinc, β -carotene
Okpa	Bambara groundnut flour paste mixed with palm oil, pepper, salt, and other spices to taste.	Iron, niacin, magnesium, β -carotene
Ukpo-ogede	Dried plantain flour, over ripped plantain pastes, palm oil, pepper, salt	β -carotene, iron, zinc
Abacha (Native Salads)	Dried cassava slices mixed with palm oil, leaf green vegetable, fermented oil bean seed slices, salt, pepper, also crayfish, and pieces of cow skin (<i>kpomo/kanda</i>), mixed with potash (<i>akanwu</i> , in Igbo) to produce a yellow paste <i>ncha</i> (soap) are added.	β -carotene, iron, vitamin C, zinc

4. Food Production, Purchase, and Consumption in Nnewi

The act of cultivating land and rearing animals remains a reliable source of food for all populations. Topographically, Nnewi has a land size of 60,477 km² [13]. The soil is sandy, porous, non-resistant, and has a low load-bearing capacity [20], which may contribute to this town's flood and soil erosion [21]. In addition, the United Nations Human Settlements Programme (UN-HABITAT) [20] identified unplanned and illegal construction of shanties on would-be drainage channels in slum areas of Nnewi as contributing causes of this flood and erosion. Hence, the poor economic potential of agriculture in Nnewi [22] may result from discouraging soil state, flooding, and erosion. Furthermore, another factor could be the loss of land and/or occupation shift due to industrialization and urbanization. Moreso et al. [23] identified the high investment cost, credit crunch, inadequate human capital, and expertise as factors mitigating urban agriculture in Nnewi. Consequently, the town depends on foods from northern parts of the country, neighboring towns, and international importations [24]. However, these have been hampered by the continued insecurity in northern Nigeria [25] with the concomitant effect of the coronavirus global pandemic on food security in Nigeria [26]. Therefore, there is a need for a formidable strategy that encourages and boosts sustainable urban agriculture in Nnewi.

As in most African settings, Nnewi residents mainly source their food from small corner shops. These retailers buy from the central open markets, notably Nkwo Nnewi, Eke Amaobi, Nwafor Uruagu, Orié Agbor, and others [27]. People also eat out in open restaurants and hotels; however, a study conducted by Oraedu [28] with 180 food handlers in Nnewi revealed that while 77.9% of them had adequate knowledge of food safety,

only 58.6% practiced food safety measures, presenting an unhealthy eating environment that could predispose the local population to ailments. Therefore, these occurrences and situations in Nnewi call for a sustainable and healthy food system.

5. Relevant Public Health Nutrition Issues in Nnewi

Globally, efforts to reduce poverty, especially child poverty, which deprives children of access to adequate nutrition, safe drinking water, good sanitation, and proper shelter, among other things, have gained attention in recent years. In addition, the Ottawa Charter identified social justice and equity as prerequisites for health [3]. However, even with Nnewi's industrialization and urbanization, there is still clear evidence of poverty and inequality, as many dwellers live in areas with poor housing quality, little or no access to safe drinking water, and poor sanitation [20], further underpinning urbanization as a critical public health issue in the 21st century [29]. This may have contributed to the drop in access to safe drinking water (49.9% to 49%) and proper sanitation (85.5% to 49%) in the state between 1999 and 2003 [30]. Unsafe drinking water and poor sanitation can predispose children to waterborne diseases. It could be reasonably argued that the foods consumed in these areas would also face the risk of contamination, leading to foodborne diseases. These occurrences lend credence to the findings of Ezendianefo and Dimejesi [27], which implicated poor hygienic practices as the cause of the high microbial count in food products sold in Nnewi markets. These visible inequalities and deplorable living standards fall short of the Ottawa Charter [3]. Moreso does not conform to the Shanghai Consensus [31], which identified healthier cities as the pathway to achieving the Sustainable Development Goals (SDGs), especially no poverty, zero hunger, good health and well-being, clean water and sanitation, reduced inequalities, and sustainable cities and communities [32]; as such, there is a need for health interventions that would ensure the sustainability of Nnewi.

