# DEVELOPMENT AND TESTING OF FOOD BASED DIETARY GUIDELINES FOR INDIVIDUALS ABOVE FIVE YEARS OF AGE: THE CASE OF THE LAKE VICTORIA REGION, KENYA

**KORIR CHEROTICH EMILY**

**A Thesis Submitted to the Graduate School in Partial Fulfillment of the Requirements for the Doctor of Philosophy Degree in Nutritional Sciences of Egerton University**

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## DECLARATION AND RECOMMENDATION

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**Declaration**

This thesis my original work and has not wholly or in part been presented for the award of a degree or diploma in any institution or university.

Signature..... Date 1/11/2022

**Emily Cherotich Korir**

HD18/0375/12

**Recommendation**

This thesis is the candidate's work and has been prepared with our guidance and assistance. It has been submitted with our approval as the Official University Supervisors.

Signature..... Date 24/10/2022

**Prof. Prisca J. Tuitoek, PhD.**

Department of Human Nutrition,

Egerton University,

Kenya.

Signature..... Date 24-10-2022

**Dr. Debbie Marais, PhD.**

Warwick Medical School.

University of Warwick,

United Kingdom.

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## DEDICATION

This thesis is dedicated to my two sons Allan and Peter.

*'Let food be your medicine'*

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## ABSTRACT

Globally, suboptimal diets are noted as responsible for more deaths than any other risk among adults aged 25 years or older. Dietary analysis found that the leading dietary risk factors for mortality were diets high in sodium, and low in whole grains, fruits, vegetables, nuts, seeds, and ω-3 fatty acids. Further, the poor in developing countries including Kenya suffer from hunger, consumption of food inadequate in micronutrients, and the emergence of overnutrition. Similar challenges are experienced in the Lake Victoria region, Kenya. As a basis to educate the community on healthy eating, earlier research in the region recommended the development of food-based dietary guidelines (FBDGs). This research used descriptive qualitative design to develop and consumer-test FBDGs for the Lowlands in the Lake Victoria region. As recommended by FAO and WHO (1998), both policy makers and consumers were involved in the development of FBDGs. Kisumu and Homa Bay Counties were purposively selected for this study. In a series of three workshops, a 30-member panel drawn from nutrition and nutrition-related fields drafted 11 preliminary FBDGs. Using a focus group discussions (FGD) guide, a total of 72 FGDs each consisting of 8-12 community members were conducted to consumer-test the preliminary guidelines for clarity of words and perception. The FGD was conducted among primary and high school learners and among adult males and females within the community. The FGD proceedings were recorded, transcribed, translated, and coded based on themes. The thematic analysis was carried out with the aid of NVivo8 (QSR International Pty Ltd Version 8, 2008). Feedback from the FGD was used to reword the final draft consisting of 12 guidelines. The guidelines were generally perceived as promoting dietary intake on the basis of the 'balanced diet' principle. However, the 'balanced diet' concept in the region was understood to mean the consumption of meals consisting of three nutrients; carbohydrates, proteins and vitamin. Further, some concepts such as 'three regular meals','snacks' 'food variety' 'healthy and physically active lifestyle' were not easily understood. Food insecurity, inadequate nutrition knowledge, patriarchy in choices of foods to grow, emerged as challenges likely to impede the implementation of FBDGs in the lowlands of Lake Victoria region. The adoption of the FBDGs in the region will depend on access to adequate economic resources and food availability to community members.

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## LIST OF ABBREVIATIONS AND ACRONYMS

**AEZs:** Agroecological zones.

**ASDSP:** Agricultural Sector Development Support Progarrmme.

**CFSVA:** Comprehensive Food Security and Vulnerability Survey.

**DALYs**: Disability-adjusted life-years.

**EFSA**: European Food Safety Authority.

**FAO**: Food and Agriculture Organization of the United Nations.

**FBDGs**: Food-based dietary guidelines.

**GBD:** Global Burden of Diseases.

**GHGE:** Global Greenhouse Gas Emissions.

**GLOPAN**: Global Panel on Agriculture and Food Systems in Nutrition.

**GOK**: Government of Kenya.

**HLPE**: High-Level Panel of Experts on Food Security and Nutrition.

**ICF:** International Classification of Functioning, Disability and Health.

**ICN:** International conference on Nutrition.

**IFAD:** International Fund for Agricultural Development.

**IFPRI**: International Food Policy Research Institute.

**IOM**: Institute of Medicine.

**IPCC:** Intergovernmental Panel on Climate Change.

**IUNS:** International Union of Nutritional Sciences.

**KDHS:**Kenya Demographic Health Survey.

**KNBSES:** Kenya National Bureau of Statistics Economic Survey.

**LM:** Lower Midland.

**LMIC:** Low- and middle income countries

**LMICs:** Diets in low- and middle-income countries.

**MICS:** Micronutrient Country Survey, Kenya.

**MOH**: Ministry of Health.

**NCD:** Non-communicable diseases.

**SSA:** Sub-Saharan Africa.

**UN:** United Nations.

**UNEP:** United Nations Environment Programme

**UNICEF:** United Nations Children Education Fund.

**UNU:** United Nations University.

**USDA:** United States Department of Agriculture.

**WASH:** Water Sanitation and Hygiene.

**WB:** World Bank.

**WCRF**: World Cancer Research Fund.

**WFP:** World Food Programme.

**WHO:** World Health Organization.

**WWF:** World Wide Fund for Nature.

# CHAPTER ONE
# INTRODUCTION

## 1.1 Background of the study

Half of the world's population (3 billion people) eat low-quality diets (FAO *et al*., 2020). Low-quality diets were the leading global dietary risk factor for mortality in 2017 (GBD 2017 Diet Collaborators, 2019). Dietary analysis showed that non-optimal intake of whole grains, fruits, and sodium accounted for more than 50% of 11 million global deaths (GBD 2017 Diet Collaborators, 2019). Causes of death included; cancer (1.6 million), coronary artery disease (3.9 million), stroke deaths (1.0 million), respiratory disease (1.7 million), neurodegenerative disease (0.4 million), kidney disease (0.5 million), diabetes deaths (0.6 million) and digestive disease (1.2 million) which are non-communicable diseases (NCD). An improvement in global dietary quality in reference to healthy diets could prevent more than 11 million premature deaths, which would be approximately 24% of total deaths in 2017 (Wang *et al*., 2019). Healthy diets are dietary patterns that include diverse and varied foods including; whole grains, fruits, and vegetables, legumes, fish, milk, nuts, seeds, less sugar and sodium added food, moderate amounts of fat/oil and meat (WHO & FAO, 2003). The foods should be balanced and appropriate in terms of quality and quantity for individuals based on gender, age, physical activity, and physiological state as well as protect against overweight, obesity and lower the risk of diet-related NCD (WHO, 2018).

Diets in low- and middle-income (LMIC) countries including those in Sub-Saharan Africa (SSA) have been described as poor, characterized by high proportions of starchy foods, low animal proteins, and low fruits and vegetables (Immuraa *et al.*, 2015; Ruel *et al*., 2013) coupled with nutrition transition. Consumption of poor diet in the region is linked to the persistent prevalence of underweight (24.1%) (FAO *et al*., 2021), an increase in overweight (Agyemang *et al.*, 2016), a rise in NCD (from 18.6% in 1990 to 29.8% in 2017) is associated with nutrition transition (Matos *et al*., 2020; Seferidi *et al.*, 2022) and co-occurrence of micronutrient malnutrition (Christian & Dake, 2021) especially deficiencies of vitamin A, calcium, iron, vitamin B12, zinc, vitamin C, and niacin (Beal *et al.*, 2017).

Similar to other LMIC in SSA, issues of nutrition concern in Kenya are poor-quality diets, the prevalence of underweight, emerging overweight, and obesity coupled with micronutrient malnutrition (MICS, 2011; MOH, KNBS & WHO, 2015; KDHS & ICF, 2014). An estimated

26.6% of the Kenyan population was food insecure in 2017, with a food gap of 271 kcal per day (Meade & Thome, 2017). Approximately, four million people (12% of households) were found to have unacceptable food consumption, translated as diets chiefly consisting of staple foods, flavored with green vegetables and oil (CFSVA-WFP, 2016). Studies in the Lake Victoria region, have described diets in the region as deficient in quantity and quality (CFSVA-WFP, 2016; GOK-ASDSP, 2014; Waudo *et al*., 2006; Waudo *et al.,* 2005). A survey in Homa-Bay County estimated that 84% of households' diets in the region did not meet minimum daily calorie requirements for adults (GOK-ASDSP, 2014) while studies in Kisumu found that only 15.6 % of both men and women consumed the required amounts of calories and 14.3% and 8.9% of the adult men and women were underweight respectively (Waudo *et al.,* 2006; Waudo *et al*., 2005). Further, Cheserek *et al*. (2012) observed emerging overweight and/or obesity among the elderly women (13.6%) and men (10.6%). A cross-sectional study among 384 children (2y) in Kisumu found that 23% were underweight, 30% were overweight, 90% consumed insufficient carbohydrates, and 31% consumed foods rich in iron (Sawe *et al*., 2021). The Kenyan government's Food and Nutrition policy objective is to increase the quantity and quality of food available and accessible to ensure that all Kenyans enjoy safe food in sufficient quantity and quality (GOK, 2011). However, to improve diet quality among populations most vulnerable to malnutrition within environmental targets (Fischer & Garnett, 2016), individual countries have been called upon to align the national dietary goals and food-based dietary guidelines (FBDGs) (Willett *et al.,* 2019). The development and use of FBDGs to promote the consumption of appropriate diets and healthy lifestyles was a goal given priority consideration in the First International Conference on Nutrition (ICN) in 1992 (FAO & WHO, 1996). Further, the Second International Conference on Nutrition Framework for Action recommended (Recommendation no. 13) the development of international guidelines on healthy diets (FAO & WHO, 2014). The FBDGs are nutrition advisory statements to communicate optimum nutrition recommendations to the public, by emphasizing food choices and lifestyle. The development of FBDGs considers the ecologic setting, socioeconomic, cultural, biological, physical, and environmental factors in which the population lives (FAO & WHO, 1998). Ninety-four countries including Kenya have formulated FBDGs (Wijesinha-Bettoni *et al.,* 2021).

The Kenyan National Guidelines for Healthy Diets and Physical Activity were developed and launched in 2017 (MOH, 2017) when this research was already underway. Formulation of the

guidelines address existing public health problems and are relevant to an individual country and/or group (FAO & WHO, 1996). The studies by Waudo *et al*. (2005), Waudo *et al.* (2006) and Cheserek *et al*. (2012) jointly conducted by a team of Researchers from Kenyatta University-Kenya, Egerton University-Kenya, Makerere University-Uganda and Sokoine University of Agriculture-Tanzania in the Lake Victoria Basin, found a higher prevalence of food insecurity and malnutrition in Kisumu, Kenya compared to Jinja in Uganda and Mwanza in Tanzania. The studies recommended the development of FBDGs for the Lake Victoria region, Kenya. The aim of this study was to develop FBDGs appropriate for the general population above five years of age to guide policies and promote the consumption of healthy diets in the region.

### 1.2 Statement of the problem

Although the Kenyan Government Food and Nutrition Policy's objective is to ensure that all individuals have adequate, diverse, and healthy diets throughout their life cycle, diets in the Lake Victoria region were found to be deficient in quantity and quality (CFSVA-WFP, 2016). Research in the region found that diets were mainly composed of starchy staple foods, served with little amounts of green vegetable relish, and cooked in oil (GOK-ASDSP, 2014). The diets were also described as monotonous, lacking in variety, low in fish, meats, and vegetables, with seldom consumption of fruits. Inadequate or inappropriate food intake limits both the quality and quantity of food in the diet. An estimated 7.3% of women, 14.3% of the adult men, 29.5% of elderly men, and 24.2% of elderly women in Kisumu were underweight (Cheserek *et al*., 2012). Aneamia was a problem in the region with 91.2% of children, 61% of women, 23.6% of adult men, 34.2% of elderly men, and 32.9% of elderly women (Waudo *et al.*, 2006; Waudo *et al*., 2005). The prevalence of acute and acute to moderate vitamin A deficiency among women was 4.7% and 37.4% respectively. Despite the existence of under-nutrition, over-nutrition was noted as emerging. The overall prevalence of overweight and obesity among women and the elderly in Kisumu was 18.7% and 10.8% respectively (Cheserek *et al*., 2012). Although governments had been called upon to develop FBDGs as a guide to policy to promote healthy eating (FAO/WHO, 1996) none had been developed in Kenya.

## 1.3 Objectives

### 1.3.1 General Objective

The purpose of this study was to develop and consumer-test FBDGs among community members older than five years of age in the Lake Victoria region.

### 1.3.2 Specific Objectives

i. To identify food, nutrition, and health-related issues to be addressed by the development of FBDGs in the Lake Victoria region.
ii. To develop preliminary FBDGs to promote healthy eating and healthy lifestyle choices in the region.
iii. To consumer-test the developed preliminary FBDGs in the region for clarity, perception, and feasibility.
iv. To reword and adopt the final draft of the FBDGs for the Lake Victoria region.

## 1.4 Research questions

i. Which prevalent food, nutrition, and health-related issues are of public health concerns in the Lake Victoria region?
ii. What key message content can be used in developing FBDGs advisory statements to convey desirable dietary and healthy lifestyle choices in the region?
iii. Are the FBDG statements clear, well understood, and feasible among community members?
iv. Which words of the FBDGs need to be reworded before recommending the proposed guidelines for adoption?

## 1.5 Justification of the study

According to the Kenyan Constitution (2010) article 43, sections (1c) it is a human right to be free from hunger and to have adequate food of acceptable quality. Sufficient dietary diversity, as well as sufficient nutrient and caloric quantity, is needed for a healthy and productive life under the promise that, well-nourished individuals, accessing healthy foods and engaging in active physical lives can optimally grow and sustain the country's economic development (MoALF *et al*., 2017). The current Kenyan government has therefore set food and nutrition security as one of the four main development agendas of the country (GOK, 2017). Diets in the Lake Victoria region are deficient in quantity and quality, and unable to meet the nutritional needs of the

community members (Cheserek *et al.*, 2012; Waudo *et al.*, 2006; Waudo *et al.*, 2005). Data obtained from this study is intended to guide policy formulation in addressing food, nutrition, and nutrition-related health concerns to promote healthy eating and lifestyle choices in the region. Findings from the study are also intended to guide the development of nutrition education and advocacy materials and programmes.

### 1.6 Significance of the study

The development of FBDGs for the Lake Victoria region address issues which are specific to the community in the region. The study also provides a base to develop advocacy programmes and nutrition education materials relevant to the community. Other counties in the country can emulate this initiative to guide their adaption of the national healthy eating and lifestyle guidelines (MOH, 2017) and also in setting their food security strategies and other nutrition action plans. Healthy eating and healthy lifestyle policies and education are critical in the prevention and control of diet-related health issues and the general well-being of the target population (FAO, 2017).

### 1.7 Limitations of the study

These research findings can only be generalized for a population sharing similar agro-ecological features as those close to the Lake Victoria region (Homa Bay, Kisumu, and Siaya Counties). The researcher did not speak the local language but relied on translators. To moderate the research findings, the researcher actively participated in all phases of the research process. The double translation was conducted on the focus group discussion guide and a sample of the transcripts. All translations emphasized meanings rather than word-by-word interpretation. Judgement in qualitative studies relies heavily on the researcher who might be subjective when conducting data analysis. However, in this study the researcher was supervised by two senior researchers appointed by Egerton University Graduate School. The supervisors mitigated subjective interpretation of this research findings. Further, reliability test for codes, involvement of the panel members who were County Government employees, policymakers, program implementors and the involvement of community members moderated the findings in this study. The adaption of healthy eating by the community will only be possible if the County Governments allocate adequate economic resources to facilitate food security and poverty reduction in the region.

### 1.8 Assumptions of the study

It is assumed that the involvement of stakeholders in developing the FBDGs enhances the acceptability and uptake of the guidelines in the study area. It is also assumed that disseminated information from this study, will be effectively communicated and integrated into nutrition-related programmes and services in the Lake Victoria region. If adopted, the proposed FBDGs will influence nutrition action priorities and allocation of resources of the concerned counties. It is assumed that the County Governments will take responsibility for reviewing FBDGs periodically to reflect emerging findings.

### 1.9 Operational definition of terms

**Diet:** is the sum of food and drink consumed by an individual and often implies its quality, composition, and effects on health (Magni*et al*., 2017).

**Dietary guidelines**: are translations of nutritional guidelines into food intake recommendations by using non-technical language, enabling individual consumers to compose their daily diet in a way that provides appropriate nutrition (Magni *et al.*,2017).

**Dietary patterns:** are quantities, proportions, variety, or combinations of different foods and beverages in diets, and the frequency with which they are habitually consumed (USDHHS & USDA, 2015).

**The food environment:** is the physical, economic, political, and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing, and consuming food (HLPE, 2017).

**Food system:** comprise food environments and the entire spectrum of activities, people, and institutions that influence those environments (inputs, processes, infrastructures, production, processing, distribution, preparation, and consumption of food) and the output of these activities, including socio-economic and environmental outcomes (HLPE, 2017).

**Food-based dietary guidelines for Lake Victoria Region:** are foods, nutrition, and lifestyle guidelines developed by a multidisciplinary panel based on food, nutrition, and health concerns, to address dietary practices and behaviours prevalent among community members living in LM3 and LM4 zones of the Lake Victoria Region.

**Food-based dietary guidelines**: are a set of advisory statements that advise on food choices and dietary patterns that meet requirements for essential nutrients and protect against the development of chronic lifestyle-related diseases in the population (FAO, 1996).

**Foods, nutrition, and health-related lifestyle concerns:** are issues associated with food security, food consumption, food nutrient value, individual's dietary practices and behaviours, and how these factors are likely to influence the nutritional status and health outcomes of individuals in the Lake Victoria region.

**Healthy diet:** is a high-quality diet that is nutritious and balanced and adapted to individual requirements and hygienically safe to prevent disease and ensure a good state of health as well as optimal development and growth (Shao *et al.,* 2017).

**Malnutrition**: includes three categories; undernutrition (eg, wasting or stunting), micronutrient deficiencies (inadequate vitamins or minerals), and obesity and diet-related non-communicable diseases such as heart disease, stroke, diabetes, and certain cancers).

**Nutrition education:** is provision of science-based information to help people in making better food choices and dietary patterns to improve health and creation of an enabling environment for the public to demand healthy foods (Contento, 2007).

**Nutrition:** is the interpretation of the interaction of nutrients and other substances in food concerning the linked metabolic effects within the body. It includes food intake, absorption, assimilation, metabolism, and excretion (Magni *et al*., 2017).

**Nutritional guidelines:** are quantities of individual nutrients and quality and quantity of whole foods that people should consume to achieve a healthy nutritional state. Nutritional guidelines may include estimates such as dietary reference values (DRV), reference intake, and daily intake. These guidelines usually apply to the entire healthy population by using broad groups, such as different age ranges, but can also be tailored to more focused population groups (Magni *et al.,* 2017).

**Non-communicable diseases**: are non contagious diseases which stem from inappropriate food choices and lifestyles (WHO, 2003).

**Panel members:** were professionals, who at the time of this research, had to have been working for more than five years in nutrition and nutrition-related fields.

# CHAPTER TWO
# LITERATURE REVIEW

## 2.1 Introduction

This chapter presents an overview of dietary and health concerns and the rationale for the development of food-based and lifestyle choices for the lowlands of Lake Victoria. A conceptual framework to describe the study variables is presented at the end of the chapter.

## 2.2 Diet quality

Although food and eating for nutritional sustenance are fundamental to human life, food is not equitably distributed. Half of the world's population (three billion people) eat low-quality diets (FAO *et al*., 2020). Diet quality represents a combination of foods which when habitually consumed by an individual supplies adequate nutrients, appropriate for disease prevention and management (Echouffo-Tcheugui & Ahima, 2019). A study among three cohorts in the United States including, the Nurses' Health Study I, the Health Professionals, and the Nurses' Health Study II, distinguished 13 foods or food groups as healthy (Fung *et al*., 2018). The foods include; dark green leafy vegetables, cruciferous vegetables, carrots, other vegetables, whole citrus fruits, other whole fruits, legumes, nuts, poultry, fish, eggs, whole grains, and liquid vegetable oils) and eight as unhealthy (red meat, potatoes, processed meat, whole milk dairy, refined grains, baked goods, sugar-sweetened beverages, fried foods obtained away from home, and desserts and ice cream. Studies have associated higher diet indices which include higher consumption of vegetables, fruit, nuts, and long-chain ω-3 fatty acids, lower consumption of red meat, and avoidance of high alcohol consumption with lower weight gain, lower risk of metabolic syndromes and mortality (Angulo *et al*., 2021; Aune *et al*., 2016; Chen *et al.*, 2016; Green *et al.*, 2016; Kim *et al.*, 2019; Neelakantan *et al.*, 2018; Shan *et al*., 2020; Zong *et al.*, 2016;) improved energy (Hoddinott & Yohannes, 2002), micronutrient adequacy (Arimond *et al.*, 2011; Shamim *et al*., 2016; Sultana *et al*., 2019) better cognitive function among adults and children, and better pregnancy outcome (Arimond & Ruel, 2004; Nguyen *et al*., 2018; Rah *et al.*, 2010). Poor quality diets have been linked to all types of malnutrition, whether overweight, obesity, or undernutrition including micronutrient deficiency (Monteiro *et al.*, 2018; Moubarac *et al.*, 2017; Vos *et al.*, 2017). An analysis of global diets showed that high intake of sodium, and low intake of whole grains and fruits which accounted for more than 50% of 11 million global deaths, emerged as the leading global dietary risk factors for mortality in 2017 (GBD 2017 Diet

Collaborators, 2019). Consumption of the reference healthy diet could prevent >11 million premature deaths, approximately 24% of total deaths in 2017 (Wang *et al*., 2019).

### 2.3 Diet quality and nutrition transition concerns

Changes in diet quality and subsequent changes in disease profiles can be traced back to the transition from the Paleolithic diet to land-use change and habitat destruction in the agriculture era (Eaton & Konner, 1985; Newbold *et al*., 2015). Green revolution with mechanization and more intensive agriculture such as the use of inorganic fertilizer and irrigation resulted in the domestication of fewer species of plants and animals, high production of major staple cereals (wheat, rice, and maize), an overall increase in calorie consumption (FAO, 2004; Wik *et al*., 2008). Although the increase in calorie consumption has contributed to a decrease in chronically undernourished people (18.6% globally in 1990-2002 to under 11% in 2014-16) (Webb *et al*., 2018) excess consumption of calories even from ultra-processed foods coupled with a sedentary lifestyle have led to a rise in overweight and obesity (Baraldi *et al*., 2018; Cordain *et al*., 2005). The industrialization of food systems, technological change, and globalization, including growth in the market and political activities of transnational food corporations facilitated the availability of ultra-processed foods (Baker *et al*., 2020). The ultra-processed foods are estimated to amount to more than half of the total dietary energy consumed in high-income countries with sales being highest in Australasia, North America, Europe, and Latin America but growing rapidly in Asia, the Middle East, and Africa (Baraldi *et al*., 2018). In LMIC including those in Africa, as the poor people and those living in marginalized zones continue to experience food insecurity and undernutrition, they also bear the burden of the rising overweight and obesity which is no longer confined to developed countries (Ford *et al*., 2017). The emergence of overweight and obesity in low- and middle-income countries is largely attributed to the 'nutrition transition' from traditional to Western diets (Popkin, 1993). The nutrition transition is characterized by increased consumption of animal fats (meat and milk) vegetable fats, diets high in cholesterol, simple sugars, and other highly processed carbohydrates, low in fiber, and reduced physical activity levels (Drewnowski & Popkin, 1997; Popkin *et al*., 2012).

The worldwide number of adult women with obesity increased from 69 (57–83) million in 1975 to 390 (363–418) million in 2016 while the number of men with obesity increased from 31 (24–39) million in 1975 to 281 (257–307) million in the same year (NCD Risk Factor Collaboration, 2017). An additional 213 million children and adolescents and 1·30 billion adults were in the

overweight range, but below the threshold for obesity (NCD Risk Factor Collaboration, 2017). High body mass index is associated with non-communicable diseases (NCD) including cardiovascular and kidney diseases, type II diabetes, some cancers, musculoskeletal disorders, Alzheimer's disease, vascular dementia and other chronic diseases (Dai *et al*., 2020; Peng *et al*., 2019) is the fourth leading cause of risk-attributable mortality with a reduced life expectancy of 5–20 years, depending on the severity of the condition and presence of comorbidities (Stanaway *et al*., 2018). Reducing obesity prevalence by 5% from projected levels will translate into an average annual reduction of 5.2% and 13.2% in economic costs respectively, between 2020 and 2060 across the eight countries (Okunogbe *et al*., 2021). A systematic analysis covering 88·7% of the global adult population on global consumption of key dietary items (foods and nutrients) by region, nation, age, and sex in 1990 and 2010 found that diets based on healthy items improved globally (by 2·2 points, 95% uncertainty interval 0·9 to 3·5) (Immuraa *et al.,* 2015) and obesity rates in the developed countries are stabilizing (Black *et al.,* 2013) but increasingly becoming a burden of the poor in the society (Templin *et al*., 2019; Zhou, 2021). It is projected that the number of people who are poor and overweight in low-income countries, will increase by a median of 84.4% (range 3.54%–383.4%) if the status quo remains (Fox *et al*. 2019).

While the rapid urbanization accompanied by nutrition transition is changing the disease landscape in SSA with cardiovascular diseases and their related risk factors gaining prominent position (Agyemang *et al*., 2016), the poor and the marginalized suffer high yield gaps and hunger due to differences in agricultural intensification and industrialization (Montpelier, 2013). Concurring with the global increase in body weights is prevalent undernutrition. In the African continent, one in five people (21% of the population) faced hunger, while more than one-third (282 million) were undernourished in 2020 (FAO *et al.,* 2021). Under the shadow of the COVID-19 pandemic, the prevalence of undernutrition in 2019 in SSA was 24.1% and 28.1% in eastern Africa (FAO *et al.,* 2020). Macronutrient malnutrition reduces the immune system's ability (Cunningham-Rundles *et al*., 2005) and increases mortality by magnifying the progression of the disease. It is estimated to contribute to 53% of deaths among children (Black *et al*., 2013; Pelletier *et al*., 1995). It also compromises the physical growth of children (Headey *et al.,* 2018; Onis *et al*., 2013; UNICEF, WHO & WB, 2020), cognitive development (Balehegn *et al.,* 2019), lower educational performance, and thus poor economic productivity in adulthood and social and

economic challenges in disadvantaged communities (Black *et al*., 2013). Estimates suggest that a 10% annual decline in national income increases moderate/severe wasting prevalence by 14.4–17.8% with increased risks of inadequate dietary diversity among children (Headey & Ruel, 2022).

Compounding obesity and undernutrition is the evidence of coexisting micronutrient malnutrition. An analysis by Miguel *et al.* (2013) showed that an increase in agricultural labour productivity to $4,500-$11,999 in most countries in the world, was not only associated with obesity (64 percent) but with the prevalence of micronutrient (92 percent) deficiency. The displacement of traditional crops in the Nilotic era in favor of the higher value staple crops contributed to the emergence of critical micronutrient deficiency which includes iron, vitamin A, and zinc (Miguel *et al*., 2013; Webb, 2009). The micronutrient density indices which declined from 1979 to 1993 in SSA Africa, were attributed to the increased availability of lower-micronutrient density grains (rice, maize, and wheat) and vegetable oils and decreased proportional availability of pulses, dairy products, meat, nuts, and seeds, and fruit (Beal *et al*., 2017). An estimated 29.9% of women aged 15 to 49 years 2019 around the world were affected by anaemia, more than 30% of whom were in Africa and Asia (FAO *et al.*, 2021). The micronutrient deficiencies of vitamin A, iron, iodine, zinc, B12, and folic acid contribute to high morbidity poor growth, intellectual impairment, and perinatal complications (Bailey *et al*., 2015; Black *et al*., 2013).

Similar to other LMICs, Kenya suffers from the coexistence of under- and overnutrition. Estimated 8.9% women of child-bearing age (15-49) are more likely to be thin or undernourished (BMI <18.5 kg/m2) while, 33% of women are either overweight (22.75%; BMI 25-29.99 kg/m2) or obese (10.1%; BMI>30 kg/m2) in Kenya (KDHS/ICF, 2014). It is estimated that from 2010– to 2030 undernutrition will cost Kenya approximately US$38.3 billion in gross domestic product due to losses in workforce productivity (USAID, 2017). Major NCDs including cardiovascular conditions, cancers, diabetes, and chronic obstructive pulmonary diseases with their sequelae and their shared risk factors accounted for more than 50% of total hospital admissions (Mwenda *et al*., 2018) with an average hospital stay of 12.7 days for diabetes and 11.1 days for hypertension (MOH, 2019). As a percent, the spending on NCD was 11.0% of the total health expenditure (KSh. 50.6 billion, USD 494.34 million) in FY 2017/18 (MOH, 2021). At the household level, health expenditure has been shown to decrease income by 28.6% thus subjecting families to a

vicious cycle of poverty (MOH, 2019b). Although approximately 39% of deaths in 2019 were as a result of NCDs up from 27% in 2014 in the Country (GBD 2019 Diseases and Injuries Collaborators, 2020), it is projected to increase by 55% by 2030 (MOH, 2014; MOH, 2019). Diet quality concerns and the double burden of malnutrition are evident in the Lake region. Studies in Kisumu found that only 15.6 % of both men and women consumed the required amounts of calories and 14.3% and 8.9% of the adult men and women were underweight respectively (Waudo *et al.,* 2006; Waudo *et al*., 2005). Further, Cheserek *et al*. (2012) observed the emerging overweight and/or obesity among the elderly women (13.6%) and men (10.6%). Overweight or obesity is among the key diet-related risk factors for cardiovascular diseases and diabetes mellitus, hyperglycemia, elevated blood lipids, and hypertension (Cercato & Fonseca, 2019; Jiang *et al*., 2016; Lim *et al*., 2012).

### 2.4 Healthy diet promotion

Healthy diets as described by WHO and FAO (2003) comprises dietary patterns that include recommended number of servings of each food group, and information on the quality of food choices within a food group to encompass: four to six servings of whole grains (contributing 55-75% of total energy); and at least 400g (i.e. five servings) of fruit and vegetables per day. Though Willett *et al*. (2019) recommended consumption of 50 grams of legumes (about ¼ cup) in the daily diet, Marinangeli *et al*. (2017) earlier suggested an aligning of portion size guidance for legume consumption worldwide to 100g or half a cup of cooked legumes daily. One to two servings of nuts or seeds are recommended for daily consumption (Hu, 2003). Recommended intake for free sugar at less than 10% of total energy intake which is equivalent to 50 g (or about 12 level teaspoons), but ideally less than five percent of total energy intake for additional health benefits (Hooper *et al.,* 2015; WHO, 2003). Less than 30% of total energy intake from fats; saturated fats to be less than 10% of total energy intake and *trans*-fats to less than 1% of total energy intake (Nishida & Uauy, 2009); Less than five grams of iodized salt (equivalent to about one teaspoon) per day (WHO, 2012).

### 2.5 Healthy eating and environment concerns

Although there is a need to improve diet quality among populations most vulnerable to malnutrition, limited environmental resources and anthropogenic activities threaten the food environment and constraints in terms of healthy diet options (FAO, 2016; Haddad *et al.,* 2016). The land clearing and conversion of forests, grasslands, and other carbon ‘sinks’ into crop or

pasture land and loss of biodiversity account for over a quarter (26%) of global greenhouse gas emissions (GHGE) (Poore & Nemecek, 2018). Energy consumption in food production account for the majority 76% of GHGE (Bruckner *et al*., 2014), 78% of the global ocean and freshwater eutrophication (Bar-On*et al*., 2018) and food production reliant on irrigation accounts for 70% of freshwater withdrawals worldwide (Johnson *et al.*, 2014; Smith *et al.,* 2014). The GHGE, the use of land and water resources, pollution, depletion of phosphorus, and use of chemical products such as herbicides and pesticides impact negatively on the environment. The adverse outcomes includes reduced food production and nutrient content (Pecl *et al.,* 2017; Smith et *al.,* 2018). A simulated study on crop productivity by Kabubo-Mariara and Kabara (2018) found that, climate change in Kenya will adversely affect food security, with up to a 69% decline in yields by the year 2100 if the status quo remains. The environmental damage and climate change are likely to increasingly challenge food security over the next century (Macdiarmid *et al*., 2018). The challenge of producing food sustainably is exacerbated by the world population foreseen to increase to nearly 10 billion in 2050 (UN, 2019). The rising population require over 50% more food production against the finite natural resources that include land, soil, water, terrestrial and marine biodiversity, minerals and fossil fuels used in food production (FAO, 2022; UNEP, 2016). A projected three billion people will shift toward a diet richer in meat, fish, poultry, and dairy foods (Kearney, 2019). At higher income levels, animal source foods primarily replace starchy staples foods. Meat consumption rise from under 5 to over 10% of dietary energy with increases in income from 4,000 to 40,000 dollars per year (Bai *et al.*, 2021). The shift of the diet to animal source foods further compromise the challenged environment. Temme *et al.* (2015) estimated that per kilogram of product, meat and cheese have considerably higher GHGE compared with plant-based foods. Land use for livestock releases twice as much GHGE (16%) as for crops and human consumption (8%), while food wastage is responsible for around 6% of total global GHGE (Poore & Nemecek, 2018). To be able to feed a world with 10 billion people and confer both environmental and health benefits, a win-win situation as opposed to win-lose, lose-win, and lose-lose, global dietary patterns should shift from the demand of excessive amounts of the most environmentally damaging foods, over-consumption of calories and reduced food wastage (Clark *et al*., 2020).

Therefore, the global conversation is centered on how to produce healthy and sustainable diets within the planetary boundaries while meeting food demand for the increasing world population

(Fischer & Garnett, 2016). A proposed planetary health plate consists by volume of approximately half a plate of vegetables and fruits and the other half displayed by contribution to calories, unsaturated plant oils and (optionally) modest amounts of animal sources of protein (Fischer & Garnett, 2016). Calories should however consist of whole grains as opposed to highly processed grains. Further proposal by Willett *et al.* (2019) for 'healthy reference diet' suggested a consumption of a diet rich in plant-based foods, having double the consumption of fruits, vegetables, nuts, and legumes, with reduced intake of animal source foods and sugar by half. However, Macdiarmid *et al.* (2012) and Perignon *et al.* (2016) argued that sustainable dietary patterns that meet dietary requirements for health could be reached without eliminating meat or dairy products. To meet food demand for the increasing world population within planetary boundaries, Davis *et al*. (2019) suggested future replacement of animal source foods with vegan or vegetarian meat produced in bioreactors i.e. production of animal proteins and energy meat, milk, and eggs, by using feed sources not suitable for human consumption e.g., pastures, grass, hay, or by-products. Although the proposals on how to improve consumption of healthy diets provide a common direction (FAO, 2016; Maillot *et al.*, 2011; Willett *et al*., 2019) modelled food consumption and dietary intake for sustainable healthy diets indicate that the required changes in intake amounts of some food items are highly country-specific (Chaudhary & Krishna, 2019) and opportunities for the setting of relevant policies and interventions are at the local level (Ridoutt *et al*., 2017).

### 2.6 Diet and nutrition concerns in the Lake Victoria region

The co-occurrence of undernutrition, overweight, obesity, and NCDs is a growing dual burden in Kenya (Fongar *et al*., 2019; Masibo *et al*., 2020). The occurrences in the Country are related to epidemiological transition associated with the increase in economic prosperity, the demographic transition with relatively high proportions of younger people, to populations with increasing proportions of older people, and nutrition transition. Maize is the main staple food, accounting for 65% of total staple food and 36% of total food caloric intake (Kilimo Trust, 2017; Mohajan, 2014). Although a study in Central Kenya found an association between consumption of ultra-processed foods and with lower probability of being stunted for children, it showed that an increase in the share of calories from ultra-processed foods by one percentage point among adult women was associated with a 0.11 $kg/m^2$ increase in BMI, a 0.24 cm increase in waist circumference, a 3.9% probability of being overweight or obese, and a 3.4% probability of

having high abdominal obesity among adult women (Kimenju, 2018). Another study among women (average age 33.8y) in Kenya found that consumption of highly processed foods bread and snacks and rice in the third tercile showed a significant positive association with overweight and obesity (OR 1.52; CI 0.99, 2.32) relative to those in the first tercile (Sarfo *et al.*, 2021). The study observed that more than half (54%) of the overweight and obese women were within the highest segment (third tercile). Diets in the Lake Victoria region have been described as mainly composed of staple foods, served with little amounts of green vegetable relish flavoured with oil, monotonous, lacking in variety, low in fish, meats, vegetables, with seldom consumption of fruits (Cheserek *et al*., 2012; GOK-ASDSP, 2014; Waudo *et al.*, 2006; Waudo *et al*., 2005). Inadequate or inappropriate food intake limits both the quality and quantity of food. An estimated 7.3% of women, 14.3% of the adult men, 29.5% of elderly men, and 24.2% of elderly women in Kisumu were underweight (Waudo *et al.*, 2006; Waudo *et al*., 2005). Anaemia was a problem in the region with 91.2% of children, 61% of women, 23.6% of adult men, elderly men 34.2%, and elderly women 32.9% suffering from anaemia. The prevalence of acute and acute to moderate vitamin A deficiency among women was 4.7% and 37.4% respectively (Cheserek *et al*., 2012; Waudo *et al.*, 2006; Waudo *et al*., 2005). Despite the existence of under-nutrition, over-nutrition was also prevalent in the region. The overall prevalence of overweight and obesity among women and the elderly in Kisumu was 18.7% and 10.8% respectively (Cheserek *et al*., 2012). Although governments were called upon to develop and use FBDGs as a guide to policy and a basis for nutrition education on healthy eating (FAO & WHO, 1996) none had been developed in Kenya.

### 2.6.1 Consumption of cereals and starches

A study by Waudo *et al*. (2006) in the Lake Victoria Basin found that adult men consumed maize daily (72.5%) followed by wheat (31.1%) and cassava (28.9%). A similar trend was observed among women respondents. Sorghum, a drought-resistant crop grows well in the region, but only for commercial purposes. Compared to Tanzania and Uganda, individuals in Kisumu did not consider the traditional foods (sweet potatoes and cassava) as important starches in their diets (Waudo *et al.*, 2006; Waudo *et al*., 2005). Household Baseline Survey Report – Homabay (GOK-ASDSP, 2014) found that 84% of households' diets in the county could not meet the minimum daily calorie requirement for the adults of 2,260 kcal.

### 2.6.2 Vegetables and fruits consumption

Diversity in kind and colour is significant in fruits and vegetable consumption. In a literature review, Minich (2019) identified fruits and vegetable colours like red, orange, yellow-green, and blue-purple. Higher consumption of fruit and vegetables is associated with a lower risk of all causes of mortality, particularly cardiovascular mortality (Green *et al*., 2016; Wang *et al.*, 2014;). Studies in Kenya have shown that only a few varieties of vegetables are regularly consumed (Ekesa *et al*., 2009; Kimiywe *et al*., 2007; Waudo *et al.*, 2005). While a study by Gido *et al.* (2017) found high consumption intensity of leafy African indigenous vegetables in Kisii and Kakamega, a study conducted by Pengpid and Peltzer (2018) generally observed inadequate fruits and vegetable consumption (94.0%) in Kenya. Ayieko (2005) found that kale (sukuma wiki) was the leading item purchased by Nairobi consumers, with an average monthly household purchase of 13 kg, followed by cabbage. It was noted that as income increased, the quantity of vegetables consumed per adult equivalent increased. But, as the household income rose higher, the share of the vegetable in the total food expenditure decreased as the fruits increased. From an economic perspective, vegetables in Nairobi were thus viewed as a necessity, and households may only afford the basic food such as vegetables and devote little to fruit consumption. The study by Waudo *et al*. (2005) and Waudo *et al*. (2006) found low and seldom consumption of vegetables and fruits in the Lake Victoria Basin. In Kisumu, mangoes (17.4%) were the most consumed fruit followed by wild fruits (15.0%), oranges (9.8%), and pawpaw (8.5%). Consumption of at least 400 g (i.e. five portions) of fruit and vegetables per day is recommended. (WHO & FAO, 2003).

### 2.6.3 Legumes consumption

Legumes consist of plants that generate a pod with seeds inside and belong to the family Leguminosae. Pulses are crops harvested solely for the dry seed of leguminous plants. This excludes legumes harvested green for food (peas, green beans, and sprouts) and oil extraction (peanut and soybean) (FAO, 2004). As a source of protein, a serving of beans (125 mls), 100g cooked provides 7g of protein or 15% of the recommended dietary allowances for a 70kg adult. Generally, beans were not considered an important relish in Kisumu but as a casserole in '*githeri'* (Cooked mixture of maize and beans) by 25.5% of individuals (Waudo *et al.*, 2006; Waudo *et al*., 2005).

### 2.6.4 Meat consumption

Meat is generally a good source of proteins. Technical Report on Protein and Amino Acid Requirements in Human Nutrition (WHO, FAO & UNU, 2007) indicated that the best protein estimate for a population average requirement is 105 mg nitrogen/kg body weight per day or 0·66 g protein/kg body weight per day. Total meat can be broken down into Red meat (including beef, lamb, veal, and pork); white meat (including chicken, game, and turkey); and processed meat including, cured and smoked meat; ham, bacon, sausages hamburgers, salami and tinned meat (Linseisen *et al.*, 2002). Meat production from poultry and pigs in Kenya constitutes a minor proportion of the total meat production relative to ruminants (Bett *et al*., 2012). Meat has been classified as a good source of zinc. Beef and lamb contain 4.1 mg and 3.3 mg/100g of Zinc tissue (Williamson *et al.*, 2005). Red meat contributes proteins 20-25 g/100 g of beef, veal lamb, or mutton consumed (Williams, 2007). Gibson and Ashwell (2003) indicated that consuming less than 90 g/day of red meat may put men and women at three times higher risk of having low iron status. Red meat is also a major dietary source of vitamin B12 providing over two-thirds of daily requirements in one 100 g serving (Cosgrove *et al.,* 2005). Maker (2009) noted that moderate consumption of red meat (40-72 g/day) can help to lower the risk of, inadequate B12 intake compared to low consumers. As recommended in healthy eating advice around the world, lean red meat, consumed in moderation, is part of a healthy balanced diet (Williamson *et al.*, 2005).

Due to high association between high intakes of processed meat and increased risk of colorectal cancer (Kim *et al*., 2013), World Cancer Research Fund (2007) recommend consumption of less than 500 g of red meat per week, a minimum intake of processed red meat, and avoidance of cooking meat at very high temperatures (Boada *et al.,* 2016). In developing countries, $B_{12}$ deficiency is common because of typically low consumption of animal foods, resulting in inadequate intakes (Allen, 2009). Consumption of a meal including meat five days per week for nine months significantly improved plasma $B_{12}$ concentrations among schoolchildren in Kenya (McLean *et al*., 2007). After 2 two years of intervention, the prevalence of children with low plasma vitamin $B_{12}$ levels (<148 pmol/L) was reduced from 55.6% to 4.5%. In the general Kenyan population, consumption of animal source food per adult equivalent increases with increasing income levels. Based on the 2005–06 Kenyan household survey data, the poorest tercile consumed 35 g of protein (from all sources) per capita/day, whereas households in the wealthiest tercile consumed 81 g (Argwings-Kodhek *et al*., 2005). Though the most common

livestock kept in the Lake Victora region-Kenya, were cattle, chicken, goats, and sheep, Waudo *et al*. (2005) found that meat consumption was occasional. Studies in Homa Bay County indicated that cattle, goats, and sheep were kept to safeguard households against vulnerability such as payment of school fees and hospital bills (Kandagor & Nyandoro, 2018) or for sentimental value only (GOK_ASDSP, 2014).

### 2.6.5 Fish consumption

In the year 2017, apparent fish consumption per capita in developed countries was 24.4 kg, in developing countries, 19.4 kg, in the least developed countries 12.6 kg, and in low-income food-deficit countries, it was 9.3 kg. (FAO, 2020). Although small-scale fishing is essential to overall household well-being as it provides both income and nutrient-rich foods, fishermen in the Lake Victoria region were stated as poor (de Bruyn *et al*., 2021). Olale and Henson, (2012) estimated that, 64% of fish workers in western Kenya lived below the poverty line and that poverty was higher in households that rely on fishing as their primary source of income. A study by Waudo *et al.* (2005) in Lake Victoria indicated low consumption of fish due to high commercialization.

Fish is widely used as one of the most important sources of animal protein, a concentrated source of highly bioavailable nutrients including essential fatty acids vitamins, and, minerals (Thilsted *et al*., 2016). The Proximate composition of protein in fish is 15-24.5% protein (FAO & GOK, 2018). A portion of 140 g of fish provides about 50–60% of the daily protein requirements for an adult (FAO, 2010). Fish is also an excellent dietary source of highly unsaturated fatty acids, and polyunsaturated fatty acids, especially the ὼ-3 fatty acids, eicosapentaenoic acid, and docosahexaenoic acid (Albert *et al*., 2002; Buscemi, 2014; Hosomi *et al*., 2012). A meta-analysis by Zhao *et al*. (2015) showed that consumption of 60g of fish/day was associated with a 12% reduction in mortality. Rimm and Mozaffarian (2006) noted that fish intake was associated with a 36% reduced mortality risk from heart disease while He *et al*. (2004) showed a decreased risk of cardiovascular disease in consumption of fish once per week or more often compared with more seldom intake. Research by Lajous *et al*. (2013) suggested that increasing fish consumption to at least two servings per week in mid- or later life may lower coronary heart disease risk in women. A progressively decreasing risk of cardiovascular was observed among those who had previously suffered a heart attack, at intake of up to 40-60 grams of mainly oily fish per day (2-3 portions per week), corresponding to 0.6-0.9 g long-chain n-3 fatty acids per day (Marckmann & Grønbæk, 1999). It has been proposed

that maximal health benefits from fish consumption can be achieved by the consumption of two servings (every 100 gms) per week of fish. Moderation or the limit of fish is based on advice about limiting mercury exposure from fish. In Belgium fish is grouped together with other animal source food to limit intake (Hertfort *et al*., 2019).

### 2.6.6 Milk consumption

Although the Food, Agriculture Organization recommends 200 kg of milk equivalent consumption per year per person (Muehlhoff *et al.,* 2013) the global average whole-milk consumption in 2017 was 88 kg per person, with very significant differences between countries/regions. The recommendation of 200 kg translates to approximately 550 ml per capita per day or 421ml per adult equivalent per day (2 glasses of milk). Per capita consumption in Western Europe was almost 270 kg of milk per person, compared with 35 kg in Africa (Alvåsen *et al.,* 2018).

Depending on location and socio-economic class, milk consumption may vary between 50 and 150 litres per capita and per year (Bosire *et al*., 2017). A study by Waudo *et al.* (2006) found that in the Lake Victoria region the most consumed animal protein by adult men daily was milk (50.8%) in tea. Besides protein, milk is regarded as an excellent source of calcium (Miller *et al*., 2007). One cup/serving of 240 ml gives 276 mg of calcium and 8 gm of proteins. Consumption of milk in form of tea may not be adequate to meet the daily recommended intake of calcium which is 1000mg and 1300mg for adolescents. Moreover, consumption of milk in tea would require the addition of sugar which contributes greatly to total caloric intake (Albala *et al*., 2008). Calcium is the milk component most likely to impact growth because it is a major component of skeletal tissue. Adding milk to the diets of children in developing countries was shown to increase growth (Dror & Allen, 2011; Zhang *et al*., 2016). Milk drinkers have been found to have significantly higher, intakes of vitamin A, calcium, phosphorus, magnesium, and potassium than non-milk drinkers (Murphy *et al*., 2008; Rangan *et al*., 2012). A study of Kenyan school children demonstrated that consumption of a meal including milk for five days per week for nine months significantly improved plasma $B_{12}$ concentrations (McLean *et al*., 2007). After 2 years of intervention, the prevalence of children with low plasma vitamin $B_{12}$ levels (<148 pmol/L) was reduced from 41.0% to 8.9%.

### 2.6.7 Use of cooking oil

Fats and oils are concentrated energy sources and are stored in the body as adipose tissue for the provision of a continuous fuel supply. Unsaturated fats (found in fish, avocado and nuts, sunflower, soybean, canola, and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee, and lard) and trans-fats of all kinds, including both industrially-produced trans-fats (found in baked and fried foods, and pre-packaged snacks and foods, such as frozen pizza, pies, cookies, biscuits, wafers, and cooking fats and spreads) and ruminant trans-fats (found in meat and dairy foods from ruminant animals, such as cows, sheep, goats, and camels) (WHO, 2018). Industrially-produced trans-fats are not part of a healthy diet and should be avoided (Nishida & Uauy, 2009).

It is generally recommended that adults take at least 15% of their energy as fat to ensure adequate consumption of total energy, essential fatty acids, and fat-soluble vitamins. Total fat energy of at least 20% is consistent with good health. Although there is no direct evidence for men that raising fat intake to 20% will be beneficial, women of childbearing age require at least 20% of their energy from fat and adults with BMI <18.5, especially in developing countries in which dietary fat may be important to achieve adequate energy intake in malnourished populations. Highly active groups with diets rich in vegetables, legumes, fruits, and wholegrain cereals may however, sustain a total fat intake of up to 35% without the risk of unhealthy weight gain (FAO & WHO, 2010; Hooper *et al*., 2015; WHO, 2003). It is suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and trans fats to less than 1% of total energy intake (WHO, 2003). The study among women in the Lake Victoria Region indicated that 61.9% of the households used oil daily in their cooking and 20.6% used fat (Chipsy, Kimbo, and Kasuku-containing trans-fatty acid). However, this study observed that the caloric energy contribution from fat was <15 %. An indicator that though fats/oils were consumed by the majority, the total amount of fat/oil consumed may be inadequate (Waudo *et al.*, 2005; Waudo *et al*., 2006).

### 2.6.8 Sugar added products

Sugars added to foods or drinks by the manufacturer, cook, or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates are referred to as free sugars (Mela & Woolner, 2018; Swan *et al*., 2018; WHO, 2015; WHO, 2003). Chen *et al.* (2009) observed that individuals who consumed food or beverages high in added sugars tended to

consume more calories than those who consumed food or beverages low in added sugars Systematic reviews and meta-analyses support the view that Sugar-sweetened drinks, particularly soft drinks, and fruit juices, have a causative role in obesity (Malik *et al*., 2006; WHO & FAO, 2003; Vartanian *et al.,* 2007). A mother's diet high in sugar may potentially shape her child's flavor preferences even before birth (Beauchamp & Mennella, 2011). Consumption of sugar-sweetened products should be only occasionally and in small amounts. The term 'occasional' defined by 'The Communication on Obesity Action for Child Health Reference Group' is consumption of sugar-sweetened products 'once a week or less' (Wilde *et al.*, 2007). WHO has recommended consumption of less than 10% of total energy intake per day with the further suggestion that a reduction to below 5% of total energy intake per day would have additional benefits (5% of total energy intake is equivalent to around 25 grams (~6 teaspoons) of sugar per day for an adult of normal body mass index). The suggested limits on intake of sugars apply to all free sugars and sugars consumed are "hidden" in processed foods (1 tablespoon of ketchup contains ~4 grams (~1 teaspoon) of sugars (WHO, 2003). The study by Waudo *et al.* (2006), found that sugar was consumed highly by 86.1% of the women respondents daily. This was sugar mainly in tea. A study to examine the relationship between knowledge and beverage consumption habits among children (8 – 14 years) attending elementary schools in London, Ontario, Canada found that Children with higher knowledge scores consumed significantly fewer sugar-sweetened beverages and significantly more water (Irwin *et al.*, 2019).

### 2.6.9 Water and food safety issues

Safe food handling procedures and food production require an adequate supply of clean water (Bhagwat, 2019). A high-quality diet has been described not only as one which is nutritious and balanced and adapted to individual requirements, but also hygienically safe to prevent disease and ensure a good state of health as well as optimal development and growth (Shao *et al*., 2017). Food safety was recognized as part of the enabling environment for reducing hunger and malnutrition in the 2014 Framework for Action, adopted at the ICN2 (FAO & WHO, 2014). In Kenya, unsafe water, sanitation, and hand washing were estimated to account for 6250 age-standardized disability-adjusted life years per 100,000 in 2016, while diarrhoeal diseases accounted for 244.2 years lost to disability and 5689.9 years of life lost per 100,000 in the same year (Achoki *et al.,* 2016). Out of approximately 80% of hospital attendance due to preventable diseases in the country, about 50% of these diseases are Water, Sanitation, and Hygiene (WASH)

related. In Homa Bay County, diarrhoea (11 percent) is the third most common disease. The only known water supply schemes that are operational with frequent breakdowns are those in major urban centers such as Homa Bay, Mbita, Kendu Bay, and Oyugis. Whereas some investment has been made to deliver water to the other urban centers, the schemes have not been completed. Areas with gravitational capacities are also being explored for investment such as in Suba. The average distance to the nearest water point stands at five km. This means a majority of the residents have to lose more than 30 minutes to reach water points and queue for the service (GoK, 2013).

### 2.6.10 Water intake

Water comprises from 75% of body weight in infants to 55% in the elderly (Nicolaidis, 1998). Water in our body is essential for cellular homeostasis, carrying nutrients and waste products between major organs, regulating body temperature, lubricating joints, and acting as a shock absorber (Jéquier & Constant, 2010). Water is also important in the gastrointestinal, kidney, heart functions, and hemodynamic responses (Popkin *et al.*,2010). Urinary excretion and drinking water-mediated through the sensation of thirst are the main regulatory processes in maintaining the volume of fluid in the body. During exercise, individuals may not hydrate adequately when allowed to drink according to thirst (Bar-Or *et al*., 1980) and there is a need to drink extra fluid, to make up for what is lost through perspiration (Gandy, 2015).

World over, there is no information on adequate hydration levels. Armstrong & Johnson (2018) in their literature review noted that despite numerous efforts to define a state of euhydration and determine the daily water requirements of children, men, women, and older adults, no empirical research provided definitive answers and no universal consensus existed. The dynamic complexity of the water regulatory network, and inter-individual differences, are the primary reasons why widespread consensus regarding the daily water requirements has not been reached (EFSA, 2010; IOM, 2004). As a baseline euhydrated state, Armstrong and Johnson (2018) proposed a novel alternative to estimate water requirements per day by use of a plasma arginine vasopressin concentration < 2.0 pg/ml. This estimate is equivalent to a total water intake of 1.8 L/24 hours . On examination of data in their literature review, the researchers noted that, at a plasma arginine vasopressin concentration < 2.0 pg/ml, the brain did not attempt to conserve water whereas, plasma arginine vasopressin concentration ≥2.0 pg/ml represents dehydration or hypohydration because, at this level, the brain acted to conserve water. Elderly individuals and

children are more vulnerable to dehydration (Pross, 2017). It is recommended that athletes or children in hot climates should begin athletic activities in a well-hydrated state and drink fluids over and above the thirst threshold. The need for better education on water intake was identified as a way to help prevent sudden hypotension and stroke or abnormal fatigue (Popkin *et al*., 2010). Although it has been estimated that 70-80% of recommended water intake comes from drinks and 20-30% from foods, Guelinckx *et al.* (2016) argued that estimating water from food is difficult, if not impossible for members of the general public to understand. The researchers noted that water from fluids is the main driver of total water intake and that encouraging the consumption of fluids, especially drinks that do not contribute to total energy intake such as water is appropriate. There is a dearth of information on water intake n the Lake Victoria region.

### 2.6.11 Physical activity

A Healthy and highly protective dietary pattern is one compatible with the maintenance of a healthy weight when complemented with an active physical lifestyle. Physical activity is a behavior that results in an elevation of energy expenditure above resting levels (Pinheiro *et al*., 2011). It has also been defined as any bodily movement produced by skeletal muscles that result in energy expenditure (Caspersen *et al*., 1985) or the thermic effect of any movement that exceeds basal energy expenditure (Tappy, 1996). Factors that influence physical energy expenditure include intensity, duration, and frequency of activity (Welk, 2002). Individuals engage in some physical activities which include obligatory demands such as occupational work, schoolwork, housework, or discretionary activity such as exercise or sport.