Across Nigeria, the three forms of malnutrition—undernutrition, hidden hunger, and overweight—are still prevalent and may coexist. In recent years, Nigeria's number of malnourished children has steadily increased [33]. The latest figures from the National Population Commission [13] showed that 75.2% of children under five were classified as having anemia in the Anambra state. Anemia occurs when there is a lower-than-normal level of erythrocytes, hemoglobin, or their abnormalities to meet the body's needs [34], which could be an indication of iron, vitamins B6, B9, and/or B12 deficiency, and micronutrients essential for their production. Similarly, the findings of Henry-Unaeze and Okonkwo [35] with 200 adolescents (12–19 years) in Nnewi, whose primary sources of calcium are cereals and legumes, revealed a serum calcium concentration of 7.12 ± 3.54 mg/dL, lower than the average value of 8.5 to 10.5 mg/dL [36]. Anti-nutrients, notably phytates (phytic acids), oxalate (oxalic acid), and lectins found in such food sources may interfere with the absorption of calcium or other minerals depending on the method of preparation [37]; hence, it could be argued to be a contributing factor to the observed abnormal mineral levels, suggesting the need for adequate nutrition information and education among the local population. These pieces of evidence in the town highlight the prevalence of micronutrient deficiency essential for optimal body functioning, otherwise known as hidden hunger. The study by Ezeama et al. [38], with 657 mother–child pairs in the state, also revealed a prevalence of stunting (15.1%), wasting (18.1%), and underweight (10.4%) among under-five children. These three indicators have been acknowledged by the United Nations Children's Fund [39] as markers of undernutrition. Therefore, given the sample size of this study, there is evidence to suggest endemic malnutrition in the state. Ugochukwu et al. [40] examined the lunch packs of 792 primary school pupils in Nnewi and observed that only 12.4% (98/792) and 19.2% (152/792) had balanced meals and fruits/vegetables, respectively. These poor nutritional practices could account for the prevalence of malnutrition in this area, especially among the younger population; hence, there is a need for a sustainable food policy that would mitigate these public health nutrition challenges.

6. Background to Promoting a Sustainable Food System and Healthy Diet in Nnewi

Over time, the concept of health has evolved, depending on the prevailing public health issues at that time, as well as health policies. For instance, in the 19th century, infectious diseases accounted for nearly all illnesses and deaths, especially among children [4,41]; hence, it could be understood why health was perceived as the complete absence of illness then. However, the clampdown on this occurrence in the 20th century ushered in a new meaning for health. In 1948, the WHO acknowledged that health does not necessarily mean the absence of ailments but the state of absolute well-being regarding physical, social, and mental health [1]. Although this definition was fitting for its time, with the rising number of chronic diseases and their comorbidities, especially diet-related diseases, in the 21st century, there have been substantive arguments for disapproval [2,42,43]. Consequently, a consensus was reached in 1986 (the Ottawa Charter) that a healthy individual or population must attain desires, satisfy needs, and adapt to the environment [3]. This position, which considered wider social determinants, repurposed all sectors to enable the population to maximize control over and improve their health. This has also shifted from traditional paternalistic expert-led policy-making into an all-inclusive pattern encompassing the public and critical industries. The state's development and implementation of paternalistic policy that neglects individual citizens' consent has aroused some contentious debate in the past [44]. While some argue that the state's approaches are "nanny statist", unwarranted intrusion into people's way of living, others see it as "stewardship"—the state's responsibility to protect national health [45]. Nevertheless, this new approach, which engages every stakeholder at all levels, could be argued to douse this tension in some ways, as the opinions of the public are sought in policy-making. Against this backdrop, the policies proposed in this paper to meet a sustainable food system and healthy diet in Nnewi would consider all stakeholders.

To achieve a sustainable urban food system, all stakeholders in the city need to be involved in drafting and adopting a policy feasible for the people, locality, and politics of the location. Figure 1 illustrates the statutory lawmakers elected by law [46] and the traditional monarch and other leaders elected by the traditions and customs of Nnewi [47]. In addition, other key stakeholders that could influence decision-making in the Nnewi food system would include civil society organizations such as farmers' and traders' associations, non-governmental and voluntary organizations, faith-based organizations, international donors, schools, and hospitals.

The advent of health promotion ushered in by the Ottawa Charter has resulted in new approaches to achieving healthy living. The Ottawa Charter's key actions lie in advocacy (boosting factors that favor health), enablement (ensuring equity in health), and mediation (intersectoral collaborations) [3]. As a result, public health practitioners now employ five health promotion approaches to create a sustainable and healthy environment, as illustrated in Table 2 [48].

Table 2. Health promotion approaches (adapted from [48]).

Approach	Focus	Examples
Medical	Increasing medical interventions targeted at the whole population or at-risk groups to reduce illness, disabilities, and premature deaths.	<ul style="list-style-type: none"> • Immunization • Screening for diseases • Palliative care
Behavioral/Lifestyles	Motivating and encouraging people to adopt healthier lifestyles.	<ul style="list-style-type: none"> • Persuasive mass media campaigns • Individual health coaching
Educational	Providing adequate knowledge and information as well as developing necessary skills in people so that they can make informed choices about their health behavior.	<ul style="list-style-type: none"> • Mass media campaigns • Group discussion, one-to-one advice sessions • Other activities impacting decision-making and negotiating skills

Table 2. Cont.

Approach	Focus	Examples
Empowerment/Client-centered	Helping individuals and communities to identify their health concerns and acquire skills and confidence to enable change.	<ul style="list-style-type: none"> • Client-centered counseling • Peer-support group • Community development • Promoting public engagement in decision-making on public health issues
Social Change	Making changes within people’s physical, social, and economic environment improves their quality of life.	<ul style="list-style-type: none"> • Lobbying for healthy public policies • Creating recreational centers • Organizational changes in public places such as hospitals and schools