Approximately 60% of the global population did not meet the recommended daily minimum of physical activity. Physical inactivity was identified as the fourth leading risk factor for global mortality causing 6% of deaths (WHO, 2009). Estimates from both high-income, as well as low- and middle-income countries indicated that between 1–3% of national health care expenditures are attributable to physical inactivity (Bull *et al*., 2017). Regular exercise helps control body weight, prevent osteoporosis and fractures and reduce the risk of cardiovascular diseases, diabetes, colon and breast cancer, and depression (Caspersen*et al*., 1985; WHO, 2002). Different types and amounts of physical activity are required for different health outcomes, with a minimum of at least 30min of regular, moderate-intensity physical activity (e.g. fast walking) on most days (WHO, 2020). For primary prevention of NCDs through physical activity, WHO

(2010) developed global recommendations that address the links between the frequency, duration, intensity, type, and the total amount of physical activity for the population not for the management of the disease. Recommended level is 150 minutes per week of moderately intense activity.

Due to limited existence of national guidelines on physical activity for health in low- and middle-income countries, WHO (2010) developed global recommendations that address the links between the frequency, duration, intensity, type, and the total amount of physical activity needed for the prevention of NCDs at the population level and not for the management of the disease. It is recommended that children and adolescents accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily, while adults accumulate 150 minutes per week of moderate-intensity activity as musculoskeletal injury rates appear to be uncommon at these levels. There is a dearth of information on water intake n the Lake Victoria region.

Since food consumption patterns and lifestyle choices vary widely, approaches for sustainable diets are context-specific. Internationally, FBDGs have been adapted by governments to provide context-specific recommendations and advice on healthy diets and lifestyles (FAO & WHO, 1998) and now sustainable diets (Tetens *et al*., 2020). To develop recommendations, food-based, as opposed to nutrient-based indices, are preferred because people eat foods rather than individual nutrients. Diets are made up of many separate, interdependent food components, consumed in combinations, amounts, and frequencies that vary over time (USDA, 2014). Therefore, the starting point to making sense of food-based recommendations is to understand the dietary patterns of a country and align the national dietary goals with achieving both global health and environmental targets (Willet *et al*., 2019; WWF, 2020). Individual countries have been encouraged to develop their national nutrition guidelines (FAO/WHO, 1998). The need to improve diet quality, particularly among populations most vulnerable to malnutrition is a current global concern and governments have been called upon to focus on transforming food systems to enable people to adopt and maintain sustainable healthy dietary practices (Springmann *et al*., 2018). Globally, the adoption of healthy diets and lifestyle choices is projected to lead to a reduction of up to 97 percent in direct and indirect health costs and 41–74 percent in the social cost of GHG in 2030 (FAO *et al*., 2020).

## 2.7 Healthy eating and food-based dietary guidelines

National nutrition guidelines are government endorsed recommendation that focuses on quantities of individual nutrients; and the quality and quantity of whole foods that people should consume considering prevailing socio-cultural and religious values to achieve a healthy nutritional state (Montagnese *et al*., 2015). Scientifically, FBDGs guidelines are based on the association between dietary patterns and the risk of diet-related diseases and incorporate recommendations that address major diet-related public health issues (FAO, 2017). To better the precision in the development of FBDGs, use of diet modeling (Buttriss *et al.,* 2014) and linear programming have been suggested (Ferguson *et al.,* 2004). In the development of the Netherlands and Australia FBDGs used optimization model and expert judgment, to project dietary patterns based on recommended daily amounts of food groups (Brink *et al*., 2019; National Health and Medical Research Council, 2011) while Japan (Okubo *et al*., 2015) and Ethiopian (Bekele *et al*., 2019) used linear programming. The framing of the FBDGs based on foods makes the message easy for the consumer to conceptualize and understand (Vorster*et al*., 2001). The FBDGs should be linked to nutrition education, agriculture, and food policies and should be part of an integrated strategy to improve food security, food safety, nutrition, and environmental health (Fischer & Garnett, 2016).

A global review of FBDGs by Herforth *et al.,* (2019) showed that 90 countries (7 in Africa including Kenya) have developed national FBDGs. The food categorization differed from three to five food groups (Table 1).

**Table 1:** Categorization of Food Groups used in the Development of FBDGs

| Categorization of food into five groups | | | Categorization of food into four groups | Categorization of food into three groups | Special groups with Mediterranean countries |
|---|---|---|---|---|---|
| Starchy staples (variously defined); fruits; | Starchy staples; fruits; vegetables; legumes; | Kenya Starchy foods; vegetables and fruit; | Starchy staples; fruits and vegetables; dairy; and other "protein | Starchy staples; fruits and vegetables; and "protein | Larger number of food groups (earlier described) |

| | | | | | |
|---|---|---|---|---|---|
| vegetables; dairy foods; and other "protein foods" | and animal source foods. | Legumes and nuts; meat; dairy products. | foods." | foods." | including, olive oil; fish; and nuts. |

**Source:** Adapted from Hertfort *et al.* (2019)

Key messages were either pure qualitative or both qualitative and quantitative, some indicated frequencies as daily or weekly basis with some indicating the amounts which needed to be increased or moderated (Appendix I). Most FBDGs promote an abundant consumption of fruit, vegetables, and wholegrain cereals, and limited consumption of products rich in saturated fatty acids, trans-fatty acids, simple sugars, and salt.

### 2.8 Conceptual framework

The concept of developing FBDGs for the Lake Victoria region was a follow up of earlier findings by Waudo *et al*. (2005), Waudo*et al*. (2006) and Cheserek *et al*. (2012). Using dietary intake studies, the researchers found higher prevalence of food insecurity and malnutrition in Kisumu, Kenya compared to Jinja in Uganda and Mwanza in Tanzania. Issues of foods and nutrition concerns with implicated poor health outcomes in Kisumu included; high prevalence of undernutrition and hidden hunger, food insecurity, emerging overweight and obesity, starch-based foods with very little vegetables, seldom consumption of meats and fruits. An exploration of practices and behaviour contributing to the issues of concern in the community would inform the desired change. The desired changes in turn becomes the basis for key message content to craft preliminary FBDGs. Consumer-testing would be necessary to help identify and restate the difficult words or concepts. This would in turn improve clarity and understanding of the guidelines by the public as intended. Diets are greatly affected by the food availability, the prices at which these foods are sold, and the extent to which they are culturally and socially acceptable based on beliefs, attitudes, and nutrition knowledge. Other factors affecting diets include policies and production practices and the ecosystem (HELP, 2017; Herforth & Ahmed, 2015). Involvement of the stakeholders in the process is intended to facilitate, the development of relevant FBDGs based on ecologic, socio-economic, and cultural settings and to facilitate uptake of the guidelines. Further, stakeholders' participation also ensures that the guidelines are congruent with other policies in the study area (FAO/WO, 1998). Figure 1 shows the conceptual

framework in the development of FBDGs for the Lake Victoria region. The drafted guidelines are subject to review with the emergence of new knowledge.

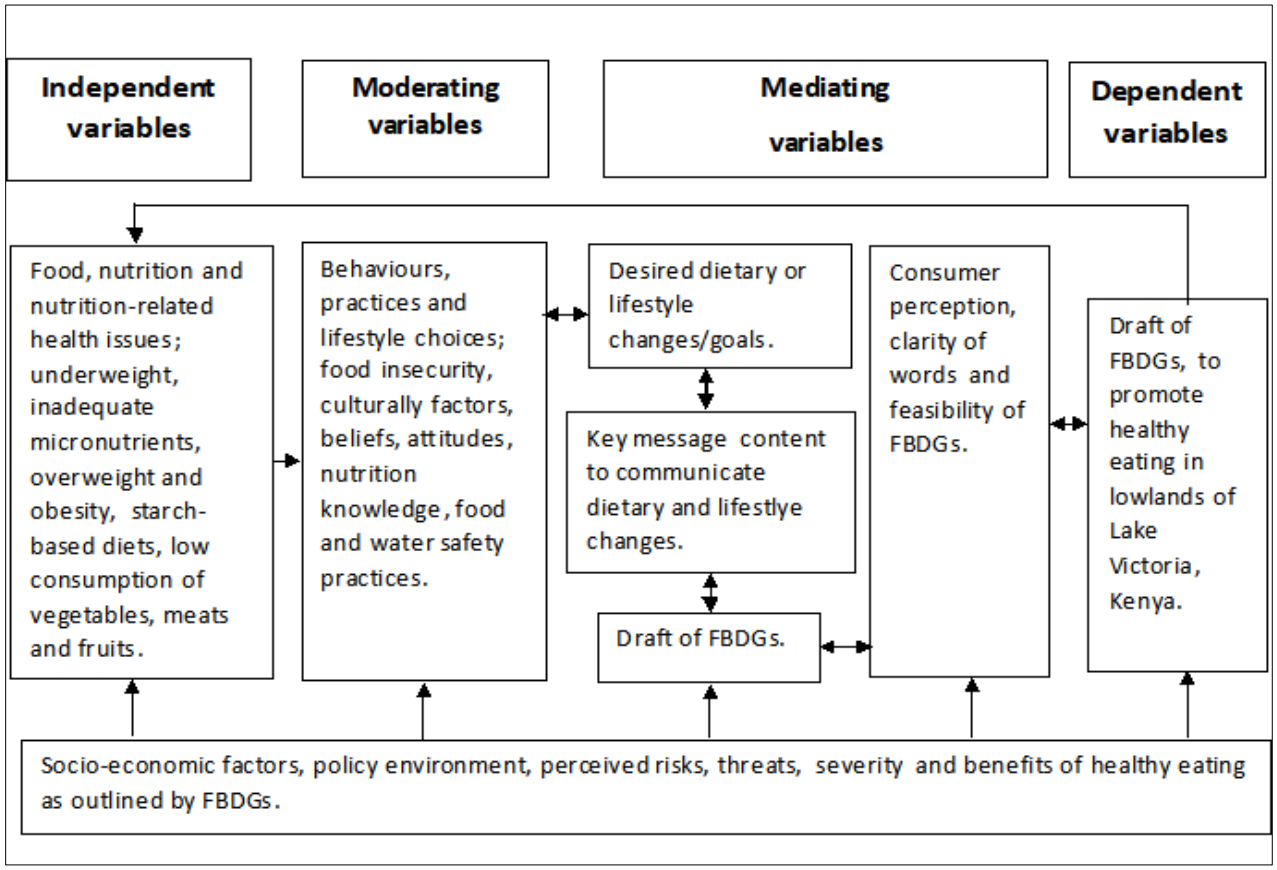


***Figure 1:*** *Conceptual Framework*

# CHAPTER THREE
# RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter describes the study methodology. It includes description of the research design, study area, study population, sampling procedure, data collection tools, data collection and analysis, and lastly ethical considerations.

## 3.2 Research design

This study used a descriptive qualitative research design, involving an interpretive as well as the naturalistic approach (Denzin & Lincoln, 2005). The researcher did not manipulate any variable but applied a multimethod approach (Denzin & Lincoln, 2004; Fox & Bayat, 2007) to develop and consumer-test draft FBDGs in the study area. The FBDGs were intended to communicate desirable dietary and lifestyle changes with an objective to promote healthy eating in the lowlands of Lake Victoria, Kenya.

## 3.3 Study area

This study was conducted in Kisumu and Homa-Bay Counties. The two Counties are in close proximity to the Lake. Therefore, most community members are fishermen. The fish caught is either consumed locally or sold to neighbouring towns, while some are exported to international markets of Europe and other countries (Homa Bay County Government, 2018; Kisumu County Government, 2018). Besides fishing, the vast majority of the population grow maize and beans, which are considered the staple foods in the region. Other crops produced in the region are sugar cane, sunflower, pineapples, potatoes, sorghum, finger millet, groundnuts, kales, and cotton. The main livestock bred is chicken, cattle, goats, and sheep. However, land's agricultural potential can be classified as high, medium, or low based on agro-ecological zones (AEZs). An AEZ is a land resource mapping unit defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use (FAO, 1996). Similar AEZs have similar specific range of potentials and constraints for land use. Land in Kenya can be classified into Tropical Alpine, Upper Highlands, Lower Highlands, and Midlands which include Upper Midland, Lower Midland (LM), Lowlands, and Coastal Lowlands. The AEZs in Kisumu and Homa Bay Counties are classified into Upper Midlands and LM (Jaetzold *et al.*, 2010a; Jaetzold *et al.*, 2010b). The LM zone which is the zone in close proximity to Lake Victoria is

categorized into LM2, LM3, LM4, and LM5 zones. Agricultural potential decreases from LM2 to much lower productivity in the LM5 zone. This study was conducted in the predominant LM3, the Lower Cotton Zone and LM4, the Marginal cotton Zone (Figure 2).

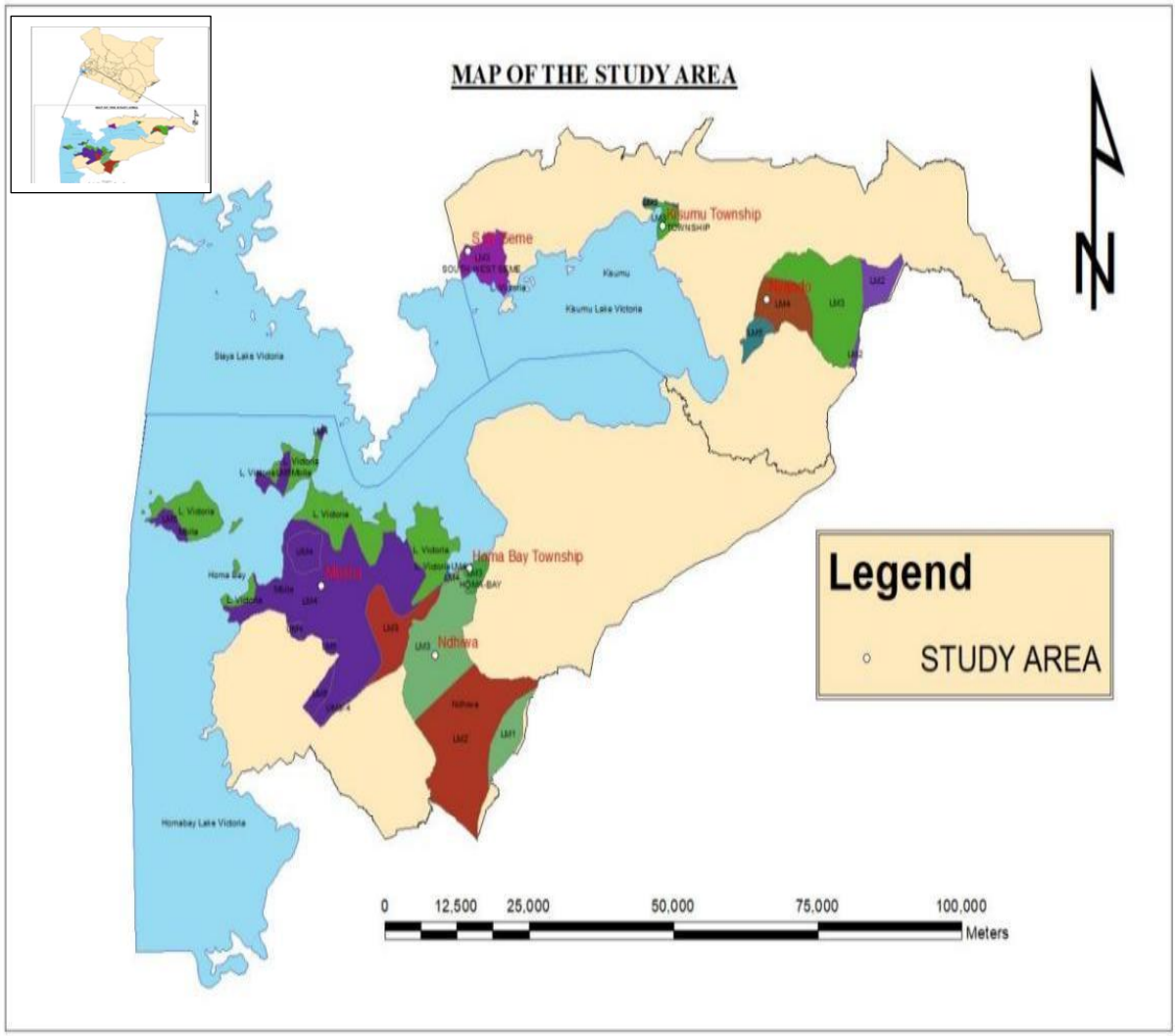


*Figure 2:* ***Map of the Study Area***

Cotton is potentially the leading crops that grow within the zones, but also groundnuts. Other agricultural potentials in LM3 and LM4 zones are as indicated on table 2. Zoning based on agro-ecology has gained greater recognition as a scientific and policy approach to advise farmers and transform the food system (European Union, 2020; HLPE, 2019; Mbow *et al*., 2019; Pimbert, 2018).

**Table 2:** Farming Potentials in the Study Area

| Agro-ecological zone | Mean annual Rainfall (mm) | Mean annual temperature ($^{o}$C) | Good yield potential |
|---|---|---|---|
| LM 3 (Lower Midland Cotton Zone) | 230-280 | 21.0-22.7 | Sorghum, finger, millet, green grams, groundnuts, beans, sweet, potatoes, soya beans, sunflower, chick peas, tomatoes, onions, muskmelons, pumpkins, butternut, cassava, sisal and Jatropha. With irrigation: rice, the new Uganda variety (lower places), bananas (on dams), Chinese cabbage and other vegetables (two planting season) |
| LM 4 (Marginal Cotton Zone) | 115-135 | 22.1-22.3 | Sorghum, millet, beans, green grams, cowpeas, chickpeas, sunflower simsim. irrigated rice (one planting season) |

**Source: Jaetzold *et al.*, (2010a) & Jaetzold *et al.*, (2010b)**

### 3.4 Study population

Food Agriculture Organization and WHO (1998) suggested the inclusion of a multidisciplinary working group comprising of representatives from agriculture, health, food science, consumers, the food industry, communication, and anthropology. However, this study engaged a panel of 30 members from the Ministries of Health and Agriculture (Crops, Livestock, and Fisheries). This was due to limited funding. The 30-member panel proposed and drafted FBDGs for the lowlands of Lake Victoria. Although the developed guidelines targeted all individuals above five years of age, the proposed guidelines were consumer-tested among Primary (216) and High school (216) learners and adult male (207) and female (211) members.

### 3.5 Sampling of study participants

The 30-member panel was drawn from three Counties of Kisumu, Homa-Bay, and Siaya while community members were sampled from Homa-Bay and Kisumu Counties.

### 3.5.1 Sampling of panel members

A 30-member panel was selected using snowball sampling (Figure 3). The researcher nominated the three County Nutrition Coordinators. This was step one. The three officers were each requested to nominate three nutritionists and other Officers from the Public Health Office, Ministry of Agriculture (fisheries, livestock, grains, and horticulture) and Community Focal Person. Those nominated had to: have worked for not less than five years in the area of their profession, be active in the field at the time of this research, be able to give expert judgment, and be perceived by others as professional and capable of contributing helpful inputs. Those nominated in this step were briefed on the proposed research and in turn asked to nominate three names of persons who they thought could fit into the study group. This marked step two. Those selected at this stage were, in turn, asked to repeat the nomination exercise. This was the third and last Step. The list of all selected names was drawn and those with high frequency in the mention of their names were selected (Appendix II). The total numbers of those selected were 30. They were Nutrition Officers (12), Public Health Officers (3), Community Focal persons (3), and Officers from the Ministry of Agriculture (fisheries (3), livestock (3), and crops (3), horticulture (3).

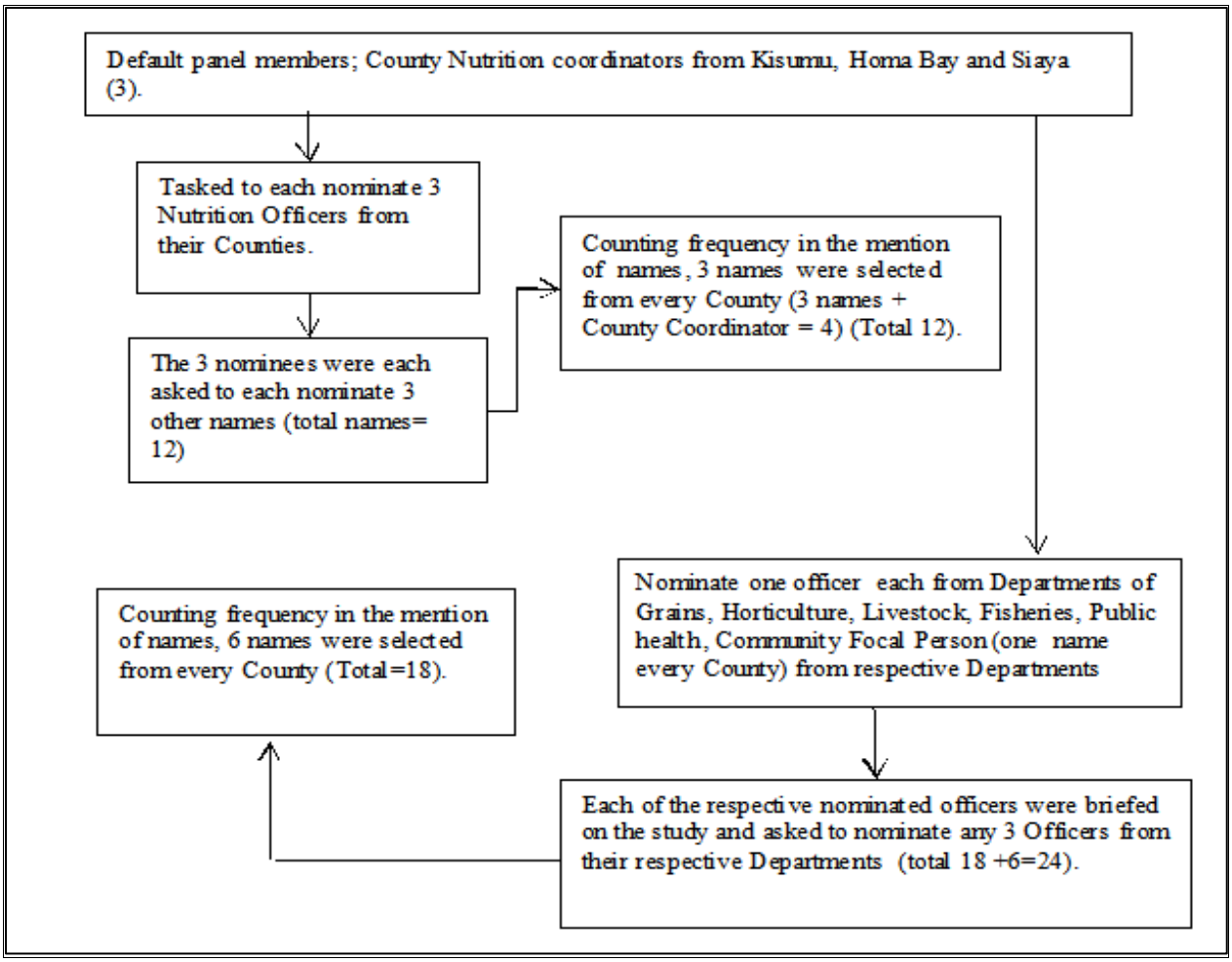


***Figure 3:*** *Selection Process of Panel Members*

### 3.5.2 Sampling of study sites

Stratified random sampling was applied to select village study sites. Based on their agricultural potentials, the Sub-Counties of Ndhiwa (HmB_LM3), South-West Seme (Ksm-LM3), Nyando (Ksm_LM4) and Mbita (HmB_LM4) were purposively selected. The LM3 zones have higher agricultural potentials compared to the LM4 zones which experience lower rainfall. The sub administrative Counties of Kisumu City (Ksm_Urb) and Homa Bay town (HmB_Urb) located in LM3 were stratified as Urban settings. List of village names within the AEZs were obtained from the local administration offices. The list of the village names was arranged in alphabetical order and assigned numbers. Using a computer random number generator, six villages were picked. Based on alphabetical order, the first three villages with a high school within the locality were picked from the selected six. A neighbouring primary school was respectively picked. Focus group discussion (FGD) of class five and form two students were conducted in each of the

selected schools. The adult male and female FGD were conducted in the remaining three villages. Although a minimum of two FGD is required, the discussions may be repeated until a saturation point is reached. This study undertook three FGD in every stratum and hence three study sites.

### 3.5.3 Sampling of FGD study participants

Twelve participants were selected from a list of class five and form two students. Students who were able to engage in discussions in a meaningful way were selected. Selection was done with the help of the class teachers. The view of class five participants was intended to capture the views of children and the form two students the perception of the adolescents. Every FGD stratum in the primary and secondary schools consisted of 12 participants. The total number of participants were 216 from primary and 216 from secondary schools. The adult male and female participants were, selected with the help of the Village Elder and Community Health Worker or Community Health Volunteers. In Ndhiwa (HmB_LM3) where there was ongoing social mobilization on water and sanitation projects, the researcher with the help of a Community Health worker identified male and female research participants from a list of names among those who were involved in the other community project. Urban setting participants were mainly drawn from small and medium enterprise groups. In Seme (Ksm_LM3), Nyando (Ksm_LM4), and Mbita (HmB_LM4) where there were no existing groups, the FGD participants were identified from a list of village members with the assistance of the Village Elder. Focus-group discussion consisted of 8-12 participants. There were a total of 207 males and 2011 females.

**Inclusion and exclusion criteria**

Participants had to fulfill the following criteria:

a) **Inclusion criteria:** Selected Primary and High school participants were those who were able to engage in meaningful discussions. Adult participants had to be married or living in their household, and be involved in food purchase and/or preparation.

b) **Exclusion criteria:** Participants who were immediate relatives, coming from the same household or immediate neighbours.

### 3.6 Data collections tools

This research applied mixed methods in data collection. Quantitative data was collected using the structured questionnaire while qualitative data was collected using discussion guides.

Community research participants belonged to the Luo and Abasuba ethnic group. They spoke *'Dholuo'.* Therefore, the FBDGs and the FGD were translated to the local language '*Dholuo'*.. Two experts from Egerton University, Faculty of Arts and Social Sciences (Department of Languages and Sociology) first, separately translated FBDGs and the FGD guide into the local language. The two translators together with County Nutrition and Sub-County coordinators discussed and harmonize the translated versions. Emphasis in translation was given to meaning rather than word to word translation.

### 3.6.1 Socio-demographic questionnaire

The researcher developed structured questionnaires which were used to capture the socio-demographic of participants. Information which included: gender, profession, years of service were collected from panel members. Data which included the ages, sex, level of education, marital status and occupation were some of the biodata collected from community participants.

### 3.6.2 Discussion guides

Research questions were used to guide plenary and group discussions among panel members in workshops. The study sought to answer questions to include: What are the prevalent nutrition-related health issues in the Lake Victoria region? What are the target nutrients? Emerging issues were summarized and used to generated five-point Likert-like Delphi questionnaires.

### 3.6.3 Delphi questionnaires

Delphi questionnaires are a series of questionnaires where survey continues until the responses show stability. However, a typical Delphi study includes at least two rounds of questionnaires (Fletcher & Marchildon, 2014). The method has been used in health sciences to find consensus (Nasa *et al.,* 2021; Niederberger & Spranger, 2020). It emphasizes the importance of opinions and perceptions of groups (Birdsall, 2004; Dalkey & Helmer, 1963; Morgan & Jorm, 2009). The group of interest is ideally a purposive sample of individuals with specific expertise on a topic and not a generalized sample (Brady, 2015). Input from the Delphi method directly affects practice, policy, or decision-making (Alder & Ziglio, 1996; Dietz, 1987). The Delphi method was used in this study to seek consensus among panel members on nutrition and health-related issues. Issues agreed upon were the basis to develop FBDGs for the region.

### 3.6.4 Focus group discussions guide

Focus group discussion guide was used to elicit responses on perception, clarity and feasibility of the FBDGs among community members. Feedback from FGD provided useful information which guided the rewording the final draft of FBDGs for lowlands of Lake Victoria region.

### 3.6.5 Training of FGD moderators and note takers

Focus group discussion were facilitated by a trained moderator and a note taker who had a first degree in nutrition. The research assistants were fluent in English and 'Dholuo' the local languages. Prior to commencement of the study they were trained on how to conduct FGD. They were particularly asked to be aware of individuals who would want to dominate discussions and how to prompt the quiet participants.

### 3.6.6 Pilot testing

Pilot testing was conducted to check on appropriateness of the FGD guide and to help members of the research team become familiar with the research procedures. Four FGD women (2 FGD) and High School learners (2 FGD) each consisting of 12 participants were conducted within Siaya township. The sessions were found to take more than one hour. The FGD was therefore revised to shorten the time taken for discussion. The main codes in the revised FGD guideline were; perception, clarity of meaning, feasibility, and ease with which the guidelines were recalled.