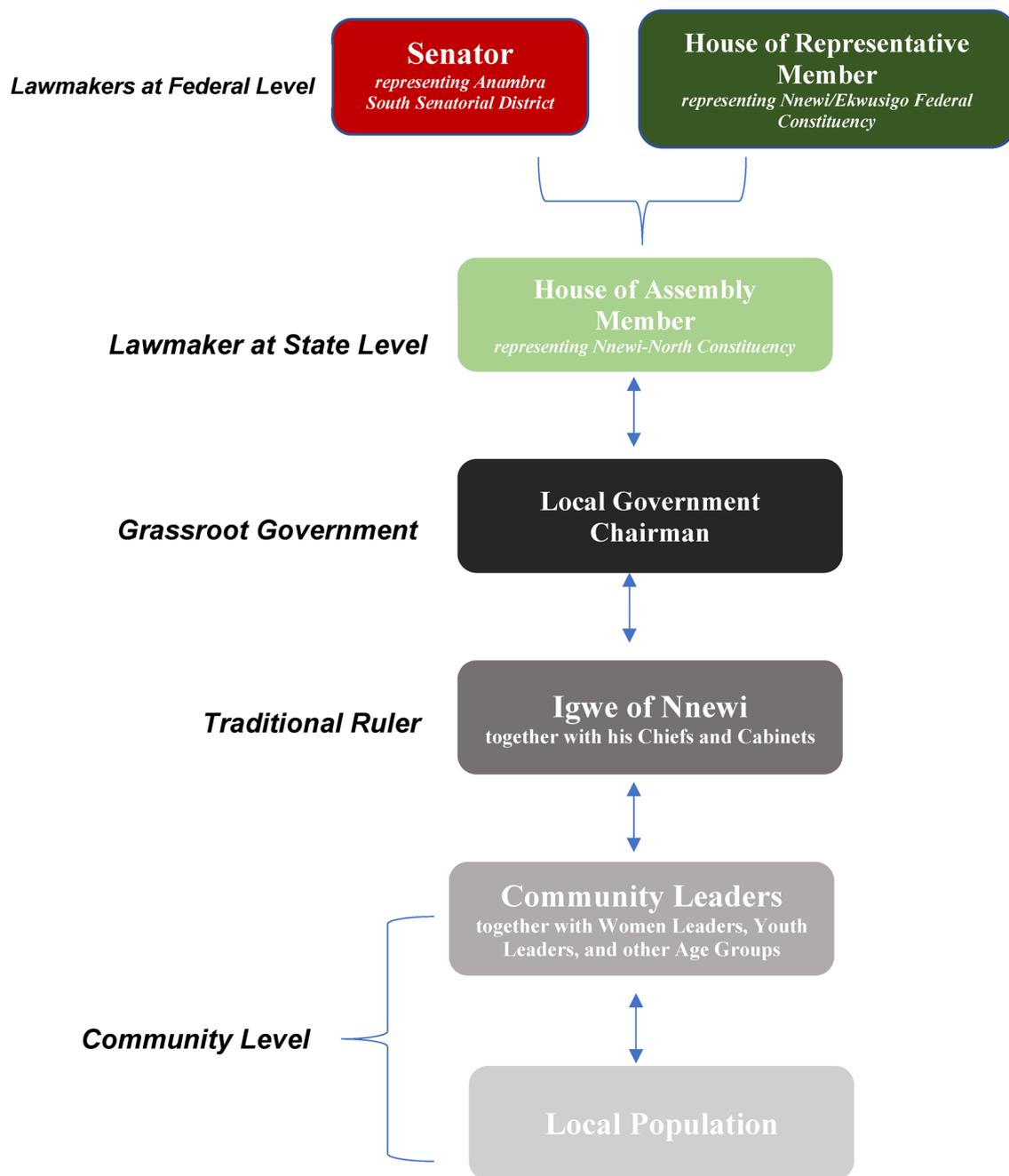


Figure 1. The key stakeholders in Nnewi (adapted from [46,47]).

7. Promoting a Sustainable Food System and a Healthy Diet in Nnewi

Dietary transition and urbanization are intertwined; as the population in an urban area grows and diversifies, there is a need to promote healthier living through proper dieting. On this basis, cities across the globe are adopting the MUFPP, with six actions anchored on governance, social and economic equality, sustainable diets and nutrition, food production, food supply and distribution, and food waste to bring about a sustainable food system and healthy diet [7]. These six actions target actualizing four broader agendas: improving citizens' engagement and transparency in food policy-making, improving nutrition, food, and health security, improving economic growth and social equity while reducing poverty, and reducing environmental degradation [49]. Therefore, in the section below, these six actions were adopted to create a food policy for Nnewi, emphasizing specific cities or regions that have successfully implemented the same approach. In addition, some health promotion approaches outlined in Table 2 were employed to bring about the desired changes.

(1) Governance

Nigeria runs as a federalist with power residing almost exclusively at the center [50]. Local government autonomy is not practiced in this setting [51]. This could account for inadequate grassroots developments across the country. Magarini et al. [52] argued that the effective way of creating a food system that meets the needs of the people is by fostering local food autonomy. This guarantees food local people the right to make their own food choices and set agricultural policies sovereignty, giving the local people the right to make their own food choices and set agricultural policies that would ensure economic sustainability as well as stoppage to indiscriminate dumping on their food markets [53]. Therefore, to bring about an effective urban food policy in Nnewi, the local government needs full autonomy for their sovereign.

Policy

- a. To establish a bill that would be passed both in the federal and the state house of assembly, enshrining the complete autonomy of the local government into law in Nigeria.
- b. With the autonomy in place, the local government would create a Ministry for Food and Policy Development with its budget, comprising representatives from the stakeholders highlighted in Figure 1, farmers and suppliers, consumer groups, faith-based organizations, civil and labor unions, research institutions including schools, and hospitals in the town. The effectiveness of this structured and shared governance in the sustainable food system is manifested in cities like Milan in Italy [54], Be-lo Horizonte in Brazil [55], and more recently, Baltimore [56] and Austin [57] in the USA.

Health promotion approach

i. Social Change

- a. Lobby the lawmakers representing Nnewi at the federal and state houses of assembly to sponsor the local government autonomy bill.

ii. Empowerment

- a. Advocating and creating awareness for the key stakeholders to join and be involved with the Ministry of Food and Policy Development in Nnewi—this would be achieved by creating an advocacy group.

(2) Sustainable diets and nutrition

This paper has highlighted the inadequate nutritional education associated with the Igbo traditional food system. Also, it has identified the prevalence of malnutrition, unsafe drinking water, and poor sanitation within the town.

Policy

- a. Health and nutrition education for students and teachers in schools through funding teachers training and retraining. Also, the student's curriculum should be updated to meet international standards while adopting the Igbo traditional food system's

peculiarities. Belo Horizonte's approach presents an effective model for this approach [58].

- b. Construction of clean pipe-borne water that would guarantee safe water for every dweller in Nnewi.
- c. Setting aside the last Saturday of every month for mandatory general sanitation and town cleaning. Also, a fine would be placed for defaulters, serving as a deterrent.
- d. Food fortification against child malnutrition. Providing flour and dairy products such as milk fortified with essential minerals and vitamins to children and pregnant women to curb hidden hunger and undernutrition. This approach has been successfully applied in Belo Horizonte, Brazil [58].

Health promotion approach

i. Educational

- a. Boosting nutrition education across schools. The study of Chidiebere et al. [59] revealed a high level (78.6%) of compliance with school nutrition and health education across schools in Nnewi, but the knowledge capacity of the teachers was faulted. Hence, the approach would be to retrain teachers and update the subject curriculum.
- b. Organizing workshops and cooking sessions for the local populations.

ii. Behavioral/Lifestyles

- a. Mass media nutrition and health sensitization and campaign via radio, television, newspaper, and social media publications. Also, printed bills, flyers, and posters to encourage the local population to eat healthily and practice adequate sanitation.

iii. Medical

- a. Providing fortified food products would serve as a medical approach to ameliorating malnutrition.

iv. Social change

- a. Constructing pipe-borne water and other basic amenities would facilitate healthy living within Nnewi.

(3) Social and economic equity

The paper has highlighted visible inequalities and heightened poverty in Nnewi. In addition, the town has no account of the food markets, corner shops, restaurants, hotels, and other hospitality industries, making it difficult to regulate and provide support and assistance.

Policy

- a. Create a mandatory register for food markets, corner shops, and all hospitality industries in the town. Offer interest-free loans to these business owners to enable them to source diverse foodstuffs and sell them to the local population at an affordable rate. The city of Baltimore, USA, was able to eliminate inequality with this strategy [60].
- b. Food assistance programs:
 - i. Subsidized public restaurants that would provide healthy and nutritious meals at low prices, especially for children from an identified deprived background. This strategy has successfully lowered hunger in Belo Horizonte, Brazil [58].
 - ii. Free school meals. Serving nutritious meals to school children from deprived backgrounds. This intervention has effectively provided daily meals to school children in the UK, especially during the nationwide coronavirus lockdowns [61].
 - iii. Food vouchers for very low-income households at local markets and shops. The National Health Service's (NHS) Healthy Start Scheme model for vulnerable pregnant women would be adopted to provide food vouchers to the local population in areas of deprivation [62].

- iv. Food banks. By partnering with philanthropists and local and international NGOs to collect and distribute food to vulnerable and deprived local populations. The works of Marcus Rashford and the Independent Food Aid Network (IFAN) in the UK would serve as a model to achieve this in Nnewi [63].