### 3.6.7 Ethical approvals

This research was approved by Egerton University's Research Ethics Review Committee. Further to which, permit to collect data was obtained from The Kenyan National Commission for Science Technology and Innovation, registration number NACOSTI/P/18/12634/22291 (Appendix III). Subsequent permission was sought from the County and other local authorities. An overview of the research and research process was presented to all research participants and only those who consented by signing the consent form participated in the research.

## 3.7 Data collection and analysis procedures

The procedures followed in this study to develop FBDGs for the Lake Victoria region aligns with the FAO/WHO (1998) recommendation (Figure 4).

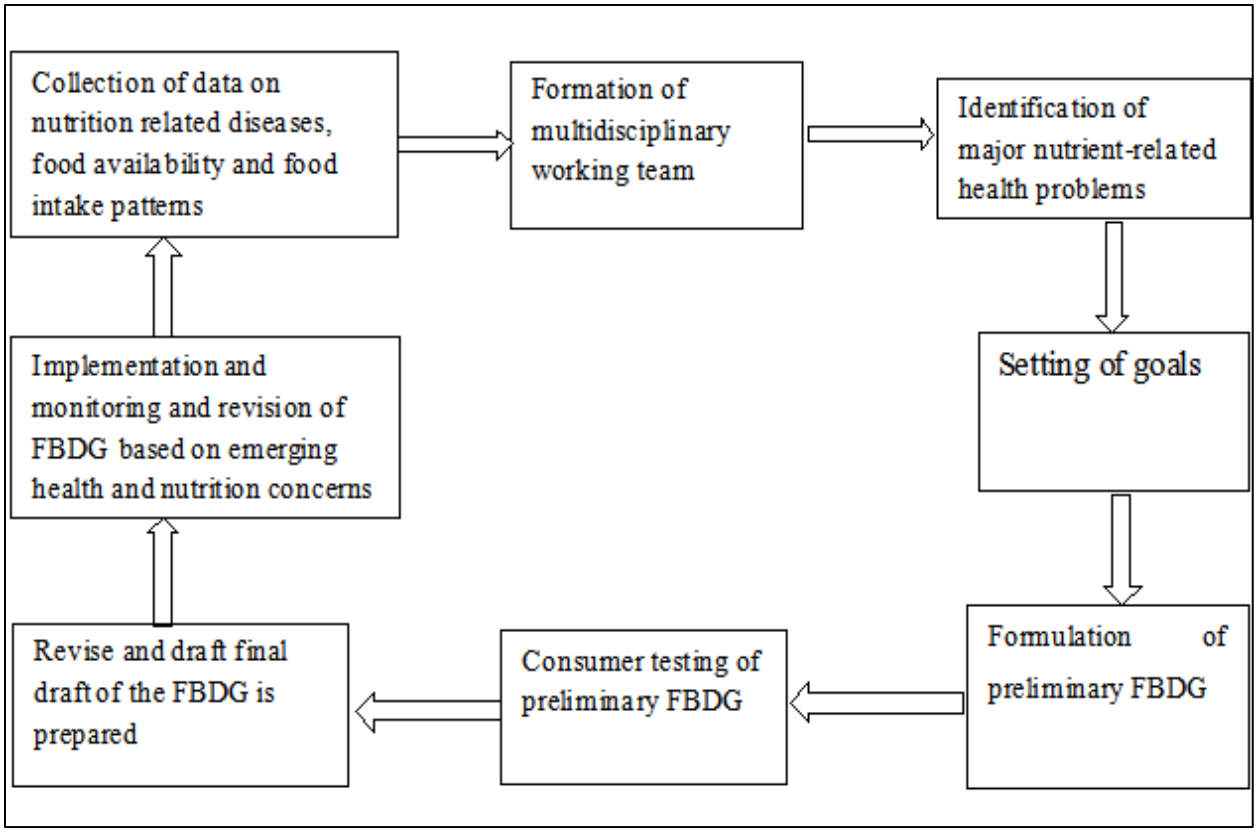


***Figure 4:*** *Recommended Steps to Develop FBDGs*

**Source:** Adapted from FAO/WHO (1998)

This research process followed three iterative phases. Panel members engaged in the first and the third phase which focused on the development of FBDGs. In the second phase, the developed FBDGs were consumer-tested among community members for clarity of words, perceived meaning, ease of recall, and barriers to implementation. Figure 5 is an illustration of the process.

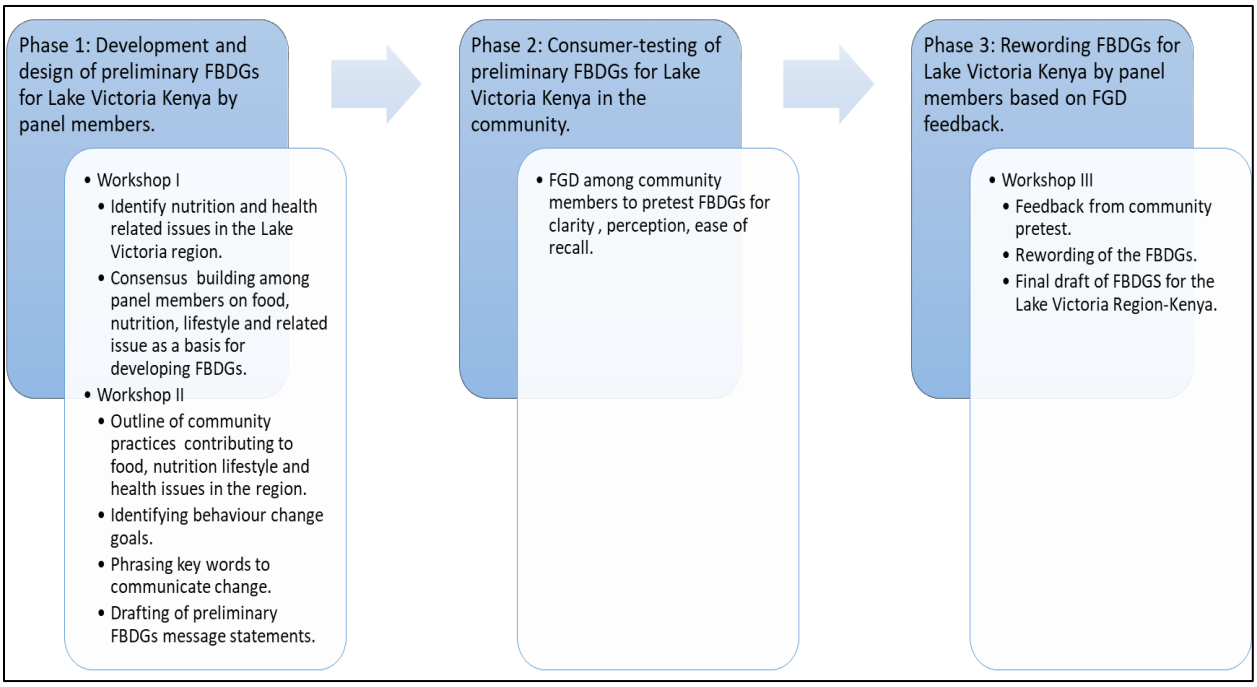


***Figure 5:*** *Phases in the Development of FBDGs for Lake Victoria Lowlands*

### 3.7.1 Phase one

Phase one of this study engaged the 30-member panel. The panel applied nominal group technique to identify and prioritize nutrition and health concerns in the Lake Victoria region. Similar technique was applied to prioritize children's perceived barriers and facilitators, as presented in the 'MyPyramid' consumer education icon in America (Jahns *et al*., 2014). Based on the prioritized issues, the panel explored desirable behaviour and lifestyles changes to promote healthy eating in the community. Desirable behaviour change was the basis to craft key message content of FBDGs.

#### 3.7.1.1 Nutrition and health concerns in the Lake Victoria region

The researcher invited the selected 30-member panel to a one-day meeting for an overview of the research process and to seek their consent to participate in the study. All the selected members voluntarily signed the consent form (Appendix IV). The panelist were then invited to attend three days workshop to discuss diet and health-related issues of concern in the region. Proceedings included discussions on: Nutrition and food security status in the Lake Victoria region; Nutritional status of individual and household members; Staple foods, fruits, and vegetable production and consumption; Livestock rearing, milk, and meat production and consumption; Fish production and consumption; and water and food safety issues. Discussions were conducted

to answer these questions: What are the prevalent nutrition-related public health issues in the region? What are the target nutrients or dietary factors link to the major public health concerns? The researcher then summarized emerging issues (Appendix V) and generated a five-point Likert-like Delphi questionnaire (Appendix VI). The Delphi questionnaire was designed to seek panel members' personal opinions on whether they agreed on identified issues as the basis to design FBDGs.The first round of Delphi questionnaire was sent to individual panel members two weeks after workshop one.

The five-point Likert-like scale was constructed ranging from "strongly disagree" bearing the lowest rank (one) through to "strongly agree" having the highest rank (five). Delphi questionnaire one responses were converted to a nominal scale (agreed/not agreed). The ratings, "strongly disagree", "disagree" and "I don't know" were regarded as "not agreed" while, "agree" and "strongly agree" ratings were regarded as "agreed". Although there is no set standard for the target percentage of agreement, many studies seeking consensus have used a score of 80% as the cut off (Cullerton, *et al*., 2019; Goodman *et al*., 2020; Scheers *et al*., 2018; Schlueter *et al*., 2020; Stewart *et al*., 2017). Issues upon which the panel members were not able to agree, were rephrased based on the participants' comments and presented as Delphi questionnaire two. Items that lacked consensus in Delphi questionnaire round two were omitted or considered as items that lacked consensus of panel members as a basis in the design of FBDGs for the Lake Victoria region. The steps followed in consensus building are shown in Figure 6.

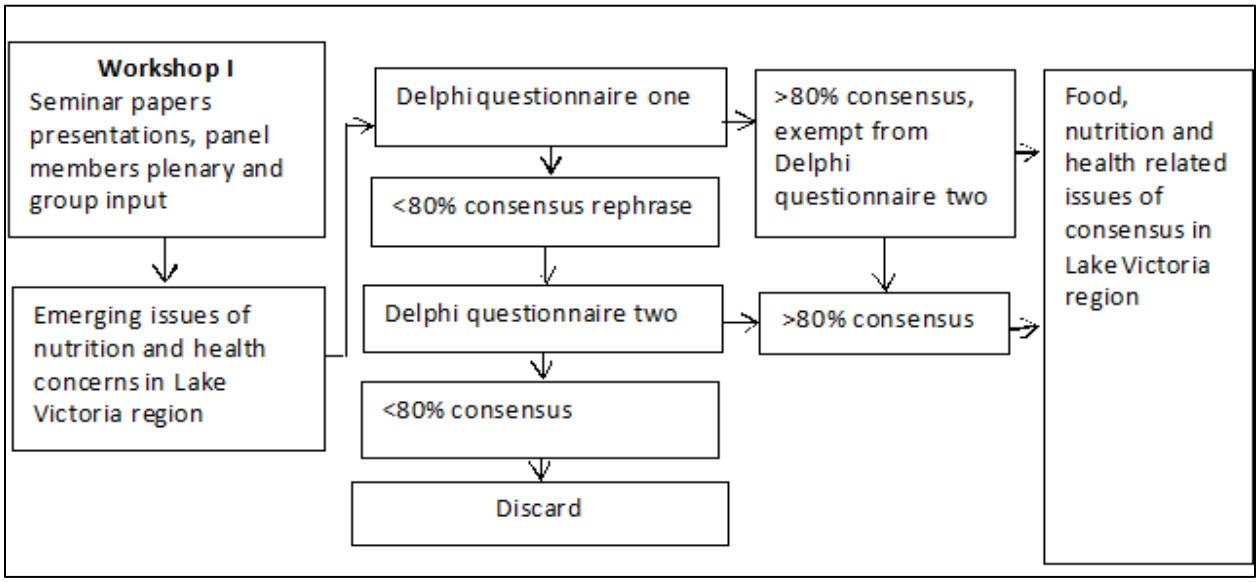


***Figure 6**: Consensus Building Process*

### 3.7.1.2 Development of key message content for the guidelines

The panelists attended a 2nd workshop convened to: receive input from workshop one; discuss any divergent expression in the consensus-building process, and negotiate decisions between panel members on the strength of arguments surrounding identified issues of concern in the Lake region. The panelists explored dietary and lifestyle issues which formed the basis in developing FBDGs for the region. The issues agreed upon were written and posted on the wall. The panel members were then asked to explore and list practices and behaviours which in their opinion contributed to nutrition and health-related issues in the region. The lists were written on sticky notes and pasted on the posters. This was repeated for all identified issues. Group of panelists were assigned posters with the sticky notes. Based on the information contained on the poster, each group was asked to organize the sticky notes to depict a tree. This was done to identify and prioritize dietary behaviour to be addressed in the formulation of the FBDGs. The problem tree analysis design begins with the starting problem (the stem or the core), then effects (branches or the consequences) then the underlying factors (roots or the causes) (Snowdon*et al.,* 2008; Veselý, 2008). The focus problem in the development of guidelines for the Lake Victoria region was unhealthy diets. Using the consumption of fewer than three meals a day, an illustration is given in Figure 7.

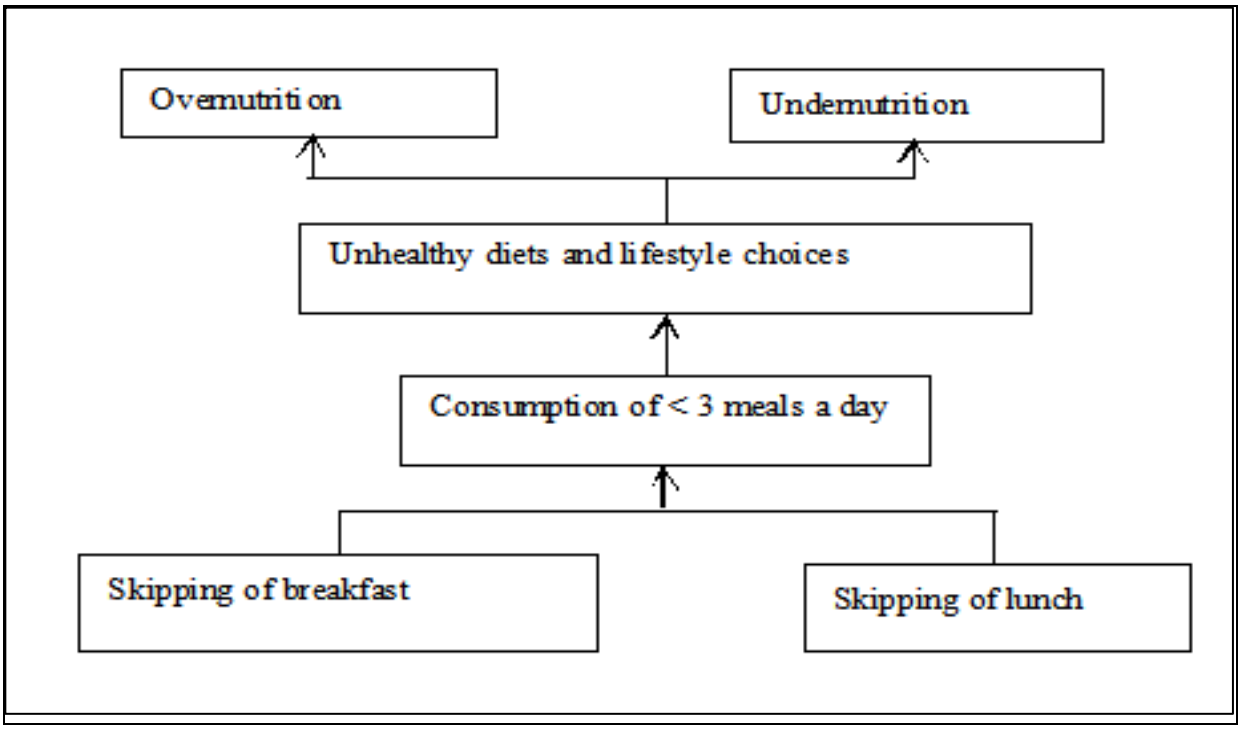


***Figure 7:*** *Illustration of Problem Tree Analysis*

Two column posters were put on the wall. Panel members were asked to explore and list desirable changes to aligned with dietary or lifestyle goals in the community. This was written on distinct coloured sticky notes and posted on column one of the posters. To communicate desirable change, the panel were once again asked to craft key message on other distinct coloured sticky notes and paste on the second column. The key content was to convey and encourage individuals to effect desirable change. An illustration of the process has been shown on table 3. using the consumption of < 3 three meals a day as an example. Panel members were again assigned groups to consolidate the issues on each column.

**Table 3:** Crafting of Key Message Content

| Consumption of < 3 meals a day | | | |
|---|---|---|---|
| Community practices/behaviour contributing to consumption of fewer meals a day | | Desirable goal and behaviour change in the community | Key message statement to communicate desirable change aligned with priority issues |
| (Listed practices on coloured sticky notes posted here) | Problem tree analysis to prioritize practices/ behaviours to be addressed to effect change | (Different coloured sticky notes with listed desirable behavioural change posted here) | (Identified key message to communicate desirable change written on distinct coloured sticky notes posted here) |

A summary of the process followed in designing preliminary FBDGs for the Lake Victoria region is given on Figure 8. Panel members' discussions are summarized in appendix VII

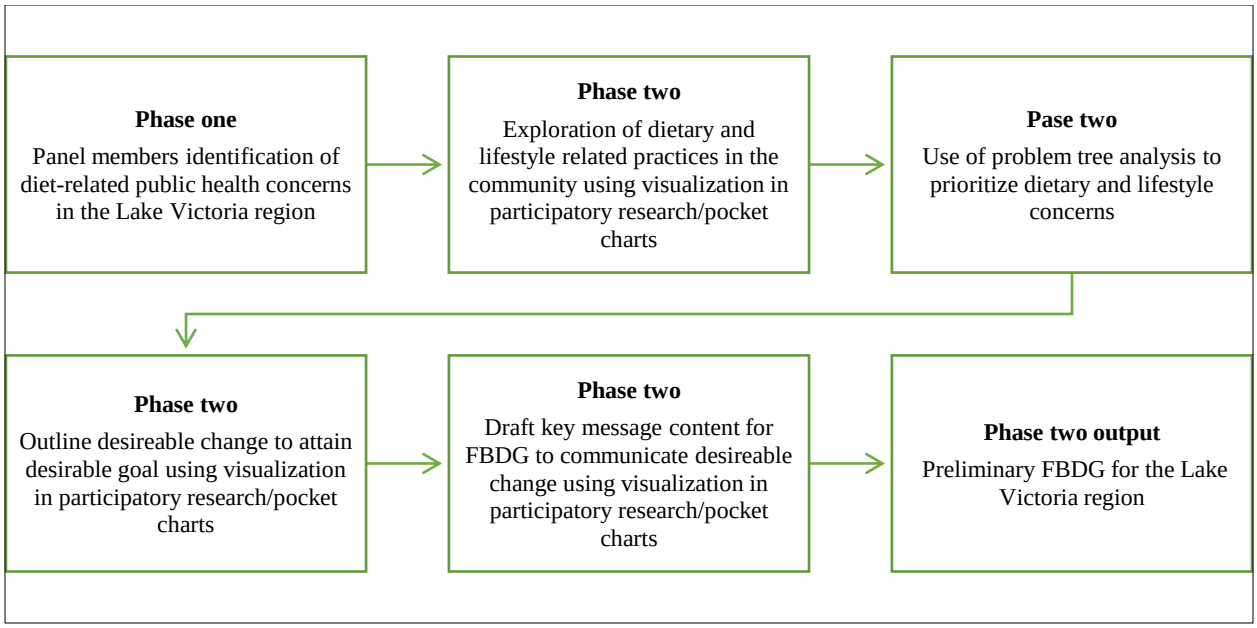


***Figure 8:*** *Design Process for Key Message Content*

### 3.7.2 Phase Two: Consumer-testing of preliminary guidelines

A FGD guide (Appendix VIII) was designed to seek information from community members on clarity of words, perception, feasibility, and ease with which drafted FBDGs could be recalled . The study area is occupied mainly by the Luo community in Kisumu and Siaya Counties and Abasuba in some parts of Homa-Bay County. Although the Abasuba speaks '*Suba*' they also speak '*Dholuo*' language due to their interaction with the Luo people**.** Two Lectures from Egerton University, Faculty of Arts and Social Sciences (Department of Languages and Sociology) translated FBDGs and FGD guide into the local language '*Dholuo'.* The two versions of translations were discussed and harmonized in a meeting among the County Nutrition and Sub-County coordinators. Preliminary FBDGs were pilot-tested in Siaya County using four focus group discussion among women and High School learners. Based on their views, the research instrument was revised.

To conduct FGD, the researcher trained two moderators and note-takers. The researcher visited identified schools before the commencement of the FGD to select participants. The adult male and female participants were also identified a week before the date of the FGD. The moderator explained the research procedures and gave the participants time to ask questions. Selected learners were given a consent form which was to be signed by their parents. The adults who voluntarily accepted to participate were given the consent form to sign. They could terminate

their participation at any time without reprisal. The FGD was facilitated by a trained moderator, who had a first degree in nutrition. Upon arrival, the research participant was given a number for identification and had their biodata recorded before commencing FGD sessions. The FBDGs were printed and displayed on posters, one at a time in front of all participants who were seated in a semi-circle. A volunteer participant read the displayed FBDGs out aloud. The participants were then asked to restate the displayed FBDGs using their own words and to explain what the message statements meant. For the words which they found difficult, they were asked to suggest words to omit or other words to include to make the message statement clearer. They were also asked if the dietary or lifestyle choice as presented was a reflection of their practice or not. If not, they were asked to state perceived barriers. At the end of every FGD, all the posters were removed and the FGD participants were asked to restate the presented FBDGs message statements. The purpose of asking the groups to recall was to test message understanding and the ease with which they were able to process and memorize the statements. The recall did not have to be in any particular order. The researcher attended all FGD conducted and read through all the notes taken to get familiar with the responses from participants. The FGD guide was slightly modified for clarifications in the light of emerging responses. FGD consisting of 8-12 participants was conducted in all strata. To ensure saturation point, three FGD were conducted in every stratum. A sum of 12 FGD were conducted in each stratum (three among primary, High School children, and adult male and female groups). In total 72 FGD were conducted (Kisumu County-36 and Homa-Bay County-36). All FGD proceedings were audio taped.

Audio-recorded proceedings were transcribed verbatim and translated to English. To ensure that verbatim responses were captured the researcher actively supervised the transcription of the audio tapes. Two transcribed audio records were translated back to ‘Dholuo’ by an independent Nutritionist who then was asked to listen to the original audio records confirm whether they retained the same meaning after translation. Inductive content analysis was done for themes. Coding was done with the aid of NVivo8 (QSR International Pty Ltd Version 8, 2008). Based on semantic content, the relationship between codes and emerging codes, and themes were collated to form a thematic map of the findings. The researcher has presented findings from FGD with supporting excerpts. At the end of every FGD discussion, any message recalled was recorded once. Each stratum of the FGD was expected to recall a maximum number of all the eleven messages. If all participating FGD (72) recalled all the 11 message statements, there would be a

total of 792 (N) FBDGs recalled. Descriptive statistics were used to analyze message statements recalled.

### 3.7.3 Rewording of FBDGs

The third and final phase in this research was the rewording of the FBDGs. The panel members were invited to a third workshop to receive feedback from FGD and deliberated on the final wording of the FBDGs message statements. A summary of deliberation to reword the FBDGs are shown in appendix IX. After deliberations, a fair draft of the FBDGs was adopted. The researcher then designed a Delphi questionnaire and sent it to individual panel members for their input on reworded FBDGs (Appendix X). All panel members agreed on the proposed wordings with only a few suggestions. The second round of the Delphi questionnaire was therefore, not necessary in this last phase.

## 3.8 Reliability and validity of the findings

The researcher and a trained coder carried independent coding on 18 (25%) transcripts. The codes showed inter-coder reliability of Cohen Kappa value .67 (Table 4). Results obtained through the descriptive method of research often have high internal consistency as research is conducted in the respondent's natural environment and no variables are manipulated. Input from the panel members in the first phase was validated during the engagement with the community members in the second phase. In turn, input from the community members was validated in the third phase during engagement with the panel members in the drafting of a fair draft of the proposed FBDGs for the Lake Victoria region. Since the panel members and the community members re-iterated the findings it is assumed that these findings are valid.

**Table 4:** Codebook

| Main codes | Emerging Sub themes | Code | Reliability |
|---|---|---|---|
| FBDGs Clarity of words | Words difficult to read | 1C | 0.81 |
| | Words difficult to understand | 2C | 0.78 |
| FBDGs Perception | Good perception of food/nutrients and effect on health | 1P | 0.56 |
| | Good dietary and diet related practices | 2P | 0.58 |
| | Wrong perception of food/nutrients and effect on health | 3P | 0.60 |
| | Inadequate knowledge on food composition/nutrients | 4P | 0.76 |
| | Bad dietary and diet related practices | 5P | 0.74 |
| FBDGs Barriers | | | |
| Food insecurity | Harsh climatic conditions for food production | 1BFIS | 0.74 |
| | Seasonal food production | 2BFIS | 0.76 |
| | High cost of food (food expensive affordable) | 3BFIS | 0.70 |
| | Sale of family food produce | 4BFIS | 0.58 |
| | Bad farming practices | 5BFIS | 0.68 |
| | Large family size | 6BFIS | 0.64 |
| Poverty | No food | 1BP | 0.63 |
| | Skipping of meals | 2BP | 0.71 |
| | Hunger | 3BP | 0.68 |
| | No money | 4BP | 0.72 |
| | Difficult to get money | | |
| | Not enough money | | |
| Attitude | Food dislike | 1BA | 0.62 |
| | Beliefs | 2BB | 0.55 |
| FBDGs Restatement | Able to restate (Eleven FBDGs) | 1R | 0.56 |
| Average | | | 0.67 |

### 3.9 Credibility and confirmability of data

In this study, the credibility and confirmability of the data were established by the iterative process. The first and the third phase engaged panel members, while the second phase engaged community members. The prolonged engagement with the panel members allowed the researcher to gain a deeper understanding of issues of nutrition concern. The multidisciplinary panel with various experiences increased a wider view and perception of the research question. The community members who were of various age groups, the children, adolescents, and the adults contributed to a richer variation of the food, nutrition, and lifestyle-related issues under study. To confirm dependability and interpretation of data, two experts who were my supervisor conducted a second review. Results were also checked with four members (two women, and two men) who did not participate in the research and they confirmed the fitness of the results as well. For content analysis, three transcripts that had been translated to English were also back-translated to 'Dholuo' to ensure that the translated version captured meaning rather than a word-to-word translation of the transcripts. Note-taking and transcripts described participants' behaviour, experiences, and context to understand the participants' reality. A summary of the process followed in data collection and analysis is given in Table 5.

**Table 5:** A Summary of Data Collection and Analysis Procedure

| Objective/Activity | Data collected | Data collection methodology | Method of data analysis | Data output |
|---|---|---|---|---|
| Objective one<br><br>Consensus building Workshop I<br>Seminar papers on food, dietary and health related issues | Emerging issues of food and nutrition concerns | Plenary and group discussion<br>Delphi questionnaires. | Thematic analysis<br>Descriptive statistics | Outline of emerging food, nutrition and health related issues of consensus. |
| Objective Two<br>Development of Preliminary<br>Workshop II<br>Draft for the Lake Victoria region | Exploration and outlining of practices/ behaviour in the community that contributed to food, nutrition and health | Visualization in participatory research (pocket charts) in plenary and group sessions. | Problem tree analysis | Priority practices/behaviours in crafting FBDGs. |
| | Setting of desirable goals and outlining behavioural change in the community to attain desirable goals. | Visualization in participatory research (pocket charts) in plenary and group sessions. | Thematic analysis. | Outline of desirable goals and behaviour change. |
| | Craft message statements to communicate desirable changes aligned with | Visualization in participatory research (pocket charts) | Thematic analysis. | Preliminary FBDGs message statements |

| Objective/Activity | Data collected | Data collection methodology | Method of data analysis | Data output |
|---|---|---|---|---|
| | priority. | | | |
| Objective Three Consumer-testing of preliminary FBDGs | Clarity of words, perception of FBDGs, feasibility and recall. | FGD | Thematic analysis | FBDGs message statements perception, barriers and restatements. |
| Objective Four Workshop III Rewording of FBDGs statements with no clarity | Views on receiving FGD feedback. Restated FBDGs | Plenary and group discussions. Delphi questionnaire | Thematic analysis. Descriptive statistics | Suggested restatements. Final draft of FBDGs message statements. |

# CHAPTER FOUR
# RESULTS

## 4.1 Objective one: Nutrition and health-related issues of consensus in Lake Victoria region

A 30-member panel of policymakers in the Health and Agriculture sectors (Table 6) engaged in a workshop to discuss and identify issues on nutrition related to health as a basis to develop FBDGs for the region.