Health promotion approach

- i. **Social Change:** creating physical access to food for the vulnerable and deprived, especially children.

(4) Food production

The key challenges to agriculture, as described in this paper, are land tenure, soil topography, and inadequate resources.

Policy

- a. Removing illegal structures and shanties blocking the waterways and afforestation would be a long-term plan to curb erosion in Nnewi and restore the integrity of the soil [20].
- b. Secure access and tenure to land and promotion of urban agriculture. Mapping out lands in strategic positions for farming and giving access to local farmers. The Participatory Urban Agriculture Program (AGRUPAR) within the Municipality of Quito, Ecuador [64], is an excellent initiative that could solve the problem of food production in Nnewi. This would involve targeting the vulnerable (women, elderly, disabled, and local farmers) and promoting the self-production of organic foods by supplying them with adequate resources.
- c. School and other public institutions farming programs. The Belo Horizonte food program also promotes school gardens, which have proven effective in nurturing young farmers [58]. The food program in Nnewi would seek to set aside Fridays for farming in public institutions in the town.

Health promotion approach

- 1. **Social change:** physical and environmental restructuring of the town.
- 2. **Educational:** workshops on urban agriculture in public institutions.

(5) Food supply and distribution

The over-dependence on northern Nigeria and other outside sources for food, as described in this paper, with its attendant problems, such as the issues of the middlemen and socio-economic shock (as seen with the global pandemic), has resulted in an unsustainable food system in Nnewi.

Policy

- a. Straight from the farm strategy. This would create special spots for farmers within highly frequented sales places in the town with no additional charge, thus allowing them to sell at lower prices to the poor. This has been effective in the city of Belo Horizonte [58]. The AGRUPAR also created local marketing projects called “bioferias” where the farmers can sell their surplus [64]. Arguably, this approach eliminates the middlemen, ensuring that the farmers have enough to eat and can earn a living from their subsistence farming.

Health promotion approach

- i. **Social Change:** creating a direct link between the farmers and the final consumers.

(6) Food waste

It is a global issue that while there may be excess food in some households or through wholesale and retail services leading to food waste, others face increasing hunger and malnutrition [65].

Policy

- a. Establishing a logistics and information platform would allow farmers, sellers, households, and hospitality industries to provide information on excess food that would

have otherwise been wasted. This platform would allow the collection of such foods and redistributing them to already existing subsidized public restaurants, free school meal programs, food banks, and households on the local government food voucher register. The Foodsaver program in Ghent, Belgium, adopted this approach, resulting in 64,395 food items amounting to 300.34 tonnes of food redistributed, reaching 58 local charity organizations and restaurants and 18,971 vulnerable people [66].

- b. Artificial intelligence (AI) and hospitality industries in Nnewi. As technology evolves, there have been advances in the use of AI to reduce food waste, especially in hotels and restaurants. Winnow is an app developed for this purpose and has proven effective [67]. Therefore, working in collaboration with all hospitality industries in Nnewi, there would be workshops to educate local chefs on using apps like Winnow to reduce food waste in their kitchens.
- c. Promoting a circular economy. The local population would be taught how to convert foods and food material for disposal into feedstock for their farms and gardens in manuring. This strategy, otherwise known as a circular economy, ensures that nothing is wasted but serves as feedstock for sustainable farming [68].

Health promotion approach

- i. **Social Change:** creating a platform providing timely information about food excesses.
- ii. **Educational**
 - a. Educating the local population and all stakeholders on using and accessing the information platform for food excesses.
 - b. Educating the hospitality industry on the use of phone apps like Winnow.
 - c. Educating the local population on composite making with food materials for waste.