**Table 6:** Demography of the Panel Members

| Panel members | Frequency (N=30)% | | Years of service |
|---|---|---|---|
| | Nutritionist | Nutrition related departments | 17.3 ± 10.5 |
| Female 14 (47%)<br>Male 16 (53%) | 40% | 60% | |

Topics presented to the panel members for discussion included: A review of dietary patterns in the region; Nutrition and food security status; Nutrition and health-related concerns; Staple foods, fruits, and vegetable production and consumption; milk, and meat production and consumption; Fish production and consumption; and water and food safety issues. The discussion centered on nutrition and diet-related health issues in the region versus the dietary population goals (WHO & FAO, 2003).

Listed issues that emerged from the literature review and seminar presentations as discussed included micronutrient deficiencies (vitamin A, zinc, iron, prevalence of anaemia), insufficient calories, underweight, high starchy diets, low consumption of vegetables, fruits, and animal source foods, limited accessibility to safe water for drinking, food preparation and emerging overnutrition. To build consensus and ensure shared convergence of opinions among panel members, the researcher listed the identified issues of nutrition and health-related concerns and designed a self-administered Likert-like Delphi questionnaire. Over 80% of the panel members needed to agree on an issue as a basis to construct guidelines. The 80% score is deemed 'significantly' greater than the level of agreement that could be obtained by chance alone (Black *et al*., 2011). Only two rounds of Delphi questionnaires were adequate in this study.

The issues which reached the threshold level in Delphi questionnaire one included inadequate intake of iron (88.9%), vitamin A (81.5%), low consumption of meat (100%), milk (100%), fruits and vegetables (100%), consumption of less than <3 meals a day (100%). These issues provided the rationale to develop FBDGs for the Lake Victoria region. The issues which did not reach the 80% threshold in the first round were rephrased and presented as Delphi questionnaire two. They included the prevalence of zinc deficiency (40.7%), low consumption of fish (74.1%), low calories in the diet (74.1%), and low use of fat or cooking oil (66.7 %). These issues were rephrased and presented to the panel members as Delphi questionnaire two. An example was rephrasing the statement on fish consumption. Those who supported the need to promote fish consumption in the region argued that the quantity consumed was little and the method of cooking small fish *'omena'* was inappropriate. *'Omena'* was stated as purchased from the market in small portions locally referred to as 'dish'. This would then be cooked and served to the entire family, not as the main item in a meal but as a *'terokuon'* (an accompaniment to the starch in a meal). to indicate that despite the availability of fish due to proximity to the Lake, consumption by individuals was low. The safety of small fish, like any other fish, depends on the safety of the water. The intestinal contents in small fish are not eviscerated, yet the intestines are generally loaded with microorganisms and worms. The panel members expressed the need to encourage the population to adequately cook small fish to destroy pathogenic microorganisms and cysts from worms. The statement on fish consumption was therefore rephrased to indicate that although the small fish was a common relish in the region, the amount consumed by individuals in a meal was little. The score for this statement in the Deplhi questionnaire round two was 96.3%. Other factors of poor-quality diets which achieved the 80% threshold in the second round were overcooking of vegetables (88.6%), poor storage of foods (85%), increased consumption of highly processed fatty foods (100%), and sugary foods (96.3%).

Issues which did not attain the threshold level of 80% both in the first and second round of Delphi questionnaires included; zinc deficiency (55.6%), inadequate intake of fat (55.6%), inadequate intake of calories (66.7%), culture influence on food choices (37%), beliefs as influencing food choices (70.4%), scarcity of cooking fuel (74.1%), high consumption of alcohol (77.4%) and lack of awareness on personal hygiene (70.3%). Low level of agreement on the prevalence of zinc deficiency (40.7%) in the region could be attributed to the fact that there is heightened awareness of vitamin A and iron, but not zinc deficiency. Further, the panel argued

that much of the foods consumed in the region was high in starch and that every family used some amount of fat o oil when cooking meals. The issue on hygiene was stated as not emanating from a lack of awareness, but a failure to practice what the community already knows. The beliefs, culture, and scarcity of fuel were viewed as not 'significantly' influencing the quality of diet. A summary of the level of agreement is presented on Table 7.

**Table 7**: Issues of Nutrition and Health Concerns Considered in Developing FBDGs for Lake Victoria Region, Kenya

| Issues of nutrition and health concern | | No. of panel members in agreement (n=27) (% ) | |
|---|---|---|---|
| | | **Delphi one** | **Delphi two** |
| Micronutrients malnutrition | Inadequate intake of vitamin A | 81.5 | |
| | Inadequate intake of iron | 88.9 | |
| | Inadequate intake of zinc | 40.6 | 55.6 |
| \Macronutrients malnutrition | Inadequate intake of calories | 74.1 | 66.7 |
| | Inadequate intake of fat | 66.7 | 55.6 |
| Consumption of animal source food | Low consumption of fish | 74.1 | 96.3 |
| | low consumption of consumption of meat (beef, pork, mutton) | 100 | |
| | Inadequate consumption of milk | 100 | |
| Fruits and vegetables consumption | Low consumption of fruits and Vegetables | 100 | |
| | Vegetables cooked once in the day to be reheated for the next meal | 55.6 | 88.6 |
| | Overcooking of vegetables | 100 | |
| Consumption of energy dense food | Consumption of highly processed and fatty/fried foods as an emerging trend | 66.7 | 100 |
| | High consumption of sugary foods (soft drinks) | 63 | 96.3 |
| Food consumption practices | Consumption of less than three meals a day | 100 | |
| | Monotony in the diet | 85.2 | |
| | Food choice is influenced by culture (it is a taboo to serve pumpkin relish to men) | 48.1 | 37 |
| | Food choice is influenced by beliefs (fruits | 70.5 | 70.4 |

| Issues of nutrition and health concern | | No. of panel members in agreement (n=27) (% ) | |
|---|---|---|---|
| | | **Delphi one** | **Delphi two** |
| | belong to the children) | | |
| | Scarcity of cooking fuel limiting the type and variety of food to be cooked (avoiding preparation of traditional vegetables perceived to take a long time to cook) | 55.6 | 74.1 |
| Intake of alcohol | High consumption of alcohol | 55 | 77.7 |
| Foods insecurity | Reliance on maize as staple food | 96 | |
| | Sale of the little family food produce to get money to meet family needs other than food | 100 | |
| | Seasonality in food production limiting availability of food throughout the year | 96 | |
| | Emerging poor harvest due to crop failure | 100 | |
| | Inadequate food in the granary to last up to the next season | 96 | |
| | Food inaccessibility (no money to purchase) | 96 | |
| Inadequate water supply, hygiene and food safety concerns | Inadequate supply of safe water for washing and cooking | 96 | |
| | Lack of awareness in personal hygiene (lack of critical hand washing points) | 63 | 70.3 |
| | Lack of awareness in food safety (storage of cooked food in cupboards with humid warm prevailing conditions, poor sanitary conditions in fish landing beaches) | 70 | 85 |
| | Consumption of improperly washed fruits from vendors | 66.7 | 92.6 |
| | Purchase of improperly washed and cut vended vegetables | 100 | |

### 4.2 Objective two: Drafting of preliminary guidelines for Lake Victoria

The second objective of this research was to develop preliminary food-based and lifestyle guidelines to promote or moderate healthy eating and lifestyle choices in the region. panel members considered the listed issues in objective one and explored dietary and lifestyle practices and behaviours, which in their opinion were factors that contributed to the nutrition and health-related concerns in the region. Practices such as skipping breakfast and lunch, consumption of very little relish, dependence on maize flour, less dietary diversity, inaccessibility to clean and safe water, and increased use of motorized transport were some of the identified prevalent dietary and lifestyles practices and/or behaviours. The panel members were divided into groups and assigned thematic areas to conduct tree analysis. The problem tree analysis was used to structure and prioritize the listed dietary practices or behaviours (Figure 9). The stem or focus problem was poor quality diets and lifestyle choices. Three layers of the root causes of poor diet quality were identified in this study. The first layer of roots or the immediate roots were considered as priority areas (Figure 9). The first layer became the focal point in designing the key message content of the guidelines in this study. The issues outlined were; skipping of meals, inadequate consumption of staple foods, low consumption of animal source foods, low dietary diversity, low consumption of fruits and vegetables, reliance on maize as the main staple food, excess consumption of energy-dense foods, minimum use of safe water and low physical activities .

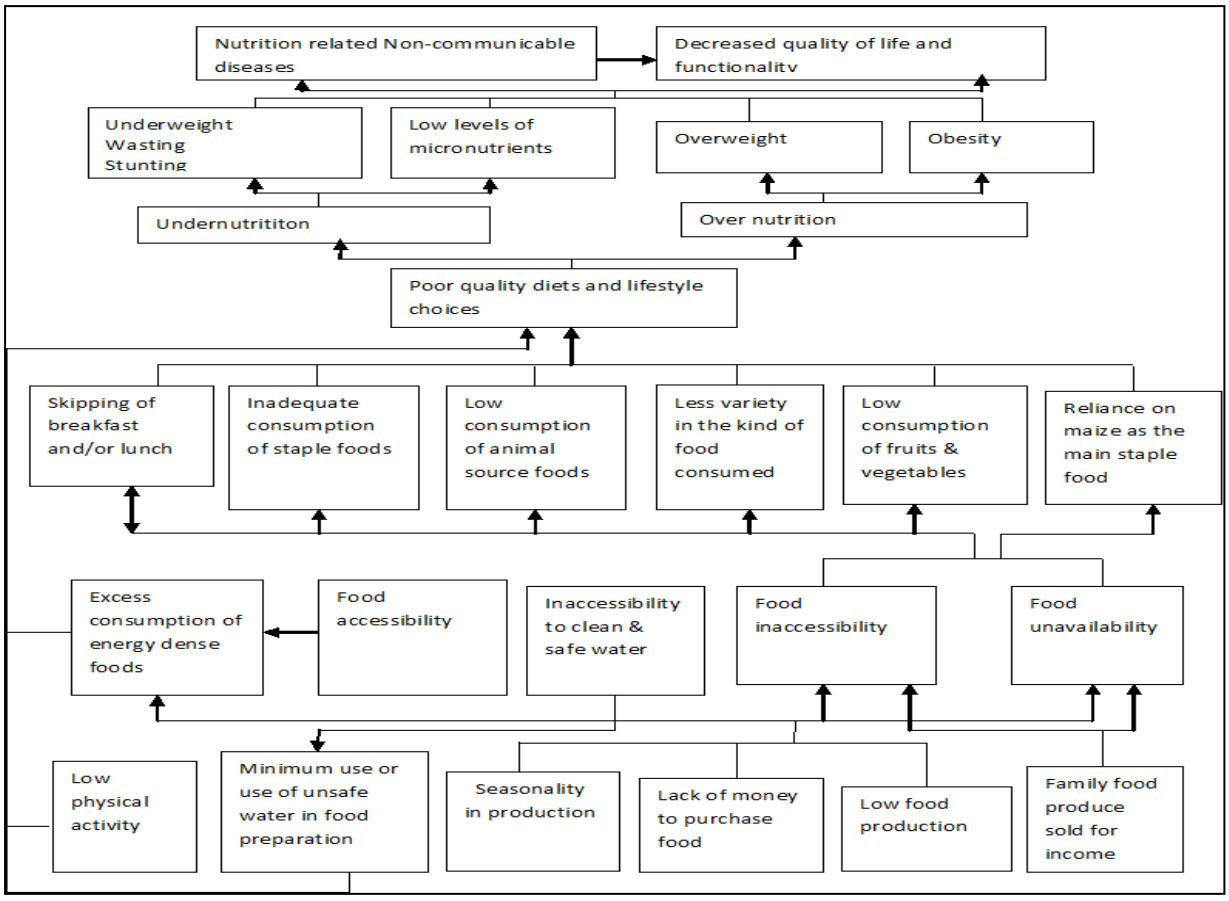


***Figure 9:*** *Problem Tree Analysis of Factors Contributing to Poor-Quality Diets in Lake Victoria*

To craft the key message content of the FBDGs, panel members were asked to explore practices and behaviours which in their view contributed to the immediate root causes of poor diets. The desired changes, to identified practices became the key content of the FBDGs message statements. For example the panel identified breakfast and lunch as the regularly skipped meals. The goal, in this case, was to promote the consumption of breakfast and other meals regularly. Children were stated as preserved foods served for breakfast for later consumption. Men considered waiting for breakfast to be cooked instead of going to the farm as laziness and they preferred to be served breakfast at the farm. Food items served for breakfast and/or lunch were either porridge made from maize flour or tea with no milk. Sometimes tea and porridge were served without sugar. The thickness of the porridge depended on the availability of maize flour. If little was available, then thin porridge was prepared. All of these were considered in the

formulation of the guidelines: *'Eat a well constituted breakfast every morning'; 'Eat 3 regular meals and 2 healthy snacks every day'*. A summary of the foods, nutrition, and lifestyle practices and behaviours in the Lake Victoria region, desirable goals, keywords, and a draft of the guidelines is presented on Table 8.

**Table 8:** Preliminary FBDGs and Lifestyles Guidelines for Lake Victoria Region

| Foods, nutrition and lifestyle practices/behaviour in the Lake Victoria Region | | Desirable goal/key words/FBDGs message statement |
|---|---|---|
| Skipping meals | Regularly skipped meals were breakfast and lunch. Children preserved foods served for breakfast for later consumption. Waiting for breakfast (men) to be cooked instead of going to the farm was considered laziness.Preferred to serve breakfast at the farm. Foodsitems served for breakfast and/or lunch was either porridge made from maize flour or tea with no milk and *'mandazi'* (doughnut like). Sometimesbeverages were served without sugar. Thickness of the porridge depended on availability of maize flour. If little was available, then thin porridge was prepared. | To promote regular meal consumption to compose of: three meals and 2 snacks; and appropriate food groups.<br>Message statement<br>1. Eat a well constituted breakfast every morning.<br>2. Eat 3 regular meals and 2 healthy snacks every day. |
| Dependence on maize as staple food | Maize was the main staple food. Processed maize flour were stated as available in small affordable packages. '*Riga'* 'local name for locally milled maize flour was associated with low socio-economic status. Consumption of sorghumwas associated with diabetic diets and low-income earners. The processing of sorghum was stated as tedious, makes the stool hard,only considered as last resort in absence of maize, in hunger. Sweet potato planting not | To promote regular meal consumption to include: variety of cereals e.g.traditional neglected cereals (sorghum, millet); unrefined cereal grains; diverse starches e.g. cassava, potatoes.<br>Message statement<br>3. Eat whole cereal grains and starches to include *'ugali'* from maize/sorghum/millet, cassava, matoke, rice, brown chapati as |

| | | |
|---|---|---|
| | considered activity for men but rather women in the community. Consumption of cassava considered not prestigious. It was a practice to sell cereal produce at a cheap price soon after harvest to meet other family needs. | accompaniments to your relishes. |
| Inadequate and inappropriate relishes | Inadequate consumption of relish: Men served first before other household members. Certain parts of meat served as per gender include chicken drumsticks served to men. Emerging in urban setting street foodsincludeconsumption of *'mandazi'* cut and mixed with free soup. Tea eaten with cereal based or starch products considered as a complete meal e.g Rice with tea. Relish considered as an *'escort to ugali' 'terokuon'* (relishes thought of as facilitating thickened porridge consumption). | To promote consumption of appropriate relishes. |
| | Low consumption of vegetables: Relishes had either no vegetables or too little.Common vegetables included kale, tomatoes, onions, cow pea leaves. Traditional vegetables were expensive and wild vegetables were no longer available. Vegetables were overcooked. | To promote consumption of freshly prepared vegetables: every mealtime; increased amounts; and widen variety. |
| | Low consumption of fish: Relishes commonly consumed made from small fish which included; *'omena'* (sardine), '*wiu'*, '*kamongo'*. These fish was bought from the market, sold in small portions, cooked and served to all family | To encourage consumption of accessible fish. |

| | | |
|---|---|---|
| | members. Large fish stated as unffordableto the local community, mainly for export. Although cheap imported fish was stated as available in the region. | |
| | Low consumption of meat: In urban setting relishes were thought of as not good enough without some meat. In rural, meat consumption was occasional. Pork consumption noted to be on the raise; available in the butcheries; concern that pigs not inspected, slaughtered in homes not slaughter house (mainly Siaya). | To encourage moderate consumption of meat among regular eaters while encouraging inclusion of moderate amounts of meat in the diet of non-meat consumers. |
| | Low consumption of eggs and poultry: Keeping chicken had cultural connotation.Households with chicken must have only one cock and the rest hens 'symbol of the man in the house. A son moving out from the father's homestead must carry a cock, a sign that he is a man and can stand on his own. Eggs mainly consumed in urban settings. Consumption of eggs in the rural areawas believed to delays speech in young children or to overgrown foetus in pregnancy. Eggs mainly left for the hens to brood and hatch or sold out. Eggs only consumed as fill ups in the diet. Poultry was occasionally consumed. | To encourage moderate consumption of eggs and poultry |

| | | |
|---|---|---|
| | Low consumption of legumes and oil seeds: Prices were stated as high due to low production in the region. Legumes available include beans, green grams and oil seeds groundnuts, soya bean and sesame. Groundnuts were stored under lock and key, roasted or boiled and sold as snacks. Roasted groundnuts and sesame seeds commonly consumed as snacks. Groundnut sauce was only prepared for special occasions. Belief that beans is eaten with chapati and rice, such not commonly available in the rural settings; in urban settings, cooking of legumes confined to weekends because of the amount of time it takes to select soak and cook. | To promote increased consumption and variety of legumes and seeds<br>Message statement<br>4. Every meal time serve on your plate variety of relishes made from meat, poultry, fish, legumes and freshly prepared vegetables. |
| Low consumption of milk | Very little if any milk consumed. Mostly consumed in tea with the amount being described as '*just enough to colour the tea'*. Some little milk mostly used to ferment vegetables '*kuogo'* traditional relish. When available, milk was preferably sold for income. Milk to meet deficit was imported from neighbouring Counties and Uganda. | To promote increased milk intake<br>Message statement<br>5. Drink a glass of milk, mala or yoghurt everyday |
| Seldom consumption of fruits | Fruits available included;mangoes, guavas, avocados, pineapples, oranges, watermelon.Wild fruits including guavas, '*jamna', 'chua', 'nyabende', 'olemo'* only regarded as for children. The cost of the fruits makes it | To promote increasedconsumption of variety of fruits. The fruits need to be washed before consumption.<br>Message statement |

| | | |
|---|---|---|
| | hard to make it part of the diet. Fruits were stated as bought and eaten at vendors stall with little washing. | 6. Eat variety of well washed fruits everyday |
| Water safetyand food hygiene concerns | Diarrhoea 3rd cause of mortality in the Counties. Episodes of diarrhoea common during the rainy season due to floods. Accessibility to clean safe water indicated as a challenge to the community. Source of water: piped, Rivers, Lake and wells. | To encourage use of clean and safe water in food preparation, cooking, cleaning of surfaces and utensils which come in contact with foodandin hand washing.<br>Message statement<br>7. Use clean and safe water for food preparation and hand washing every time |
| Emergence consumption of energy dense foods | Increased in purchase of street and take away foods for home consumption.Increased availability and accessibility of soft drinks, energy drinks, chips, samosa, maandazi, and chapati. Preference for purchase of large size cold drinks, to quench thirst rather than drinking water. Indulgence of caloric cheap fried foods: '*mandazi*' or chapati and free soup for lunch; Rice and tea as a complete meal | To reduce consumption of caloric-dense foods.<br>To encourage voluntary intake of drinking water.<br>Message statement<br>8. Eat less of locally vended starchy, fatty foods and sugar sweetened products<br>9. Drink plenty of clean and safe water everyday |
| Use of cooking oil | More tendency to use oils instead of fats commonly referred to as *'mafutaya salad'*. Most households use cooking oil/fat.Although all householdswithoil, the amount of oil used was sometimes little hardly enough to brown onions. | To encourage use of appropriate amounts of cookingoil instead of hydrogenated fat.<br>Message statement<br>10. Eat foods prepared with small amounts of cooking oil |

| | | |
|---|---|---|
| Low physical activity | Currently motorized transport (motorbikes) available even in the rural area. However, due to exposure to hard labour in rural areas, this may be applicable for those in upper income. | To encourage increasedparticipation in physical activities.<br>Message statement<br>11. Enjoy a healthy and physically active life everyday |

Eleven preliminary FBDGs message statements were drafted and translated to the local language '*Dholuo'.* The translations were based on meaning rather than word by word (Table 9).

**Table 9:** Preliminary FBDGs in *'Dholuo'* Language

| Prelimary FBDGs message statements | 'Dholuo' translated FBDGs message statements |
|---|---|
| Eat three regular meals and two healthy snacks every day. | *Cham chiemomokoariyomayot e kind chiemomadongoadekgi.* |
| Eat a well constituted breakfast every morning. | *Cham chiemomosangimaberokinyi pile pile* |
| Every meal time, serve on your meal plate a variety of relishes made from fish, meats, legumes and vegetables. | *Sechedutomichiemo ne niiketokabindchiemomopogoreopogore kaka ring'o, rech, kothekodalote.* |
| Eat whole cereal grains and starches to include '*ugali*' from maize/sorghum/millet, cassava, matoke, rice, brown chapati as accompaniments to your relishes. | *Cham chiemomamedoteko kaka kuonarega mar cham kaka duma/bel/kal/omuogo/bel/ Chapatmarabuorgi Michele.* |
| Eat meals prepared in small amounts of cooking oil. | *Cham chiemomotedigi moo matin mar salad.* |
| Eat a variety of well washed fruits every day. | *Cham olembemopogoreopogoremoluokmaler pile pile.* |
| Drink a glass of milk, mala or yoghurt every day. | *Madho glass achiel mar chakmachiewmopoto kata, yoghurt odiechiengkoodiechieng.* |
| Drink at plenty of clean and safe water everyday | *Modhpiimalermothiedhi pile pile* |

| | |
|---|---|
| Use clean and safe water for food preparation and hand washing every time. | *Tikodpiimalermothiedhietedokodluokoluedokindeduto.* |
| Enjoy a healthy and physically active life everyday | *Bed gingimamakarekitimogikmamiyodelmijingo'o.* |
| Eat less of locally vended starchy, fatty foods and sugar sweetened products. | *Kikithorchamochiemomihonomachiwotekomotimosukarimangeny kata dhoutchiemomitedogimoomangeny.* |

### 4.3 Objective Three: Consumer-testing of preliminary guidelines

The third objective of this research was to consumer-test developed preliminary FBDGs for the Lake Victoria region. Focus group discussions consisting of 8-12 participants were conducted in 72 community settings within six administrative wards, three in Homabay County and three in Kisumu County. Homa Bay town (HmB_Urb); Ndhiwa (HmB_LM3); Mbita (HmB_LM4); Kisumu town (Ksm_Urb); Nyando (Ksm_LM3); and Seme (Ksm_LM4). Primary pupils (216) and secondary school adolescents (216) participated in the FGD. Class five and form two students were purposively selected based on age. Primary pupils' ages ranged between 10 to 13 years and the secondary students were aged between 15 to 18 years. Among the adult population, a total of 211 females and 207 males participated. The age group for adult males was 26 to74 years and females 18 to 71 years of age. Over 80% of the female (177) and male (165) participants attained primary school education. Only 15% (32) of male and 9% (19) of the female participants attained high school and tertiary education. Over 68% of the male (141) and over 62% of females (132) were farmers. Other economic activities included fishing and small-scale businesses (Table 10).

**Table 10:** Demography of Focus Group Participants

| Focus Group Participants | | | Total no/frequency |
|---|---|---|---|
| | Primary School going | High school students | |
| Number of participants | 216 | 216 | 432 |
| Age (years) | 10-13 | 15-18 | |
| | Adult male | Adult female | |
| Number of participants | 207 | 211 | 418 |
| Age (years) | 26 -74 | 18-71 | |
| Occupation | (n=207)(%) | (n=211)(%) | (n=418)(%) |
| Employed | 3 (1.4%) | 5(2.4%) | 8 (1.9%) |
| Farmers | 141 (68%) | 132(62%) | 273(65.3%) |
| Self employed | 12 (5.7%) | 43 (20.4%) | 55(13.2%) |
| Fishermen | 37 (17.9%) | - | - |
| Fishermen/farmers | 8 (1.9%) | - | - |
| Manual labourers | 6 (2.9) | 17 (8%) | (5.5%) |
| Housewives | - | 14 (6.6%) | - |
| Level of education | | | |
| Primary | 165 (79.7) | 177 (83.9%) | 342 (81.8%) |
| High school | 26 (12.6) | 16 (7.6%) | 42 (10%) |
| Tertiary | 6 (2.9%) | 3(1.4%) | 9 (2.1%) |

The eleven guidelines were printed on individual posters and displayed one at a time, in full view of all participants. Using a FGD guide, the participants were asked to; state perceived meaning of the guidelines, barriers, recall and restate the guideline message statements and to suggests words to omit or include to make the understanding of the guidelines clearer. The main codes included; perception of the guidelines, word clarity, feasibility and the ease with which the FBDGs could be recalled.

Word cloud analysis showed a general perception of the proposed FBDGs (Appendix XI). Findings have been presented based on emerging themes with accompanying verbatim

expressions. The quotes are labeled in terms of study sites and the participant's stratum. An ellipsis (…) indicate omitted words or sentences.

### 4.3.1 Word clarity and perception of preliminary FBDGs

As a nutrition education tool, FBDGs are intended to communicate to the general public about healthy eating and lifestyle choices in a clear, simple, and positively expressed manner (Tetens *et al*., 2018).

#### 4.3.1.1 Eat a well-constituted breakfast every morning

An exploration with the panel members revealed that breakfast was regularly skipped. Where consumed, breakfast foods were mainly composed of thin porridge or tea without milk. The thickness of the porridge depended on the amount of flour available. The lesser the flour, the thinner the porridge. This guideline was therefore proposed to promote the consumption of regular and appropriate breakfast meals. Only about 12% of participants ate breakfast on the day this study was conducted.

**Guideline perceived as communicating the need to eat a balanced diet in the morning**

The word 'constituted' as used on the guideline was found difficult to pronounce. Over 80% of the participants described this guideline as communicating the need to eat a 'balanced diet' every morning. A balanced diet was perceived as a meal containing 'all nutrients' or 'all classification of foods' 'three food groups', 'three types of diets', 'the three components of a meal' which in their knowledge were proteins, 'carbohydrates', 'vitamins' or the three nutrients named based on their respective functions in the body viz energy-giving, body-building and protective foods:

> *'It means we should eat a balanced diet'* (Ksm_LM3_Wom_2)*; 'We should eat a well-balanced breakfast in the morning'* (HmB_Urb_Adol_2); *'My understanding is that we take food known as a balanced diet, consisting of all the nutrients'* (Ksm_Urb_Men_2); *'Balanced diet is when we eat all kinds of classifications of foods, which are carbohydrates, proteins, and vitamins'* (Ksm_Urb_Adol_1); *'…balanced diet is food that consists three food groups: Vitamins, proteins, and carbohydrates* (Ksm_LM4_Child_1); '*We should eat a well-balanced breakfast in such a way that it must contain the three types of diets that are the protein, carbohydrates and vitamins'* (HmB_Urb_Adol_3); *'After the overnight fast it's advisable for someone to take all these 3 components of a meal so that we can have a well-balanced diet'* (HmB_Urb_Adol_1); '*…there are*

*specific nutrients that are needed in food like the energy giving, the body building, and the protective foods, we should have all those when eating'* (HmB_LM4_Wom_1).

Similarly, the descriptions of food items in a well-constituted breakfast were based on the three nutrients or their respective roles in the body. 'Milk', 'eggs' and 'beans' were identified as breakfast items 'providing proteins' or 'body building foods', 'rice', 'mandazi', 'chapati', 'sugar', 'tea', *'githeri',* were identified as 'carbohydrates' or 'energy-giving foods', and 'fruits' and 'vegetables' as sources of 'vitamins for disease prevention:

'*...the milk in tea is giving us proteins, you can take it with mandazi which gives us carbohydrates'* (HmB_Urb_Wom_2); '*...it should be tea with rice. This rice will give you energy or eggs that are a source of protein or at times you can include the mangoes or oranges to prevent you from getting diseases'* (HmB_LM4_Wom_1); *'...you should also have some food like chapati to take your tea with and maybe another bodybuilding food like beans'* (HmB_LM4_Men_1); '*...the sugar that I put in tea gives me energy, then I take it with 'githeri' which also gives me energy' (*HmB_Urb_Wom_3); *'...we should also have some fruits which are also vitamins to our bodies and we should also have protein for example tea with beans'* (Ksm_LM4_Adol_1).

Only five (0.1%) participants understood the significance of breakfast as the 'first meal' of the day:

*'...breakfast is the first meal of the day, so you need to eat food that will give you energy'* (Ksm_Urb_Men_2); *'...breakfast is like at night we were fasting, so we are breaking the fast in the morning'* (HmB_LM4_Adol_3).

The significance of a balanced breakfast was stated as for 'healthy growth', and for provision of 'energy' for the ' the days' activities':

*'We should eat a balanced diet so that we grow healthy'* (HmB_LM4_Child_3); '*When we eat well-constituted food in the morning we will have the energy to carry out our activities in the day'* (HmB_LM3_Child_1); '*We should eat a balanced diet every breakfast so that we can be ready for the day'* (Ksm_Urb_men_1); '*We should eat different types of foods so that even when we leave the house in the morning for our daily activities we leave when strong'* (Ksm_LM3_Men_3).

Other phrases used among primary school-going children to describe this guideline included, 'eating well-mixed food', 'well-prepared food', or 'well-cooked foods' in the morning. Among secondary school-going learners, adult male and female participants, other descriptors of the guideline included 'inclusion of different types of food' and 'eating more than one type of food':

> *'I should eat well-prepared food every morning'* (Hmb_Urb_ Child_2); '*We should eat well-mixed foods before we go to school every morning'* (Ksm_LM4_Child_3); *'We should take different types of foods'* (Hmb_LM4_Adol_3); *'We should be eating different kinds of food and not only one type'* Ksm_LM3_ Wom _1); '*It is having more than one type of food of different variety every morning'* (Hmb_Urb_Men_2).

**Tea and porridge perceived as the main components of a breakfast meal**

Tea and porridge beverages were identified as the main food items in a breakfast meal. Other food items eaten for breakfast were viewed as accompaniments '*escort to the beverages'*:

> '*I feel that when somebody wakes up in the morning they should first drink something before starting the chores they want to do. I take tea strong tea or milk tea, provided it is tea'* (Ksm_LM3_ Wom_ 1); *'According to me, good breakfast should contain different types of foods like tea, tea when you take strong tea (tea without milk) it is like you have not taken tea but when its 'good tea' (tea with milk) with sugar then you have taken tea, in that case, it will be heavy breakfast because even when you take it, hunger pangs are delayed before the next meal, lunch'* HmB_LM3_Adol_1); *'...I take strong tea (tea without milk) or tea with milk, provided it is tea'* (Ksm_LM4_ Wom_ 1); '…*a good breakfast is when for example you are taking porridge this porridge should be made of millet and cassava'* (HmB_LM3_Adol_3); '*It should be tea prepared with milk'* (HmB_LM3_Wom_3); '*...any given time we want to eat breakfast it should not be tea alone but, it should be tea with some escort'* (HmB_LM4_Adol_3); '*...I drink tea with a heavy escort, for example, 'githeri' or rice'* (Hmb_LM3_Adol_2); '*It should be tea with milk and I can take it with sweet potatoes or some well prepared 'githeri' that is it'* (HmB_LM3_Wom_3).

**Perception of breakfast as a fixed menu consisting of bread tea and eggs**

Although other foods eaten for breakfast included, *'githeri', '*sweet potatoes', 'bread', 'rice', 'mandazi' some participants perceived breakfast as a kind of set menu composed of 'milk and

bread', 'tea with bread', or 'tea with eggs', or 'porridge'. Further, fruits were perceived as important constituents of a breakfast meal:

'*A good breakfast should just be the tea because it gives some very good energy so if you can get this tea with bread every morning it can be really good'* (HmB_LM3_Men_2); *'...there should be tea with enough milk on the table, some bread '* (HmB_Urb_Wom_1); '*…milk tea with eggs every day* (HmB_LM3_Men_2); '*...milk with bread'* (Ksm_Urb_Adol_2); '*...you can take bread with spread'* (HmB_Urb_Men_2); *'...breakfast should have, tea with bread then eat some fruits like pawpaw and mangoes'* (HmB_LM4_Child_3); '*Ideally, we should be eating well in the morning and after eating well we should eat some fruits'* (Ksm_LM3_Wom_2); '*I should take tea with milk and an escort, could be bread and take a fruit later'* (Ksm_LM4_Men_1); *'...you can take tea with an escort then you eat even a fruit on the side'* (Ksm_LM4_Wom_1).

#### 4.3.1.2 Eat 3 regular meals and 2 healthy snacks every day

Panel members noted that, besides skipping breakfast, community members in the Lake Victoria region mostly skipped lunch. The leftover porridge made from maize flour or tea served for breakfast was stated as regular foods served for lunch. Supper was noted as the only planned meal of the day. This guideline was therefore proposed to promote the consumption of regular meals and snacks during the day.

**The need to further clarify the guideline**

This guideline was proposed to promote regular consumption of meals. Except one or two participants in every group, most participants did not know what this guideline represented. They sought clarification on what the 'three meals' and the 'snacks' meant:

*'I have a question, that statement is talking about three meals, which three meals are these? I do not understand?'* (HmB_LM4_Men_3)*; '... it is talking about three main meals but I do not know which three meals these are?' (*HmB_Urb_Men_2); '*The three main meals? Maybe we will only understand if you explain further'* (HmB_LM4_Wom_3); '*…I have a question kindly tell us what a snack is?* (HmB_LM4_Men_3); *'...I have a problem, with the word snacks what are these snacks because I do not understand what they are?* (HmB_LM3_Wom_2); '*I think the snacks are the proteins…so let's now eat the proteins* (HmB_LM4_Wom_1); *'I do not*

*even know what this snack is? I am not getting the message'* (HmB_LM4_Men_1); '*... there is a time I used to travel a lot and I could hear passengers tell the driver to stop so that they buy snacks and they could buy fried fish then eat the flesh and keep the bones in a polythene bag even meat people could buy and just eat it without ugali so it means that snacks are of different types but ideally it should be a light meal?'* (HmB_Urb_Men_2); '*These three meals we are not aware of them because we all know that the meal we have for lunch is vegetables, fish or just vegetables. These three, we do not know what they are because we are not even seeing them?'* (HmB_LM4_Wom_3); '*We have ugali and fish are those, not major meals?'* (HmB_LM4_Wom_ 2); '*There are three kinds of food that we are to take, within the three types of foods, we are to take in two which are light'* (HmB_LM4_Adol_2).

Only a few adolescents could rightly described the guideline as promoting regular consumption og breakfast, lunch and super. They also described snacks as necessary to complement missing nutrients from the three the main meals:

*'...you have to eat light foods between the three meals so that you may be satisfied in between and before the period for next meal'* (Ksm_Urb_Adol_2); *'We need to take three regular meals but snacks are added to complement. Taking the regular meals, they lack all the nutrients. The missing nutrients are compensated in snacks'* (Ksm_LM4_Adol_3)*;* '*Healthy snacks are the foods that are eaten in between regular meals and apart from that they should be foods that can help our body'* (Ksm_LM3_Adol_1);*' ...first basic meals are breakfast, second is lunch and third is supper and snacks are foods one can eat in between breakfast and even lunch and between lunch and supper'* (HmB_Urb_Adol_3)*; '...we have three main meals in a day and these snacks are just in between them, it means we should have proper breakfast, lunch and supper then have snacks in between these three meals'* (HmB_Urb_Men_3); *'...after I have taken breakfast… after some hours I can now eat these snacks, I eat them between lunch and breakfast then after taking lunch I will also have a snack before supper* (HmB_Urb_Wom_1).

The three regular meals were viewed as a representation of the three food groups rich in carbohydrates, proteins, and vitamins or their respective functions in the body:

*'...every meal time you should ensure that you have variety such that you have carbohydrates, protein and vitamins that is what am understanding'* (HmB_LM4_Men _1)*;* '*... it means you may eat proteins, carbohydrates and vitamins may be in a meal and eat two healthy snacks every day'* (Ksm_Urb_Adol_3); '*The 3 major meals are body building foods, energy giving foods and foods that protect us from getting diseases'* (Ksm_LM3_Men_2);*'What am getting is that every meal time you should ensure that you have variety such that you have carbohydrates, protein and vitamins that's what am understanding'* (HmB_LM4_men _1)*;* '*I think eating regular meals, it means you may eat proteins, carbohydrates and vitamins may be in meal time and eat two healthy snacks every day'* (Ksm_Urb_Adol_3); '*The 3 meals are body building foods, energy giving foods and foods that have vitamins'* (Ksm_LM4_Wom_3); '*The 3 major meals are body building foods, energy giving foods and foods that protect us from getting diseases'* (Ksm_LM3_Men_2); *'The message is saying when we are taking 3 meals like ugali and meat, we should have some light fruit like orange as part of the meal'* (HmB_LM4_Adol_1).

The term 'snacks' was translated to mean 'light foods' in '*Dholuo'* language. In all the FGD strata, 'rice' was perceived as light food and was quoted as an example of snack foods:

'*…those snacks are like rice'* (Ksm_Urb_Men_Urb_2); *'According to me heavy meals are like ugali and beef the light ones are just like rice'* (HmB_Urb_Wom_2); *'Snacks are like tea with rice'* (Hmb_LM3_Child_2).

Snacks were also described based on the perceived appropriate 'time' (when) and place (where) to eat them. The snacks were expressed as foods eaten at 'leisure time', 'when on a journey, 'food items served a long side main meals' or 'after the main meals*'*:

*'...you will now eat the snack as you relax'* (HmB_LM4_Men_1); '*Snacks are foods we eat during the leisure time when you go swimming. When you go for a picnic'* (Ksm_Urb_Child_3); *'Light foods you can eat after the main meal. As you rest you can eat foods like the crisps which were mentioned earlier* (Hmb_LM3_Wom_1); '*They are foods you can eat when you are going on a journey* (Ksm_Urb_Child_3); *'The message is saying when we are taking 3 meals like ugali and meat we should have some light fruit like orange as part of the meal'* (HmB_LM4_Adol_1);*'...after you have prepared your food, eaten and is satisfied you eat this snacks just as a top-up regardless*

*of the meal you have prepared this snack must be eaten after the meal'* (HmB_LM4_Wom_1).

**The phrase 'healthy snacks' perceived to mean foods for good health**

Although some participants correctly identified the term 'healthy snacks' as including 'yoghurt, fruits, vegetables, and porridge', the word 'healthy snack' means foods that make one healthy eaten to be healthy:

*'Healthy snacks are like yoghurt, fruits'* (Ksm_LM4_Adol_1); *'...healthy snacks like fruits, vegetables'* (Ksm_Urb_Adol_1); '*For example, a healthy snack is a porridge made of maize'* (HmB_LM4 _ Adol_3); '*...two healthy snacks can be vegetables'* (Ksm_Urb_Adol_3); *'Snacks are foods we can eat so that we can be healthy'* (Ksm_Urb_Adol_1); *'A healthy snack? The word healthy there is that they are good to our health'* (HmB_LM4 _ Adol_3).

**Energy-dense foods equated with snack foods**

Despite the use of the term 'healthy snacks' some participants associated snacks with the consumption of energy-dense foods including; cakes, sugar-added beverages, French fries, and biscuits:

'*Snacks are the food we eat but do not have any nutrients'* (Ksm_Urb_Child_3); *'Snacks are things that contain sugar like cakes'* (Ksm_Urb_Adol_3); *'So the message says that in between take something light like 'afya' (sugar added preserved juice)* (Ksm_LM4_Wom_1)*; 'Eat light foods like scones and juice quencher, juice cola* (Ksm_LM4_Child_2); *'...we can have some snacks bought from the supermarket like chips or anything'* (HmB_LM4_men_2); *'Light meals can be biscuit'* (Ksm_LM3_Wom_1); '*Snacks are like Popcorns, porridge, biscuits,* (Ksm_LM3_Child_1).

#### 4.3.1.3 Every meal time, serve on your meal plate a variety of relishes made from fish, meats, legumes, and vegetables

Relishes in the region were not considered as essential components of a meal, but rather, as 'flavour for ugali' or *'terokuon'* (escort for ugali) or an 'accompaniment for ugali'. This guideline was therefore designed to encourage the consumption of relishes in a meal.

**Perception of the guideline based on the balanced diet concept**

There was a tendency to discuss this guideline based on the 'balanced diet' concept:

> '*It means that in every meal, for example when eating rice, we should accompany it with beans and some vegetables like sukuma wiki to make it balanced diet'* (Ksm_Urb_Adol_2); '*... we should have a balanced diet so that we have a variety of foods like the legumes'* (HmB_LM3_Men_1); *'...I understand that every meal time, the food you eat should be balanced like for example you can have meat, vegetable, and ugali with some fruits so that it is not just ugali and meat it should be balanced '* (HmB_LM4_Wom_3).

**Inclusion of vegetables in a meal perceived as appropriate**

This guideline was perceived as promoting the inclusion of both vegetables alongside the meats, which to all participants was acceptable. Similar information was being disseminated in health care facilities:

> '*...every meal time we serve different types of foods like meat, fish, legumes, we must also serve the vegetables like Amaranthus, kales and cow peas'* (HmB_LM3_Men_3); '…*you should put some cowpeas, kales on the side even when you cook fish'* (Ksm_LM4_Wom_2); *'...it is good to eat ugali with fish and vegetables'* (Ksm_LM3_Child_1); '*There was a time I went to the hospital and we were taught that vegetables are very important in our bodies, whatever you eat you must have vegetables on the side, be it local vegetables or any vegetables'* (Ksm_Urb_Wom_2).

**Vegetables and fruits as known sources of vitamins**

Although there was no mention of fruits in this guideline, the participants referred to fruits that were placed in one group with vegetables as sources of vitamins. A meal with fruit was thought of as complete:

> '*When having a meal, we should eat different kinds of food and we should also include fruits, vegetables, and chicken'* (HmB_LM3_Child_2); '…*fruits and vegetables both have vitamins'* (HmB_LM4_Wom_3); '*...when eating, do not just take food only, you must also eat some fruits'* (Ksm_Urb_Men_1); '…*we should eat foods with vegetables and meat or in a day eat good food consisting of fish, meat, with vegetables or fruits'* (Ksm_LM4_Child_2); *'I will take ugali, fish with vegetables then I will cut*

*oranges and also include the. Such a food when I eat I know it is complete'* (HmB_Urb_Wom_1).

**Categorization of meat and fish as protein foods**

Meats and fish were categorized as sources of proteins:

*'... when it is kales you can mix it with any protein like fish, meat'* (Ksm_LM3_Adol_2); '*... you must also eat some fruits, and the things called proteins like eggs and legumes'* (Ksm_Urb_Men_1). '*...you can have fish and vegetables for lunch so this fish builds our body then the vegetables protects us from getting diseases. Fish and meat are the same'* (HmB_LM4_Wom_3).

**Categorization of legumes as vegetables and as meat alternatives**

Legumes were classified as the protein as well as vegetables:

'*...green grams is a type of vegetable so there is no need of eating vegetables again'* (Ksm_LM3_Men_2); '*…when eating, do not just take food only, you must also eat some fruits, and the things called proteins like eggs and legumes'* (Ksm_Urb_Men_1).

**Perception of relishes in terms of food exchanges**

A few participants 8(0.1%) knew about food exchanges. However, >60% of participants seemed to view exchanges as indicating food replacement. The school curriculum was the reference:

'*...we are required to eat these foods every meal time for instance if you do not take meat you can have eggs and vegetables instead, and sometimes you can eat the legumes like beans and green grams with ugali and sometimes you can also eat ugali and fish'* (HmB_LM4_Wom_1); '*...fish and meat are the same when you eat meat and another person eats fish you shall have eaten the same thing'* (HmB_LM4_Wom_3); '*…in home science (unit subject taught in high school), it is like taking meat, fish, legumes like the groundnuts and putting in one plate…I shall have done zero work to my body it is like serving foods giving the same nutrients'* (HmB_LM4_Wom_1).

**All the listed foods perceived as needed to be served on one plate every meal time**

Some participants perceived the guideline as indicating the need to serve all the listed foods, on one plate every meal time. A child participant expressed concern over the plate size noting that, a

small plate would not accommodate all the listed foods in a meal's serving. More so serving fish and meat on one plate was not acceptable:

> '*Every meal time when having a meal, your plate should have different kinds of foods like fish, meat, legumes and vegetables'* (HmB_LM3_Adol_1); '*...when we are taking breakfast, lunch and supper we should have all these foods on our plates'* (HmB_LM3_Men_1); '*When you cook for example meat you should have also vegetables and also fish to mean you put small portions of all those foods'* (HmB_Urb_Wom_2); *'...you may have a small plate and you cannot put all the foods on it and again fish and meat you cannot put on one plate'* (HmB_Urb_Child_1); *'...I cannot imagine myself serving fish, meat, legumes, and vegetables on one plate'* (HmB_LM4_Wom_1).

**Eat whole cereal grains and starches to include 'ugali' from maize/sorghum/millet, cassava, matoke, rice, and brown chapati as accompaniments to your relishes**

Maize remains the main staple food in the region. Although sorghum grows well in some parts of the region, it was for commercial purposes. This guideline was proposed to encourage the consumption of whole cereal grains and the inclusion of traditional starchy foods.

**The guideline positively identified as composed of energy foods**

Most participants correctly identified the listed foods as containing carbohydrates which were largely understood to provide energy upon consumption. Since supper was the only planned meal in the day, this guideline was perceived as promoting the consumption of whole cereal grains especially for supper or when doing manual jobs:

> '*...this has singled out the energy-giving foods as part of the balanced diet that is the carbohydrates. This message has pointed out the whole cereal ugali as an example of foods that give us energy* (Hmb_Urb_Men_2); '*…we are being advised to take the food rich in energy to accompany the relishes…as we take the meat, we are advised to take with chapati or ugali to provide the energy required by the body'* (Ksm_LM3_Adol_3): *'...we should eat foods containing carbohydrates like ugali, the ugali should be from maize, sorghum, millet and cassava'* (Ksm_LM3_Adol_2); '*…if you spend the day taking tea at intervals, like I do, at night you have to eat ugali made from whole maize or sorghum' (*Ksm_LM3_Wom_1); *'...when eating, we try and eat energy giving foods'* (Ksm_LM3_Men_2); *'...you should take ugali from locally milled*

*flour such that, even if going to work at the construction site, you are strong and can work well'* (Ksm_Urb_Men_2).

**Listed foods perceived as given examples not meant for inclusion in a meal**

Although some participants understood the exchange concept, some of the participants viewed the listed foods as just examples of foods in this group, which did not necessarily have to be included in a meal:

'*..we can change the diet to include the foods that are listed there to instead of maize alone'* (HmB_LM3_Men_2); *'…this statement, shows the types of foods we need to eat like maize, the things you see to be interchanged instead of eating only ugali you eat these and the others too'* (Ksm_Urb_Men_2);*'…it is telling us that the different types of carbohydrates, ugali made from locally milled flour, can be replaced with chapati, rice, cassava, etc'* (Ksm_Urb_Wom_1); *'…the foods that we can eat so that we get energy and the listed foods are just examples like ugali made from sorghum/millet/cassava, matoke, brown chapati, and rice so all these are just example sources of energy-giving made from foods'* (HmB_Urb_Men_3); '*…I should eat energy giving foods like whole cereal ugali maize, sorghum, millet, cassava, matoke, brown chapati and rice'* (HmB_Urb_Wom_3); *'…we should eat energy giving foods like ugali made from whole maize, sorghum, millet, matoke, rice brown chapati as accompaniments to your relishes'* (HmB_LM3_Child_2).

**Perception of 'whole cereal grains' as utilization of cereals as whole seeds**

The term 'whole cereal grains' was perceived as 'cooked whole as cereal grains' and not cereal flour products. However, since maize is usually milled at local millers commonly referred to as 'posho millers' the whole cereal grains were translated to mean the 'locally milled flour':

*'... the whole is like 'githeri' cooked whole grain'* (HmB_Urb_Adol_1); *'A whole grain means that it has not been processed, it is just seeded for example boiled maize'* (Ksm_Urb_Adol_3); '*We have been told to eat foods that give us energy and they have been listed there …these foods are the ones that are very natural and have not been processed'* (Hmb_LM3_Men_1); *'…the whole cereal maize is whole the way God created it but the refined one there are some parts that have been removed from it before it is processed'* (Ksm_LM4_Men_2); *'it is telling us to eat ugali the one taken to the posho mill at home it is flour got from maize then ground at the posho*

*mill'* (HmB_LM4_Child_1); *'When we are eating ugali it should be the one from the local posho mill, not the refined one'* (HmB_Urb_Adol_3).

**Whole cereal flour perceived as nutritious**

The locally milled whole flour was understood as milled with all components intact, without added chemicals or preservatives, consisting of 'roughage' viewed as playing some role in the digestion process:

*'...the whole grain is good because it contains nutrients much of the nutrients compared to that one which has already been packed'* (HmB_LM4_Adol_2); *'...locally mill maize is whole, containing the outer cover and the inner germ, so giving us more energy. Even bananas and cassava are natural, harvested directly from the farm and they are cooked, they do not have any chemicals'* (Ksm_Urb_Men_2); '*Ugali made from locally milled flour is heavy when you eat, there are no chemicals'* (Ksm_LM4_Adol_2); '*For the refined flour in industries they use preservatives to store them'* (Ksm_Urb_Adol_3); '*Whole cereal is, for example, you take the maize you dry them you take them to the posho_mill after it is posho milled, ...the importance is that it has some roughages'* (HmB_LM4_Adol_2); '*That outer cover is called roughage and there is the importance of roughage in digestive system'* (Ksm_LM3_Adol_2).

**Whole cereal flour described as 'heavy' with more energy and satiety**

The locally milled flour was generally referred to as 'heavy' and with 'more energy' while refined was thought of as 'light' and containing less energy compared to refined flour:

*'....eat foods like maize, sorghum because the maize flour we buy from the shops are sifted and a lot of things have been removed from it, hence it does not give enough energy'* (Ksm_Urb_Wom_2);*'...heavy foods that we should eat are like the whole cereal ugali from maize and the others that have been written there and we are also being told that brown chapati is also heavy'* (HmB_LM3_Adol_2); *'...the flour from whole maize has more energy than the one being bought from the shop because the whole one it is milled with all its content even the cover and the sifted one has been processed and some other parts have been removed'* (Hmb_LM3_Adol_1); '*...the ugali made from sorghum gives more energy'* (HmB_Urb_Wom_1).

Ugali made from whole maize flour was viewed as having higher satiety and delayed hunger pangs:

> '*When I cook with the locally milled flour my family gets full when I cook the packed flour they do not get full, it is not heavy'* (Ksm_Urb_Wom_1); '*The locally milled is heavy, even when you eat with fish, you feel full even when you go to work'* (Ksm_LM4_Men_1); *'…the packaged flour (refined), if you eat it, it digests very fast within a short time while the whole mill is heavy'* (HmB_Urb_Adol_1)*; 'Posho milled flour is cheap and 'nikechmakoich' (it catches) because the stomach remains full longer'* (Ksm_Urb_Adol_3); '*The locally milled flour stays long and one feels full for long'* (Ksm_Urb_Men_2).

**Perception of the guideline as promoting use of composite cereal flour**

This guideline was also viewed as promoting the use of composite flour, which some participants perceived as having more energy:

> '*…when you say you eat the whole cereal grain, it should not be ugali made from maize alone, it should include millet sorghum cassava in the maize'* (Ksm_Urb_Adol_2); *'…I think if it is ugali you mix the sorghum and cassava and make your ugali then eat it with vegetables or even omena when you do that, you will find that you have energy more than someone who just ate ugali made from sorghum or just maize alone and then this flour should be the one you take yourself to the posho mill, not the sifted one'* (HmB_Urb_Wom_3); '*…we should eat food for example if it is ugali then we mix maize, sorghum, and millet then it should be a very good ugali so that we get the energy'* (HmB_LM3_Wom_3).

**The guideline perceived as advocacy against the shift from refined flour**

A male participant viewed the message as advocacy against emerging shifts in the diet from traditional foods like cassava and bananas, to the consumption of processed, packaged, appealing, and readily available foods in urban settings. The shift in the diet was positively associated with emerging diseases like diabetes:

> *'….we should stop imitating what we see happening currently but we should go back to the foods that people no longer use and despise like cassava, bananas'* (HmB_LM4_Men_1)*; '…locally milled flour, brown chapati are not very appealing to us, so they are trying to encourage us people in urban areas. For us we*

*enjoy things that are appealing like packaged flour even if you use it to prepare ugali it is different, and rice is very appealing'* (Ksm_Urb_Men_2); '*...we should eat energy giving foods because of the current diseases like diabetes requires that we eat energy giving foods like bananas, cereals, and flour mixed with cassava to help prevent these diseases'* (Ksm_Urb_Wom_2).

**Unfamiliar with use of 'brown chapati'**

Since chapati is cooked by shallow frying to a golden brown colour, to the participants, the known colour of cooked chapati was indicated as brown:

'*…but this brown chapati I know it, my wife usually cooks it for me it is just the normal white chapati but its nicely cooked golden brown in colour and very soft'* (Ksm_Hmb_Men_3); *'...chapati turns brown when it is cooked and some people will even say that the white chapati is always brown as long as it has not burnt during cooking'* (HmB_Urb_Wom_2).

#### 4.3.1.5 Eat meals prepared in small amounts of cooking oil

The use of cooking oil and fat in Kisumu was found to contribute to < 15 % of caloric energy (Waudo *et al.*, 2006). This guideline was designed to promote the use of cooking oil but in moderate amounts in the region.

**Guideline perceived as intended**

Participants found this guideline simple and easy to understand. Some participants were specific on oil referring to it as 'salad' (the term commonly known in the region and used in the translated version) or specifically mentioning the term 'liquid oil' or 'oil not fat'. The guideline was restated in simple terms as 'not to use a lot of oil when cooking, 'not to put a lot of cooking oil, 'should eat food cooked in a small amount of oil' as reflected in the excerpts:

*'... every food that is prepared should have very little amounts of oil and maybe it is the salad oil that is good'* (Ksm_LM4_Men_2); *'...the type of oil we should be using is the one which has no effects so I think we use the cooking oil in small amounts it can be good'* (Ksm_LM4_Men_3); '*...not to use a lot of oil when cooking'* (Ksm_LM3_Wom_1); *'We should not put a lot of cooking oil in our food'* (Ksm_LM3_Adol_1);*'...we should eat foods prepared with small amounts of oil'* (HmB_LM3_Child_1); '*... we should use small amounts of salad you do not put a lot*

*of it'* (HmB_LM3_Men_3); *'…The food we cook should have little oil and this oil must be salad oil'* (Hmb_LM4_Wom_3); '*…any food you are cooking you should not use a lot of liquid cooking oil, you use a little'* (Ksm_Urb_Wom_1).

**The 'use of a little oil' perceived as a caution against disease risks**

The participants seemed to be aware of the risks associated with the use of excess oil or fat in food, rightly identifying some of the adverse effects as overweight, obesity, cardiovascular-related conditions, and a random mention of 'diseases' or 'conditions' which were not necessarily associated with fats or oils such as 'amoeba', 'nausea', 'skin disease':

'*If we eat a lot of oil, it increases calories in our body'* (Ksm_Urb_Child_3); *'…when you eat large amounts of cooking oil, you become fat'* (Ksm_LM3_Adol_3); *'…when we eat small amounts of cooking oil it may protect us from obesity'* (Ksm_LM3_Adol_1); *'…we should use cooking oil but not a lot of it because it is like the experts have realized that when a lot of oil is used it can have some side effects'* (Ksm_LM4_Men_3);*'…too much oil is not good if you take too much oil you can have stomach problems'* (HmB_LM3_Men_3); *'We should eat food cooked with small amounts of cooking oil; cooking oil can cause diarrhoea'* (Ksm_LM3_Child_3); *'…there are some diseases like an amoeba that are caused by use of too much oil'* (HmB_LM4_Wom_3); *'…food should not be prepared with a lot of oil because when you use a lot of oil you feel nausea when you eat that food'* (HmB_LM3_Wom_2);*'…if you consume a lot, it may cause skin disease'* (Ksm_LM4_Men_1); '*Because if you put more amount of salad you can get heart problem and pressure'* (Ksm_Urb_Child_1);*'…meals which are cooked in oils have some effects like they coat the heart'* (Ksm_Urbn_Adol_2);*'…a lot of oil can block capillaries blocking blood from flowing'* (Ksm_LM3_Adol_2).