8. Monitoring and Evaluation of the Nnewi Food Policy Program

Evaluation is an integral part of health intervention. Rootman et al. [69] defined it as the systematic assessment of features of the intervention to produce a knowledge base that serves different purposes of critical stakeholders. This may include formative or summative purposes [69]. While formative purposes aim to improve or reorient the intervention, summative purposes seek to continue, discontinue, replicate, or scale up the intervention [69]. Monitoring usually precedes evaluation; the knowledge of the outputs as the result of various activities in the intervention informs the outcomes and the impacts of the intervention on the targeted population, which are the focus of evaluation, as illustrated in Figure 2 [48].

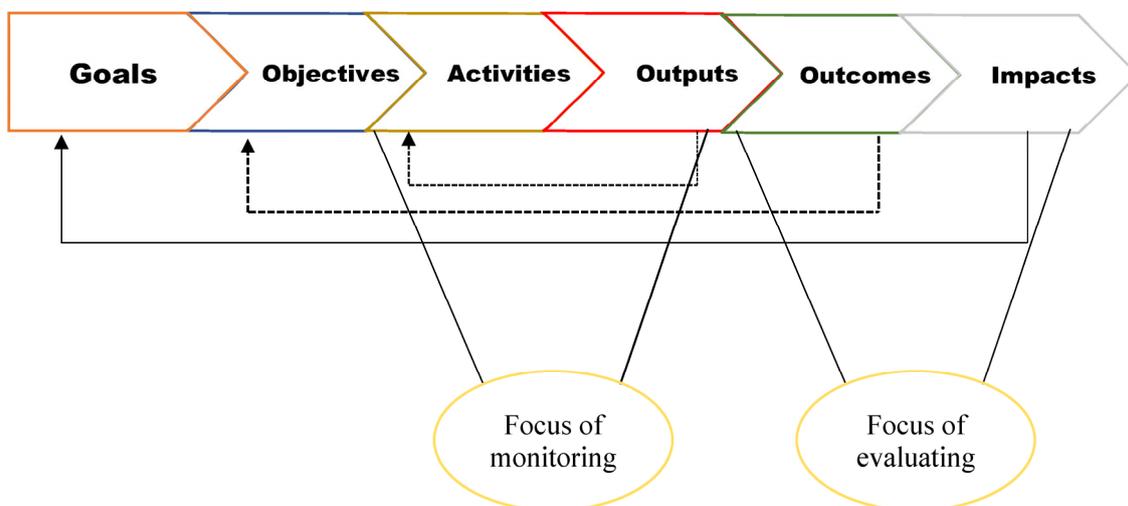


Figure 2. Components of monitoring and evaluation of health interventions (adapted from [48]).

Therefore, a strategy is needed to monitor and evaluate the Nnewi food policy. The framework created by the FAO and Resource Centers on Urban Agriculture and Food Security Foundation in collaboration with MUFFP cities (Table S1) has been applied in three cities, namely Nairobi (Kenya), Antananarivo (Madagascar), and Quito (Ecuador) [49], presents a standard to follow. This includes 44 indicators that can be categorized into two main groups: self-assessment binary indicators (evaluating the presence (or absence) of a specific item and/or policy) and quantitative indicators (measuring percentages, absolute numbers, and/or rates that evaluate progress against specific baselines) [49].

A self-assessment form (Table S2) was used to score each self-assessment binary indicator [49], while the quantitative indicators involved collecting data from the population before the policy implementation and yearly after that [49]. Depending on the indicator assessed, this would include an experimental, quasi-experimental, or non-experimental approach. In addition, a disaggregated data approach would be employed, which involves further breaking down the data generated into one or more dimensions or characteristics (socio-economic class, sex, geographic area, and/or age) [70]. This allows the identification of groups or parts of the lagging population. In addition, the Food Insecurity Experience Scale Survey Module (FIES-SM), which consists of eight questions (Figure 3), was employed to evaluate the population's access to nutritious food over a year [71]. Therefore, these evaluation tools present the indicators that should be adopted to assess the outcomes and impacts of the Nnewi food policy scheme. Furthermore, reflecting on the scores and performance of the indicators would inform judgments on the progress of the policy, thereby providing a basis for improvement in specific areas while expunging or amending other parts of the policy.