The moderated amounts of oil were also believed to be advocacy for reduced consumption of large quantities of 'chemicals or cholesterol' believed to be present in oil:

*'We should eat foods which are cooked with a little oil because these oils contain some chemicals I mean so if we eat a lot of them they can bring problems to our lives'* (HmB_LM4_Adol_2); *'I think salad has some chemical which is responsible to interrupt the system of the body when taken in large quantity, cholesterol, so it is better when we put a small amount of cholesterol in our body than large*

*amounts'* (Hmb_LM3_Adol_1)*;'...some oils have cholesterol which might be in small amounts when you use oils in small amounts, but when you use oils in large amounts the cholesterol will also be in large amounts'* (Ksm_Urb_Adol_1).

**Preferred use of oil due to perceived high cholesterol in fat**

There were expressions to indicate increased use of oil instead of fat due to the perceived presence of cholesterol and heightened awareness of emerging diseases associated with the use of fat. In a layman's physiopathology, 'fat solidify in the body as it does on cold food to block blood vessels. Solidified fat was believed to possibly 'weaken the body', 'block blood vessels' or 'clog the intestines':

*'...fat is not good because it has cholesterol but this salad is free from cholesterol'* (HmB_LM3_Adol_2); '*...the liquid one does not contain cholesterol*' (HmB_Urb_Adol_1); *'The reason as to why people use the cooking oil in this area is the rate at which diseases keep cropping up ...fats cause those diseases so people have decided to leave the fats like the yellow ones to use the cooking oils'* (Ksm_LM4_Men_3); *'...these days people use the salad because, the solid one is not good to the body when it is used to prepare food it causes harm to the body ... it causes some diseases'* (Ksm_LM4_Men_2); *'...fat solidifies and sticks on cold food, ...it behaves in the same way in our body once we eat the food'* (HmB_LM3_Wom_3*); '...the effects can block the blood vessels*' (Ksm_LM3_Men_1); '*... the solid one sticks on food and when we eat it, especially when it is cold it makes our body weak'* (Hmb_LM3_Adol_1); *'...if you cook with cooking fat then it is cold you find that it solidifies the food so the effects can block the blood vessels kind of thing*' (Ksm_LM4_Men_1); *'....the solid one will clog our intestines'* (Ksm_LM3_Adol_1).

When compared with fat, liquid oil was believed to be 'more healthy', easily 'transported', and 'digested' as quoted:

*'...cooking oil is preferred to cooking fat because it is more healthy'* (Ksm_LM4_Men_1); '*Salad is good because it can be easily transported'* (HmB_LM3_Adol_2);'*...cooking oil is very easily digested, but the cooking fats can even solidify in the stomach'* (Ksm_LM3_Adol_3).

**Increased use of oil due to unavailability of materials for repackaging fat**

Increased use of oil was attributed to a lack of polythene bags to repackage cooking fat which in the Kenyan markets are distributed to retail shops in bulk:

> '...p*reviously there used to be 'Kimbo' or 'Kappa' (brands of fat available in the Kenyan market) that were packaged in a paper in small quantities, but are currently only packaged in tins in large quantities that women cannot afford'* (Ksm_Urb_Men_2); *'...the polythene bags for repackaging fat are not there'* (Ksm_LM3_Men_2).

**Health workers as a source of health information**

Community health workers were important sources of diet-related information as quoted:

> '*When I went to the hospital I was taught that the 'salad oil' is good and that is what I currently use'* (HmB_Urb_men_3); *'We have the community health workers and there are some training that they do attend and they are trained by the ministry so after the training, they come back and share the information with us'* (Ksm_LM4_Men_2).

**Oils and fats perceived as synonyms**

The adolescent participants did not clearly understand the difference between fats and oils:

> *'...we should not take foods with excess oils may be the oils that are obtained from animals'* (Ksm_Urbn_Adol_3); '*...I understand that we should not consume a lot of manufactured cooking oil'* (Ksm_Urbn_Adol_3);*'...this is to stop you from, taking fat since you will be taking a lot of oil'* (Ksm_Urb_Adol_1).

**Association of cooking oil with deep frying of food**

Some participants associated cooking oil with deep-frying:

> '*...they have mentioned liquid oil, these are foods that are deeply fried ..., we should not use a lot of it, we just use a little in food'* (Ksm_LM3_Men_2); *'...when you are preparing a meal the amount of oil you put should not be much, it should be just a little salad and the foods should not be deep-fried, but it should be cooked with not too much oil'* (HmB_Urb_men_2).

**Eat a variety of well-washed fruits every day**

Fruits in the Lake Victoria region were seldom consumed. The study by Waudo *et al.* (2006) found that mangoes (17.4%) were the most consumed fruits in Kisumu, followed by wild fruits

(15.0%), oranges (9.8%), and pawpaw (8.5%). This guideline was designed to promote the consumption of fruits in the region.

**Perception of the guideline as intended**

This guideline was simple to understand:

> *'...we should eat these fruits when they are clean this message is telling us that we should eat a variety of fruits for example when you eat bananas today then the following day you eat a mango so that we just do not eat one type of fruit'* (HmB_LM4_Wom_3)*;'...we should eat fruits, any time you eat fruits you should wash them, you should not eat a mango today and a mango the next day you should buy oranges or bananas the next day'* (Ksm_Urb_Wom_2);*'...we should eat a variety of fruits every day and these fruits should be well washed like if 'I eat pawpaw today I should not eat pawpaw again tomorrow instead I should look for a different like maybe pineapple'* (HmB_Urb_Men_3).

Washing of fruits was well perceived as necessary to remove 'dirt', 'germs' or 'chemicals'. which was necessary to avoid 'stomach ache', 'diarrhea', 'amoeba', and 'cholera':

> '*...is telling us that when we eat fruits they should be clean not that we just eat them when they are dirty and we should eat them daily'* (HmB_LM4_Adol_1); *'...when I wash it, it means I remove the germs from the cover'* (Ksm_LM4_Wom_3); '*…we are told to wash it we make it free from the pathogens which will affect our lives* (Ksm_LM3_Adol_3); *'...if you wash it some chemical swill be washed away'* (HmB_Urb_Adol_3); *'Because if you eat fruits without washing with clean water you might have a stomach ache'* (Ksm_Urb_Chil_2); *'...we should eat different types of fruits that are well washed so that we prevent ourselves from getting diseases like diarrhea'* (Hmb_LM3_Adol_2); '*…if you eat the fruit which is contaminated it has a micro-organism it can even lead to the amoeba, you can suffer from amoeba or anything'* (Ksm_Urb_Adol_1); *'....So we are required to first wash the fruits to avoid diseases like typhoid'* (Ksm_Urb_Men_3); *'When you eat fruits that are not well washed you can suffer from cholera'* (HmB_LM3 _Child_1); *'Sometimes you can find that the government says we should not eat fruits when there is cholera outbreak'* (HmB_LM4_Men_1).

**Farm and market environment perceived as sources of fruit contamination**

Critical points of contamination for fruits were perceived as during harvesting or at the market by 'vectors', by 'touching', or by 'dust':

> *'…these fruits that we eat we should wash them because in most cases we do not have an idea of where the fruits fell during harvesting'* (HmB_LM4_Men_2); *'… an example of a mango it might even fall even on cow's dung'* (Ksm_Urb_Adol_1);*'…these fruits you can go to the market and find flies all over them'* (HmB_Urb_Men 2);*'…from the market you cannot eat it before washing because it is touched by different hands'* (HmB_LM3_Men_2).

**Fruits perceived as important constituents of a balanced diet**

At least eight (68%) participants in every stratum mentioned that fruits were sources of vitamins and important constituents of a balanced diet. Three participants associated fruits consumption with skin conditions and wound healing:

> '*…when we eat a fruit in a day it gives us vitamins'* (Ksm_LM3_Adol_3); '*…it is good to take fruits because they are protective, they protect us from disease'* (Ksm_LM3_Men_2); '*…they are encouraging us to eat fruits is because they tend to help in issues of skin diseases and wounds'* (Ksm_Urb_Men_3).

**Drink a glass of milk, mala, or yoghurt every day**

An exploration with panel members indicated that very little milk was consumed in the region. This guideline was intended to promote the consumption of milk and milk products in the region.

**Perception of the guideline as intended**

This guideline was perceived as encouraging the general population to drink milk every day. The Primary and High School participants associated drinking milk with the intake of proteins, body building foods and body protection against diseases, strong teeth, and bone formation:

> '*We should drink one glass of milk every day because milk can give us proteins'* (HmB_LM3_child_1); *'…fresh milk or yoghurt helps in body building'* (Ksm_LM3_Child_1)*; '…milk is protective, it helps the immune system to be strong'* (HmB_LM3_Adol_1); *'… we should drink a glass of fermented milk or yoghurt to add us protein in the body'* (HmB_LM4_Child_2); '*…when you take milk it has calcium and also protein which helps in body building'* (Ksm_LM3_Adol_3); *'We should*

*be drinking milk, as in it falls under proteins which help in bodybuilding and also it helps our teeth becomes strong'* (Ksm_LM3_Adol_1); '*We should drink calcium so that our teeth should be clean' (*Ksm_Urb_Child_3); *'Milk it is good for our bodies, first … for the formation of the bones'* (Ksm_Urb_Adol_2); *'…to make our bones strong'* (Ksm_LM3_Child_3).

**Milk perceived as convalescence food**

Milk was viewed as a useful convalescence food and a 'necessary' drink when working in 'dusty places' to 'soften or cleanse the chest':

*'Sometimes when am sick I always say to my mother that go and buy for me fermented milk'* (HmB_LM4_Child_2); *'I usually see when someone faints they are given the fresh milk'* (HmB_LM3_Adol_1); *'They are trying to tell us to take milk to soften our chest'* (Ksm_LM3_men_1); *'…here in Manyatta there is a lot of dust so if you drink milk it cleanses your chest'* (Ksm_Urb_men_2).

**The phrase 'one glass of milk' was unclear**

The phrase 'one glass' was viewed as the recommended maximum amount of milk required for the day. However, adult female and male participants argued against this statement noting that it is possible to drink more than one glass of milk in a day:

'*This milk should not be too much it has limits it should not be too much or too little because these people have given us a measurement that is one glass…'* (HmB_Urb_Men_1); '*…we should not drink more than one glass of milk*' (HmB_LM3_Child_2); '*That message is saying that we drink one glass of milk every day but the truth is this milk those who have it drink more than one glass because even me I drink more than one glass*' (Ksm_LM4_Wom_1); *'That message is telling us to use milk every day and we should use milk any amount that we get'* (Ksm_LM4_Men_3).

Further, participants indicated more familiarity with the use of a cup to drink milk and not glass as quoted:

*'We should drink one cup of milk'* (Ksm_LM4_Child_1).

**Use of words 'fresh milk' perceived as implying non-boiled fresh milk**

The '*Dholuo'* translation included the word '*machiew'* which meant fresh milk. The phrase 'fresh milk' was confused for non-boiled milk. Some participants expressed concern and stated the need to boil milk before use:

'*...are we getting it direct from the cow or we should boil it first?'* (HmB_LM3_Adol_1); '*It is not very good to drink fresh milk because when directly from the cow it can contain a lot of dirt'* (Ksm_LM4_Men_1); '*When you have a cow you can milk it then boil then boil the milk and drink'* (HmB_LM4_Child_1).

**Drink plenty of clean and safe water**

This guideline was designed to promote the use of clean and safe water. The Lake Victoria region is hot and semi-humid and most individuals in the rural areas engaged in strenuous activities. This guideline was perceived as intended. Identified need for water included 'prevention of dehydration', 'stomach upsets', and 'constipation':

> '*We cannot live without water in our body'* (Ksm_Urb_Child_1); '*…we should drink clean water because the body must have water and as it is said, water is life'* (Ksm_Urb_Wom_2); '*…clean and safe water in our body prevents the body from dehydration* (Ksm_LM3_Adol_3); *'We should be drinking treated water to avoid stomach upsets'* (Ksm_LM3_Men_1); *'…we should drink at least eight glasses of water to prevent constipation* (Ksm_Urb_Child_3).

Safe water was perceived to mean water treated by use of chemicals or boiling. All participants understood the purpose of treating water as 'to kill disease-causing pathogens or 'germs' as quoted:

> '*It means we should not only drink just clean water but clean and safe'* (Ksm_Urb_Adol_2); '*We should drink clean treated water that is the one treated with chemicals or boiled'* (Ksm_LM3_Wom_2); '*We should drink boiled water or treated water because the waters we drink sometimes contain germs or different diseases, so we must boil or treat before drinking'* (Ksm_LM3_Child_1); *'Because when you don't drink clean water you can suffer from cholera'* (HmB_LM3_Child_1).

In Homa Bay, chlorine was dispensed at water source points, while water filters were observed in some schools. However, in Ksm_LM4 there were two approaches indicated. The first was identified as a water project to supply piped water and the second approach was where individual

community members called on community health workers to supply them with the chemical for water treatment whenever they needed as quoted:

> '*...there are some people who brought water treatment chemical (chlorine) and put it near the rivers'* (HmB_LM3_Adol_1); '*...we fetch water from the borehole and there is chlorine there so after fetching you just put the chlorine'* (HmB_LM3_Adol_1); '*...there is a water project so you find that from the river you find that the water project deals with everything it cleans and does everything so when you just go there you just take water'* (Ksm_LM4_Adol_1); *'Community health volunteers taught us that they were told after we fetched water from Nyando or the streams we go to them and they give us 'water guard' (water treatment chemical in the Kenyan Market) then we use to treat our water then drink'* (Ksm_LM4_Men_2).

**Use clean and safe water for food preparation and hand washing every time**

Due to low sanitation and hygiene awareness in Kenya (MoHS, 2007), the National Nutrition Action Plan 2012-2017 in Kenya stated the need for all service providers to incorporate nutritional and food safety consideration and messages into their routine work. This guideline was designed to promote the use of clean and safe water.

**Perception of the guideline as intended**

Most participants well understood the message as intended. The term 'clean and safe water was understood as water 'not contaminated', 'treated water', 'boiled', or 'chlorinated'. The availability of water treatment at water points in Homa Bay allowed the community members to treat all water collected at those sources. Participants understood the need to use clean water to prevent diseases:

> '*…we should use clean and treated water when we cook and also wash our hands'* (HmB_LM3_wom_1); '*...you should use either boiled water or water which is chlorinated to wash utensils and prepare foods'* (Ksm_LM4_Adol_1); '*If you have a borehole you are given chlorine for free so you just use it'* (HmB_LM3_Child_2); *'...it is important because it will help the people on how to maintain hygiene and reduce water-borne diseases like cholera, typhoid, dysentery'* (Ksm_LM3_Adol_3); *'...if I use clean and safe water I prevent cholera'* (Ksm_LM3_Child_1); *'...we should use clean boiled water and even the water we use for hand washing should be very clean water ...it can protect me from getting diseases'* (HmB_Urb_men 2).

**Awareness of critical hand washing points and safety concerns**

The participants were aware of the need to wash their hands before handling food or eating. They also knew that hand washing was a necessary practice after visiting the toilet. However, little was mentioned about the need to wash food with clean and safe water except for food purchased from the market:

> '*...before we prepare food we should wash our hands and we should also cook using clean water'* (Ksm_LM4_Wom_1); '*We should use safe water for cooking, hand washing even after visiting the toilet, or after handling something'* (Ksm_Urb_Child_2); '*...at times you can prepare food with dirty water, such food will not be clean food and if someone eats it they might have stomach problems so even when we are from the toilet we should wash our hands'* (HmB_LM3_Child_1); *'...it is important for people to use treated water in food preparation and hand washing because the food we buy from the market has been touched by different hands so you have to wash to remove the germs because you do not know what the same hands had touched previously so it is advisable to we first wash our hands or we first wash our foods before cooking'* (HmB_LM3_Adol_1).

**Enjoy a healthy and physically active life every day**

This guideline was intended to encourage participation in physical activities.

**Missing link between physical activities and food-based dietary guidelines**

Unlike the preceding guidelines which focused on food consumption and health-related issues, this guideline introduced the concept of physical activities. The participants found it difficult to link physical activities with food and health issues. The word 'healthy' on the guideline was misconceived as stating that 'good health' is a prerequisite for exercise. There was a need to clarify this guideline before any meaningful discussions could proceed:

> '*When we eat recommended food that provides us with energy, then we will be active'* (Ksm_LM3_Wom_2); *'... that message says after we have practiced all the messages from number one, then the body will be healthy and you will never feel any problem and once you feel okay you will definitely live a comfortable life'* (Ksm_LM4_Wom_1); '*…physically active from what we have been taught from number one ...it now combines all the messages because once you have drunk that one*

*glass of milk, you have boiled drinking water and you have also washed your hand with clean water I think when you combine all those you will have a physically active life every day'* (HmB_LM4_Men_1); '*If I am not sick or even have malaria, then I have a healthy life because I do my chores (being physically active) and i am not just sleeping, then I am okey Nowadays I work from morning until evening and I feel okey'* (Ksm_LM3_Wom_1); '*The message is saying to be healthy, the person eats healthy diet when you are healthy then exercise'* (HmB_Urb_Adol_1).

There was a need to clarify this guideline before any meaningful discussions could proceed. All research participants engaged in either voluntary or involuntary physical activities daily. They knew the need to engage in active exercise as opposed to a sedentary lifestyle:

*'This message is telling us that we should not just sit without doing anything'* (Ksm_LM4_Wom_3); '*We should do exercise even if you have a vehicle you should find time to exercise so that the sweat is excreted from our bodies* (HmB_LM4_Men_3); *'It is not good to stay every day in class we have to go outside and play'* (Ksm_Urb_Child_3).

Across the high school stratum, 'movement' was started by 'running'. Among the adult population, voluntary engagement in physical activities which included jogging was only acceptable in an urban setting for the male gender and the affluent in the society but not in the rural areas:

*'in school, movement is by running'* (Ksm_LM4_Adol_1); '*I run from home to school every morning without stopping on the road'* (HmB_LM3_Child_3); 'O*ur husbands leave very early in the morning to go for jogging* (Ksm_Urb_Wom_2). *'If you go to Homa Bay town in the morning you will just find the people working in offices are the ones doing morning run'* (HmB_LM3_Adol_1); '*…if you go to Mililani (an upmarket estate) in the morning hours you will see whites (white foreigners in Kisumu) jogging, including the old men and women'* (Ksm_Urb_Men_2); *'I went to the farm I have been there up to 3 pm when I come back after getting something to eat I feel really tired, so suppose I wake up and go jogging won't I be wasting time that I should be using in my farm?'* (Ksm_LM4_Men_2); '*Women are committed people when you wake up and start jogging people will be surprised and they will wonder how idle you are to an extent of deciding to jog'* (HmB_Urb_Wom_2); *'They will think you are mad you will be*

*considered a witch, that one you will be sent back to your home that you are a witch'* (Ksm_LM4_Wom_1).

Physical activities were expressed as necessary to 'stretch the body' or to 'keep fit, 'active' and not 'weak' but 'strong'. The health benefits associated with physical exercises included, 'enhanced blood circulation and burning of calories:

'…*sometimes you can run to stretch your body'* (Ksm_LM3_Wom_2); '*…every day you should do activities that make you physically fit and healthy'* (HmB_LM3_Men_2); '*…we should find something to do so that we are physically active like exercise'* (HmB_LM4_Men_2); '*We should be doing some activities that make us strong'* (Ksm_LM4_Men_2); *'… when we do activities, …it increases the blood circulation in our body'* (Ksm_LM3_Adol_3); *'…we should create time and do exercises so that the foods we eat can function well in our body'* (HmB_LM4_Men_3); *'…exercise your body so that the food can easily circulate'* (Ksm_Urb_Adol_2); *'If you do exercise you become flexible and there are some fats that accumulate in the body so by the time you are doing exercise they get used down and release energy* (HmB_LM4_Adol_3).

**Physical activity as involuntary engagement**

Adult participants in rural areas perceived the message as promoting active engagement in mandatory daily chores such as fetching water, washing utensils, splitting firewood, and farming as quoted;

'*...we should do some household chores like going to fetch water, washing the utensils so that we do not have a weak body'* (HmB_LM4_Wom_3); '…*this message is encouraging us not to be lazy, we must ensure to exercise our bodies, even splitting wood'* (Ksm_LM3_Men_2); *'…if possible you can farm, and it should be every day, do exercises every day* (Ksm_LM3_Wom_1); '*For me, it depends on the nature of work I do, I do exercises because I do hard labour, I saw wood, I hammer, I do carpentry work every day'* (Ksm_Urb_Men_1).

**Physical exertion and sweat perceived as necessary outcome in physical activities**

Physical activity was equated to hard labour and sweat was viewed as a measure of having successfully engaged in some form of physical activity:

'*We should do hard labour'* (HmB_LM3_Child_1); *'When you wake up …take a hoe and go to the farm and dig hard'* (HmB_Urb_Wom_2); *'…we should do hard labour because*

*those who do not do hard labour are very weak* (HmB_LM3_Wom_3); *'...even if you are doing an activity/work, make sure you sweat'* (Ksm_LM3_Men_1)*; 'Being physically active means ...at least do some activities that make you sweat'* (Ksm_LM4_Men_3); *'This message is telling us ... you can do gardening until you sweat or play ball games, washing, that does activities that can make you sweat quickly'* (Ksm_LM3_Wom_1); *'The activities we can do are like charcoal burning up the hill because you sweat a lot* (HmB_LM4_Wom_2).

**Perception of the word 'healthy' as indicating absence of disease**

The word 'healthy' was mistranslated to mean the absence of diseases, which in their perception was a prerequisite to exercising or carrying out mandatory chores equated to physical activities:

'*If I am not sick or even have malaria, then I have a healthy life because Ido my chores, and I am not just sleeping, then I am ok. Nowadays I work from morning until evening and I feel ok'* (Ksm_LM3_Wom_1); '*The message is saying to be healthy. The person eats a healthy diet. When you are healthy than exercise'* (HmB_Urb_Adol_1); '*According to me what I understand, all those foods that we have eaten in all those messages have already given us a healthy life so what this message is saying is that we should do activities that makes us fit like exercise'* (HmB_Urb_Men_2).

**4.3.1.11 Eat less of locally vended starchy, fatty foods and sugar-sweetened products**

Research by Waudo *et al*. (2006) found that diets in the region were high in carbohydrates (69%) and that sugar was consumed by 86.1% of the women respondents daily. This was sugar mainly in tea. This guideline was proposed to moderate the consumption of starchy fatty sugar-added foods.

**The guideline perceived as intended**

Only one participant perceived the message as it was intended:

*'It tries to inform us that in the type of food which we are eating we should eat small amounts of starchy fatty and foods which have high quantities of sugar'*

(Ksm_Urb_Adol_1).

**Perception of the guideline as promoting moderate consumption of 'sugar added, fatty food' but omitting the 'starchy food' component**

This guideline was restated with emphasis placed on the need to moderate the use of 'sugar' and 'oil' but not the 'starchy food' component. Discussion among children mainly featured the 'sugar' component. Even though salt was not part of the statement, adult participants were aware that salt consumption also needed to be limited:

> *'It is telling us not to eat sugary food' (*HmB_Urb_Child_3); '*…we should eat less of foods prepared with a lot of oil them'* (Ksm_LM4_Adol_2); *'This message is discouraging us from eating food with a lot of sugar or a lot of oil'* (Ksm_LM3_Wom_1); *'...if it is fish you are eating you should not put a lot of salt in it ...it can cause harm to your body'* (HmB_Urb_Men_2_54yrs)*; '...someone may buy something along the way to eat without knowing how much sugar or salt has been used'* (Ksm_Urb_Men_2_48yrs).

This guideline was described as conveying the need to 'minimize', 'reduce', 'avoid', 'not to buy 'not to eat, 'not to get used to' or 'discourage consumption of the locally vended starchy, fatty foods and sugar-sweetened products:

> *'...instructing us to minimize the use of fatty and sugary foods'* (HmB_LM4_Adol_2); '*There are some foods that are locally vended and have a lot of sugar and fat so we are being told to reduce the consumption rate of such foods*' (HmB_LM4_Men_3); *'...we should avoid the locally vended foods that are cooked in a lot of oil and sugar'* (HmB_LM4_Men_2); *'...discourage us from eating food with a lot of sugar or a lot of oil'* (Ksm_LM3_Wom_1).

Both the primary and high school going participants mainly viewed the message as advocating for moderation with an understanding that such foods cause 'obesity', 'heart diseases', 'hypertension', 'cancer':

> *'Eating foods with a lot of oil may cause obesity* (Ksm_LM3_Adol_1)*; 'It is important because these foods give us a disease called heart disease and foods with a lot of oil cause cancer and can cause death any time'* (Ksm_LM3_Child_1); *'I have heard that if you eat a lot of sugar you can suffer from hypertension or blood pressure'* (HmB_LM3_Adol_2).

**Perception of the guideline as addressing safety and health issues of vended foods**

The use of the words 'vended foods' shifted the attention of the discussion to the safety aspects of the foods cooked away from home. They expressed concern about the food preparation environment, water quality, risk of cholera, and source of oil used in the preparation of these foods:

> *'...they should eat less of foods that are vended from door to door because they might not know how the foods were prepared it can be dirty or not well prepared'* (HmB_LM3_Adol_1);*'...they may have not cooked with clean water'* (Ksm_LM3_Child_3)*; '...we do not know how vended foods have been prepared, you can only be sure of the quality of food you have prepared at home'* (Ksm_Urb_Men_2); *'If we continue buying locally vended food, they can expose us to the risk of cholera'* (Ksm_Urb_Men_1)*; '...cooked foods for example chips has a lot of oil, and most people use a lot of oil, it is alleged that some even use 'transformer oil' so you may not know the kind of oil used and may affect your health'* (Ksm_Urb_Men_2).

**4.3.2 Perceived barriers to implementation of the preliminary food-based dietary guidelines**

Perceived barriers to implementation of the preliminary guidelines included food insecurity, poverty, inadequate nutrition knowledge, attitude, practices and beliefs, dietary shifts, biodegradation, diminishing biodiversity, and failure to take responsibility.

**Low food production**

Factors associated with limited food production, included unfavourable weather conditions, destruction of crops by wild animals,gender influence on what to farm.

**Unfavourable weather conditions**

The LM4 AEZ were stated as sunny and dry. The situation was worse in HmB_LM4 as it borders LM5 zones. Although the weather supported the growth of sorghum, the poor rains experienced did not favour the growth of maize, beans, vegetables, fruits, sweet potatoes, and cassava:

> *'the weather here, it is so sunny at times when foods like sorghum do well you might fail to get the maize, beans, and fruits'* (HmB_LM4_Men_ 1); *'...getting the sweet potatoes here is a challenge'* (HmB_LM4_Wom_3); *'Cassava is not available here* (HmB_LM4_Men_1).

Vegetables were scarcely available during the dry season. During such seasons, '*omena*' (*Clarias*) was the only available relish:

> *'…to get the vegetables, it is only during the rainy seasons because times like these most of the areas are very hot, it is not easy to grow vegetables'* (HmB_LM4_Adol_2)*; '… times like these, we boil 'omena' and eat it without vegetables'* (HmB_LM4_Adol_1).

Over 90% of adult participants did not rear cows. Milk was stated as scarce. Further, milk production was indicated as little. Rearing of cattle was a challenge due to the lack of grass for grazing, especially during drought:

> *'Milk is so scarce here even those who have cows to milk, the cows produce very little milk'* (Ksm_LM4_Wom_3); '*Even sometimes they have cows and there is drought so there is no grass for the cattle to eat'* (Ksm_LM3_child_1).

**Destruction of crops by animals on unfenced farms**

Many farms did not have fences. Roaming hippos and cows destroyed crops on unfenced farms;

> '*Cassava does well because I had once tried planting it, but what happens here, people just leave the animals to graze around so they destroyed them, even for the sweet potatoes, they do well but because of the animals, people don't plant them'* (HmB_Urb_Women_3). *'There are some who do plant near the Lake but the hippos are a problem, they destroy the crops'* (HmB_LM4_Wom_3).

**Gender influence on what to farm**

Further, men were the decision-makers on the type of crop planted. They preferred planting maize and sugar cane as opposed to short-season crops such as sweet potatoes*;*

> '*Men prefer planting maize and sugar cane to an extent that if you plant maybe sweet potatoes on the farm without his knowledge he will come and uproot all of them'* (HmB_LM3_Wom_2).