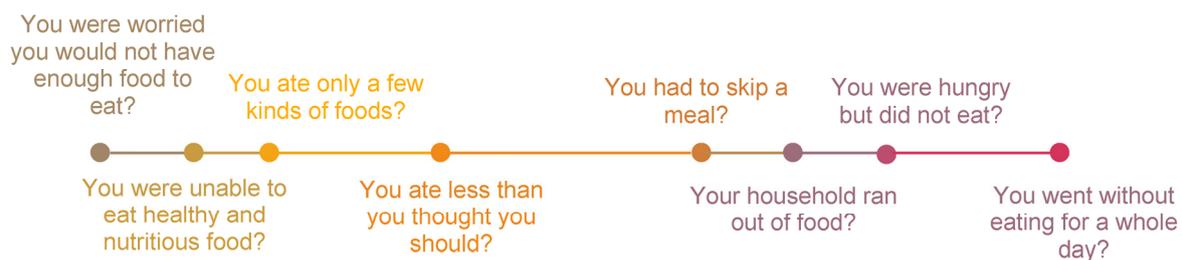


Figure 3. The food insecurity experience scale (adapted from [71]).

9. Discussion and Policy Implementations

The Nnewi food system proposed herein is anchored on the six pillars of the MUFFP, recognizing the interconnectedness needed to achieve a sustainable food policy. The governance aspect is a critical connection to the other pillars. This paper posits that the autonomy of the local government in Nnewi would give the local council political power to foster a food policy that encompasses the peculiarities of the locality and its residents. However, this could only be achieved by elected lawmakers at the state and federal levels, presenting the need for advocacy groups to increase awareness of the benefits of a sustainable food system policy in Nnewi. Another aspect of governance would be efforts to attain social and economic equality within the city through food assistance programs and clean and sustainable amenities, especially in poor-quality housing areas, as identified by UN-HABITAT [20]. A land tenure system that would give farmers preferential access to arable land, erosion control, provision of resources, and training, and creation of access to the market would address the challenges of food production, supply, and distribution identified in Nnewi. An updated nutrition curriculum and teacher training and retraining in the city would further empower people with the knowledge to achieve a healthy diet. In addition, ways to ensure no food waste within the city to achieve a circular economy would encompass a sustainable food system in Nnewi.

Establishing these backbone frameworks through governance would create a system for non-profit organizations and philanthropists to function and channel their resources

to where they matter most. Through advocacy, non-profit organizations could also lobby elected governmental officials to facilitate the pillars of the sustainable food system, which has been identified as an effective strategy in the Nigerian setting [72]. In addition, with the appropriate laws in place, donations towards the sustainability of the city's food system would be tax-deductible, further encouraging philanthropy in this sector.

10. Conclusions

Health and well-being, which form the basis of achieving the SDGs, rely on a sustainable food system; hence, there is a need for global efforts toward urban food policies. However, targeted efforts are needed in Africa and the Global South to level up with the rest of the world to achieve a global health community. In addition, such a sustainable food system in these regions would make the settlements more inclusive, safe, and resilient for residents. The MUFPP provides a framework adopted in this paper to propose a tenable food policy system in Nigeria. The actualization of this sustainable food system in such places would position them among the healthy cities of the Shanghai Consensus with the prospects of achieving the SDGs, as has been seen in cities such as Milan in Italy, Belo Horizonte in Brazil, and Baltimore and Austin in the USA, among others.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/dietetics3010001/s1>, Table S1: Nnewi Food policy monitoring and evaluation framework; Table S2: Evaluation self-assessment form.

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List of Abbreviations

AGRUPAR	The Participatory Urban Agriculture Program
AI	artificial intelligence
FAO	Food and Agriculture Organization of the United Nations
MUFPP	Milan Urban Food Policy Pact
SDGs	Sustainable Development Goals
UN-HABITAT	United Nations Human Settlements Programme

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