**Sale of family food produce**

Although keeping poultry was part of the culture in the Region, chickens were reared for what was described as financial '*emergency cash',* eggs were left for the hen to brood to facilitate the multiplication of chicks;

'*We keep the chicken majorly for emergencies maybe you need some cash urgently the chicken is available'* (Ksm_LM3_Men_2); '*We want the chicken to multiply in number so we cannot interfere with eggs because we want it to hatch'* (Ksm_LM3_Men_2).

Other farms produce sold in the Region including legumes, which was referred to as 'our bank', sorghum, rice, cassava, groundnuts vegetables, milk;

*'These legumes is our bank so we don't eat them often, after harvest, that you won't get because we shall have sold all'* (HmB_LM3_Wom_3); *'You see this sorghum, people will plant it and harvest then sell everything to the breweries'* (HmB_LM3_Men_1); '*You will find something like rice, cassava mostly we have planted it just for cash, not for food'* (Ksm_LM3_Men_2).

Other foods sold included groundnuts, milk, and vegetables. The money obtained from the sale of food was often spent on non-food items:

'*I sell chicken to get money for school fees'* (Ksm_LM4_Wom_2)*; 'Sometimes my children have been sent home for school fees I will have to sell these green grams so that I can get the school fees'* (HmB_LM3_Wom_2).

**Limited food accessibility**

High cost of food, lack of money and little income presented as challenges in food acquisition.

**High cost of food**

Despite the proximity to the Lake, only '*omena' (clarias)* was the most consumed fish. When asked about the consumption of large fish, they figuratively compared the value to the most precious mineral gold;

*'The type of fish we commonly use is the 'omena' because the bigger fish like tilapia are expensive'* (Ksm_LM4_Men_1); '*Fish (meaning large fish) is gold (indicating commercial value)'* (HmB_LM3_Wom_3).

Similarly, meat was stated as rarely consumed due to high cost;

*'Meat is very expensive what we have in place of meat is the 'omena' so instead of buying meat you buy the 'omena' that's the 'meat' we have, the real meat we just hear of it'* (HmB_LM3_Men_2);

Because of cost, milk was preferably used to prepare tea which 'could then be served to everyone including children instead of one person drinking a whole lot of milk,

'*I buy milk at Kenya shilling 50/= and sometimes that is the only money I have, so will rather buy milk prepare tea so that even the baby gets than buy the milk and drink it alone'* (HmB_Urb_Wom_2).

The cost of fruits was inhibitory and participants would rather use the money to purchase vegetables which was a 'necessity' rather than fruits;

'*Fruits are expensive, one mango can go for Kenya shilling 30/= so instead of buying one fruit why can I not buy vegetables that will be eaten by everybody'* (HmB_LM4_Wom_1); '*fruits are not always part of the family budget, as long as I get what is needed like I get vegetables and flour that's all something like fruits is not of concern'* (Ksm_LM3_Men_2).

Although the developed guidelines sought to promote the use of oil rather than fat, oil was indicated as more expensive when compared to fat;

*'This salad (oil) is a bit expensive but the fat is affordable'* (HmB_Urb_Men_3).

**Lack of money to buy food**

Most participants depended on the market for supplies. Despite food availability in the market, most participants indicated that they had no money to purchase food;

'*Sometimes I don't have money and you know for everything to be bought you have to have money* (HmB_LM3_Wom_1). *'There are foods brought to the market here from Rift Valley, but if you don't have the money you cannot buy'* (Ksm-LM4_Men_2); *'...Sometimes there is no money to buy milk so we take strong tea (tea without milk)'* (HmB_LM3_Adol_1).

**Low income**

Consumption of breakfast was perceived as only possible for individuals with regular income like 'teachers;

'*Regular breakfast is possible maybe for teachers as in those who are employed but for us, it's not possible'* (Ksm_LM3_Wom_2).

Employment was considered the main source of income and the lack of it was attributed to low income;

*'At times your parents don't have anything to do so they don't even have the money to buy food'* (HmB_Urb_Child_2);

The daily wages earned by some community members from tilling other peoples' farms could not afford the proposed three meals and snacks in a day;

> '*Parents till other people's land, according to me the wages they are getting is less because you will find he/she might work and the person gives him or her ksh. 150 and there is no flour in the house there is no soap so to satisfy this, it would be very hard they cannot afford the three meals a day plus those snacks'* (Ksm_LAPZ_Adol_2).

Some participants depended on farm crops as a source of income. Due to low value of farm produce in the local market, the little amount of money obtained from the sale of farm produce is too little to buy other foods to ensure adequacy and dietary diversity;

> '*I was planning to take my vegetables to the market tomorrow but seemingly they won't give me good returns so a day like tomorrow am not sure whether I will manage to get all the three meals'* (HmB_LM3_Wom_1); '*... the value of what we farm is so low take, for example, I want to eat this good breakfast maybe I want to have milk tea and eggs let's do this math: for me to buy milk and eggs I will need around Ksh.110/= because a packet of milk is Ksh.70/= then I will also buy 4 eggs that are Ksh.40/= so for me to have this money I will have to sell my maize yet 1 gorogoro (2kg) goes for Ksh.40/= how many tins of maize will I sell so that I get this good breakfast? that's around 4 tins because I still need even tomatoes to make these eggs and imagine this is the same maize that I am to make my ugali from and eat with my family so in general the value of the crops we grow cannot allow us to have this good breakfast'* (HmB_Urb_Men_1).

**Limited availability of food**

Due to low food production and limited accessibility, there was scarcity of food at the households level. Individuals therefore consumed less than three meals a day, compromised in quality.

**Skipping meals**

Consumption of five meals a day, three main meals and two snacks was inconceivable;

> *'Am just surprised at the five times, isn't that a lot surely? It's like when you wake up all you do is just eat surely. Really when you say five times it means when you wake up till evening your work is just to stare at the sufuria'* (Ksm_LM3_Men_3).

Breakfast and lunch meals were regularly skipped. Supper seemed to be the only planned meal:

*'Mostly we eat once a day because sometimes you woke up early to go in search of food and unfortunately you end up getting nothing to be eaten for breakfast, same to lunch you get nothing you only get lucky in the evening so in such a case it, therefore, means the whole day it is only the evening meal you are going to have'* (Ksm_LM3_Men_2); *'at night I usually try to ensure to make ugali with fish 'okoko' with maybe some kales on the side; or if not ugali with fish, if I prepare githeri (*mixture of maize and beans*) I must look for avocado for the children together with milk tea so that they eat something heavy since they stayed hungry during the day* (Ksm_LM4_Wom_1).

Other times skipping breakfast was stated as occasioned by lack of charcoal or firewood:

*'At times there is no charcoal even match sticks'* (HmB_LM3_Child_3); *'Maybe it is raining and you are using firewood and there is no firewood at home so you can't cook'* (HmB_Urb_Adol_1); '*When it has rained it is not easy to find firewood'* (HmB_LM3_Adol_2).

Similarly, some participants indicated that it was a challenge to boil drinking water or cook beans due to the scarcity of firewood or charcoal;

'*Honestly, nobody will boil water with this current situation of firewood scarcity most people will just use water'* (HmB_Urb_Wom_2); *'...getting firewood is a problem it's not available here* (HmB_Urb_Wom_3); '*let me take you again to boiling water where will they get the firewood to boil water?'* (Ksm_LM4_Wom_3); *'When you go to our homes you find that we use stoves and gas so women are not able to boil beans, boiling food requires a jiko'* (Ksm_Urb_Men_1).

**Inappropriate portion size and variety of foods consumed**

Limited availability of food resulted in inadequate food intake both in quantity and quality. During the lean periods, very little food was served;

'*We eat once or twice and even the once or twice, the food is served in very little portions just to push you to the next meal'* (Ksm_HAPZ_Men_2).

Most participants survived on snacks throughout the day;

*'At times I just take tea (without milk) for lunch'* (HmB_LM4_Child_3); *'I prefer porridge. When it reaches 12 noon to 1 pm I can still take more porridge'* (Ksm_LM4_Wom_1).

Eating behaviour was influenced by what was accessible. Breakfast was prepared based on satiety and not quality;

> *'...as long as I get any food that can satisfy me that is a good breakfast, the most q important thing is me getting satisfied'* (Ksm_LM3_Men_2).

As a dietary practice occasioned by the limited availability of food, only one kind of relish was served at a time to 'reserve' any other relish for the next meal;

> '*If we eat 'omena' one meal the next meal will be vegetables with 'ugali'* (Hmb_LM3_Men_2); *'We will rather take the fish for lunch than take the vegetables for supper because eating the two at ago to us it is like a waste of food'* (Hmb_LM3_Men_1).

The type of food consumed depended on what was available;

> '*When one has a potato farm all they think of is the sweet potatoes from morning to evening'* (HmB_Urb_Men _2).

**Diminishing biodiversity**

A 67 years old female participant lamented that, unlike olden days, wild fruits were no longer available with further evidence of degradation of the natural habitat;

> '*... just look at how the world is like today, we hardly find fruits and you know it's the fruits that we can eat as snacks and they have to be bought not like olden days when we could just easily get them around so we cannot have a balanced meal'* (HmB_LM4_Wom_3); *The activities we can do are like charcoal burning up the hill because you sweat a lot* (HmB_LM4_Wom_2).

**Low quality diets**

Poverty associated with low income, limited the quality and quantity of the food consumed in the study area. Some participants described their typical meals as composed of tea without milk for lunch or porridge or roasted maize and water, as quoted:

> *'...at times I just take tea (without milk) for lunch'* (HmB_LM4_Child_3); *'...I can take tea in the morning, sometimes tea is left and I can take in the course of the day, then I wait for supper'* (Ksm_Urb_Men_2)*; '... I prefer porridge. When it reaches 12 to 1 pm I*

*can still take more porridge, any time I feel a little tired I take more porridge. At night I am forced to boil 'omena' and look for vegetables to cook like kales on the side. If very challenged, may take those vegetables frequently without 'omena''* (Ksm_ LM4_Wom_1); *'Sometimes if you have breakfast in the morning, up to supper there is no lunch or lunch can be roasted maize and water'* (HmB_LM3_Adol_2).

Tea was the most consumed beverage throughout the day. It was consumed either alongside or instead of regular meals as quoted:

'*In my house, we take tea throughout the day and eat once a day* (Ksm_Urb_Men_1); '*…for lunch, I can take rice with strong tea and then take ugali for supper'* (Ksm_Urb_Men_1); '*Yesterday in the morning I took tea then at 1 pm when I went back I found tea already prepared so I took tea with rice than at night I ate kales, ugali, and fish* (HmB_LM3_Child_2); '*For lunch, we take rice and tea'* (HmB_Urb_Child_1); '*For me, for lunch, I like rice or 'githeri' with tea, and then I cook ugali for supper'* (Ksm_Urb_Wom_2).

Children expressed washing of hands as a waste of time especially when ugali served was small:

'*Sometimes even when you are sent to the shop and there is already ugali on the table and those who want to eat are also many yet the ugali is small so when you calculate the time you are likely to take when you wash your hands you just decide to start eating because they might finish for you food'* (HmB_Urb_Child_1).

**Lack of safe water**

There was limited access to safe water in the study area.

**Inaccessibility to water treatment chemicals**

The research participants stated that they lacked chemicals for water treatment. They stated that they lack money to buy water treatment chemicals as quoted:

*'…. some people do not treat water, and they just drink like that. They don't have the chemicals'* (Ksm_LM3_Wom_2); *'Lack money to buy water guard* (Ksm_LM4_Child_2); *'At times they may not have money to buy the water guard'* (HmB_LM3_Child_1); '*I only treat drinking water because when I imagine of the expenses for treating that water, I cannot just take it again for washing my hands and washing fruits'* (HmB_LM3_Men_1).

**Lack of firewood to boil water**

The cost for water treatment chemicals was stated as expensive. Therefore, the participants could not afford to treat both drinking water and water used for other household chores:

> '*…where are they going to get the money to buy a water guard to treat water for hand washing, food preparation and the one for drinking because most people would want to buy the water guard and use it to treat only drinking water…. boiling water where will they get the firewood to boil water, for example, the old people?'* (Ksm_LM4_Wom_3)*;* '*Honestly, nobody will boil water with this current situation of firewood scarcity most people will just use water'* (HmB_Urb_Wom_2); '*…there is no need of boiling cooking water that will be a waste of firewood'* (HmB_LM4_Wom_1); '*….to treat the water you have to have money and that money is what we do not have and secondly, women do not have the time to boil water and getting firewood is also a problem it is not available here* (HmB_Urb_Wom_3).

**Lack of containers to store treated water**

Lack of containers to facilitate household water treatment;

> *'What I wanted to say is almost the same because for instance if you have a big container you can just treat the water once so that every time you use the water it's already treated' (*Ksm_LM4_Wom_1).

**Inadequate nutrition knowledge**

The term *'variety'* is a principle in diet planning to promote a wide selection and consumption of foods. Although some participants used the word *'variety'* their knowledge to translate it to a menu plan was limited. Exchange of tea and porridge or tea and *'githeri',* porridge and *'githeri',* and milk and fruits was perceived as introducing variety to a breakfast meal:

> '*…a well-constituted diet should not be the same every day, if you drink porridge today, the next day you take tea'* (Ksm_LM3_Wom_2); '*Balanced diet means that you eat different kinds of food for example in the morning I can take mandazi, tea with 'githeri' another day I take 'githeri' and porridge another day I take milk and fruits' (*HmB_LM4_Men_3*).*

Similarly, consumption of boiled instead of roasted maize was viewed as introducing variety to a breakfast meal;

*'Sometimes someone can also take tea with 'githeri' and during harvesting seasons they can take tea with roasted or boiled maize so that they do not just eat one type of food but eat variety'* (HmB_Urb_Men_3).

Further, breakfast was perceived as a kind of set menu composed of *'milk and bread'*, *'tea with bread'*, *'tea with eggs'*, or *'porridge'*. Good tea was described as a tea prepared with milk as quoted:

'*A good breakfast should just be the tea because it gives some very good energy so if you can get this tea with bread every morning it can be really good'* (HmB_LM3_Men_2); '*It is milk tea with eggs every day* (HmB_LM3_Men_2);*'…breakfast should contain different types of foods like tea, tea when you take strong tea (tea without milk) it's like you have not taken tea but when its good tea (tea with milk) with sugar then you have taken tea, in that case, it will be heavy breakfast because even when you take it you stay long before eating lunch'* (Hmb_LM3_Adol_1); '*…for example when I am taking tea, maybe after taking that tea I should get some orange and eat'* (Ksm_LM3_Wom_2).

**Bad food practices, attitudes, and beliefs**

There were expression that indicated unhealthy eating practices, attitudes, and beliefs concerning food or lifestyle choices or having nutritional or health-related implications.

**Attitude and practices associated with consumption of breakfast**

Since the main items in a breakfast meal were believed to be tea or porridge, breakfast items were then thought of as 'drunk' and not 'eaten' as quoted:

'*… I do not usually see people eat something in the morning they usually drink so I think in the morning people should drink tea with bread or even chapati and this tea should be one with enough mil…'* (FGD_Hmb_ Urb_Men_3).

However, when compared with porridge, tea as a beverage was considered superior as quoted:

*'It would have been good if I can take some tea with enough milk and eggs and Irish potatoes in the morning but due to our low financial status, we are unable to do that we are just forced to take our normal porridge'* (HmB_Urb_Men_1).

Since it was not a practice in the region to have breakfast before going to the farm, consumption of breakfast was postponed to later hours as quoted:

‘*You know what happens here, we drink something after we are from work because no one can prepare food first before going to work* (HmB_LM3_Men_3)*; ‘We have duties to do in the morning people don't get the time to drink breakfast so according to me I think this issue of eating breakfast should be done away with because where will we get time to prepare all these foods for a well-constituted breakfast*? (HmB_Urbn_Men_3); *‘When I have work to do outside the home, I can leave very early without taking anything, but will take something around 11 am’* (Ksm_LM4_Men_2).

Further, School going participants expressed fear of discomfort which included: stomach upsets; feeling sleepy; or frequent urination if they were to eat some food or -porridge in the morning before going to school as quoted:

*‘At times when you are already used to coming to school without breakfast when you take it you feel some stomach upset’* (HmB_LM4_Child_3); *‘According to me when someone takes breakfast every morning, when he comes to school, aah there is a tendency of yawning and not understanding what the teacher is saying and feeling sleepy’* (Ksm_Urb_Adol_2); ‘*Let me just say according to me, for instance, if you take that porridge in the morning, just reaching around nine o’clock, rushing to the latrine every time’* (HmB_LM3_Adol_2).

Instead of breakfast at home, some parents gave their children money to buy and eat snacks in school as quoted:

*‘There are those children that you can prepare tea for them and they leave it there and you give them money for a break’* (Ksm_Urb_Wom_2); *‘My children do not drink anything in the morning, instead of taking something they ask me to give them money so I give 10/= and the older one 20/=* (Ksm_Urb_Wom_1); *‘Like me if my dad gives me ksh.10 I can’t go without taking mandazi’* (HmB_LAPZ_Adol_1); *‘These foods are sold to people who come from homes and we are the ones who give our children money to buy such things’* (Ksm_Urb_Men_2).

**Negative attitude towards regular consumption of 3 meals and 2 snacks in a day**

An adult male participant expressed that having 3 meals and 2 snacks in a day would be too much and unacceptable and that consumption of snacks should be optional as quoted:

*‘Am just surprised at the 5 times, isn’t that a lot surely? It’s like when you wake up all you do is just eat surely. Really when you say 5 times it means when you wake up till*

*evening your work is just to stare at the sufuria' (*Ksm_LM3_Men_3); *'It is not a must to have this snack'* (HmB_LM4a_Wom_1).

An adult male participant (36 years of age, Hmb_LM4) questioned the usefulness of inclusion of the message statement on snacks if obtaining the three meals was a challenge quoted:

*'Is the snack of any meaning in this community? We do not eat the 3 meals in the first place'* HmB_LM4_men_2).

**Negative attitude and practices towards vegetable consumption**

Though vegetables were indicated as the most consumed relish across all the zones in Homa Bay County as quoted:

*'…sometimes is difficult for some parents to afford foods like meat and fish so they just go to the shamba and take some vegetable and prepare'* (HmB_Urb_Adol_1); *'Sometimes the money you have can only buy vegetables so that's what you have to buy'* (HmB_LM3_Child_3); *'We don't even have that money to buy meat so we just eat vegetables and dagaa'* (HmB_LM3_Wom_3); '*Because of our income so we can only find traditional vegetables like dek, boo, osuga but we can not find everything that is said'* (HmB_LM4_Wom_3).

There were expressions of low preference for vegetables among adult men and women in Ksm_Urb and LM4:

*'The vegetables when you mix it with clean food like Meat or fish it dirties the soup'* (Ksm_LM4_Wom_1); *'People like vegetables but I don't like them'* (Ksm_LM4_Wom_1); *'It happens that way because I don't enjoy vegetables'* (Ksm_Urb_Men_1); *'And even when we cook meat or 'omena', then children will tell you they don't want vegetables'* (Ksm_Urb_Wom_1).

Vegetable consumption in this area was associated with low socioeconomic status as quoted:

*'According to me, I think around this place people don't value vegetables so when we cook something like rice or even chapati we regard that as high-class food and something special that we cannot mix with vegetables. Vegetables are associated with low class'* (Ksm_LM4_Men_2); '*Whenever I eat chapati and green grams I regard that as a very expensive food and I cannot mix such food with vegetables'* (Ksm-LM3_Wom_3).

Serving of vegetables alongside legumes was stated as '*not rhyming*. Legumes were indicated as eaten with chapati or rice as quoted:

> *'When you have rice and green grams you can't serve vegetables again. It doesn't rhyme'* (Ksm_LM3_Wom_2)*; 'you find that legumes are usually accompanied with rice or chapati and are eaten using a spoon, so how can you also take vegetables, vegetables do not fit in there'* (Ksm_Urb_Men_1).

Cabbage was the only vegetable that was thought of as could be appropriately served with legumes as quoted:

> '*According to me, I think for the green grams you can serve it with cabbage that is the vegetable it goes well with. It does not go well with cowpeas it can only be served with cabbage*' (Ksm_LM3_Wom_2); 'The *only vegetable I can eat with such foods is cabbage that is the only one that goes well with them the other vegetables spoil it'* (Ksm-LM3_Wom_3).

**Dislike for sorghum**

Although sorghum grows well in the region, it was underutilized at the household level. The participants expressed dislike for taste, the brown colour, and consistency:

> *'Sorghum is planted but not much, then mostly it's used in porridge and we also had the sorghum but it is not available now because people don't like the ugali made from sorghum it is not nice when you eat it with vegetables'* (HmB_LM3_Men_3); *'Because it is tasteless the reason why they don't like is the color'* (Ksm-LM4_Adol_2); *'I don't like it I tasted it but I don't like when eating it when making a fist when eating, it sticks to your hands, it's not that strong yeah it is soft and then second 'when going for a long call you find it difficult'* (Ksm_Urb_Adol_3); *'I don't like the mixed cereals because when I mix and give it to the children they will say it looks like feaces'* (Ksm_Urb_Wom_1).

An adult female participant described ugali made from sorghum flour as making the stomach tight as quoted:

> *'Sorghum, we just eat a little, it makes my stomach tight. It's only convenient for foods with soup but not vegetables'* (Ksm_Urb_Wom_2).

An adult male participant stated that the use of sorghum flour alone makes the passing of stool difficult while an adolescent participant indicated that the use of sorghum flour led to constipation as quoted:

> *'Sorghum tightens the stomach you have a problem going to the toilet/defeacating'* (Ksm_LM4_Men_3); *'The commonly used is ugali. People do not like a mix of maize flour because they don't like sorghum. Because it will lead to constipation* (Ksm-LM3_Adol_2).

Apart from sorghum, some participants also expressed dislike for whole wheat flour products referring to brown chapati as tasteless as quoted:

> *'The brown chapati is usually tasteless, it is not as sweet as the white one'* (Ksm_Urb_men_1); *'Brown chapati me I don t like it because it's tasteless but the other white one when I cook it it's tastier'* (Ksm_LM4_Wom_3)*; 'I don't like brown chapati but the person I live with likes it. When I cook he eats one and the children refuse to eat what is left. I don t find it sweet*' (Ksm_Urb_Wom_2).

**Mixed whole cereal flour perceived as food for diabetic patients**

It was generally believed that composite flour from maize, millet sorghum and cassava is for diabetic patients as quoted:

> *'There are those who don't take maize, it's like they suffer from diabetes'* (Ksm_LM4_Adol_2)*; 'Those with diabetes mostly eat brown foods like sorghum and millet, yes'* (Ksm_Urb_Wom_2); *'Commonly I see those who have diabetes use the sorghum to prepare ugali and use cassava and millet to prepare their porridge'* (HmB_LM3_Adol_1).

**Preference for food cooked in much oil**

Oil was believed to be the sweetness of the food and that food cooked with a lot of oil was stated as 'food cooked well' as quoted:

> '*What I m saying is that there are people who feel that when they use a lot of oil is when they have 'fried the food' – cooked well, but if they use a little oil they say 'I just cooked' even though I don't have money. 'There are others who like a lot of oil, they say a lot of oil makes the food taste sweeter, if you use a small amount they will say 'kwani moo ne onge ma ochiele mana gipii'? ('Was there no oil that the food has been fried with water?)'* (Ksm_LM3_Adol_3); *'...they use oil in excess, especially in omena, meat,*

*samaki, because they always say 'moo e mitchiemo' they say 'oil is the sweetness of food'* (Ksm_LM3_Adol_2); *'Local vegetables, githeri fried with a lot of oil is tasty and things like meat so that the soup is not watery'* (Ksm_Urb_Men_1).

Some participants were of the view that the use of a lot of oil softened food, especially vegetables as quoted:

*'When we use a lot of oil the food will soften than when you use a little'* (Ksm_LM4_Adol_1); *'...when kales are cooked with small amounts of oil, they become hard and when cooked in a lot of oil they become soft'* (HmB_Urb_Child_2); *'Me I like much oil in vegetables, especially the mature vegetables I have to put a lot of oil to soften them'* (HmB_LM4_Adol_1); *'When grandmothers want me to prepare cow pea leaves they will tell you 'tigi moo manyoso alodni koro gidwaroni mondo inyos a lot' – use oil that softens the vegetables, so they want you to soften the vegetables'* (Ksm_LM3_Adol_3).

**Purchase of milk was not a priority**

Participants prioritized the purchase of foods other than milk. This was due to low income as quoted:

'*I cannot take money to go buy milk for myself that's a no'* (HmB_Urb_Men_3); *'Maybe when you get money what will you start with, you will find that milk will not feature, you will prefer to buy other foods first'* (Ksm_LM3_Men_2); *'It is just the income you cannot buy milk for everybody in the family so you would opt to buy a different food that can be consumed by the whole family so milk you only meet in tea which again is not a guarantee it is just a once in a while thing'* (HmB_LM4_men_3); '*This is due to the high cost of living, instead of spending money to buy milk, you'd rather buy sugar and make strong tea that you can take in the morning and evening, instead of milk that will just be taken at once'* (Ksm_Urb_men_2).

**Negative attitude towards milk consumption**

Adolescent participants viewed the drinking of milk by entire household members as a waste nothing no difference between drinking milk and taking tea made with milk 'as quoted:

'*I think after milking, they only take a little for making tea, the rest they sell, because sometimes the household has more than 8 members, so if you want them all to take a*

*glass, to them that is a waste'* (Ksm_LM3_Adol_2); '*We take milk in tea and also if we take a glass of plain milk, there is no difference. Milk is milk they contain similar nutrients. So if you have taken tea made with enough milk, it is not a must you take milk separately'* (Ksm_LM3_Adol_2).

**Purchase of fruits was not part of the family budget nor menu plan**

Purchase of fruits was not a conscious decision. Fruits were only bought if the money remained after the purchase of household necessities such as vegetables:

*'Purchase of fruits is something that is never in my mind'* (Ksm_LM4_Wom_3); *'Me I can buy fruits even once in a week whenever I remember that I should be buying fruits but I don't buy every day* (Ksm_LM4_wom_1); '*...in the house budget fruits are not always part we don't consider it much so you can even find that a month can go without eating fruits so long as I get what is needed like I get vegetables and flour that's all something like fruits is not of concern'* (Ksm_LM4_Men_2); *'...in case you have money then you can spare some for the fruits but the majority don't budget for them because the resources we have cant allow for that' (Ksm_LM4_Men_3);* '*These fruits are expensive like 1 fruit can go for 30/= so instead of buying 1 fruit why can't I buy vegetables that will be eaten by everybody'* (HmB_LM4_Wom_1).

While an elderly female participant stated that she only bought fruits for her visitors, an adult male participant from Hmb_LM3 (where wild guavas and mangoes were abundant) stated that fruits were bought for adults because children picked wild fruits as quoted:

*'...I only buy fruits when I have visitors that is the only time I can buy fruits. When visitors come let us assume it is my son in law who is coming I have to show him that I can provide all types of foods with the different kinds of fruits'* (Ksm_LM4_Wom_3); *'No mostly the fruits that are bought from the market are eaten by the adults it is not an easy thing to find that parents buy fruits for their children, no the children eat fruits that are planted at home or the ones they find in bushes along the roads* (Hmb_LM3_Men_1).

However, in Kisumu, fruits were stated as basically bought for children. In case the entire family needed to eat, the quantity consumed was little only described as enough *'for everyone to taste'* as quoted:

*'For me, I have put that every day I must buy fruits, even if I don't buy all I buy one I buy for children. When I am able financially, their father can eat, including myself, but if a little, I buy for the children only'* (Ksm_Urb_Wm_1)*; 'It is very difficult to find someone going to buy fruits it is just like maybe you find yourself having some 20/= coin then you decide to buy some fruits for your children'* (Ksm_LM4_Men_2); *'The fruits are just to pamper the children once in a while'* (Ksm_LM4_Men_3); '*sometimes when I buy I have my children and husband so we just have to share however little it is as long as everyone gets a taste'* (HmB_LM4_Wom_3); *'For me when I buy one or two after washing I cut into pieces and every one tastes. Their father does not like, only the children. Like if I have10/= I buy two mangoes and I cut them in pieces'* (Ksm_Urb_Wom_1).

**Patriarchy and choices of foods consumed**

Though some parents skipped meals to spare the little available food for the children, eggs, and tea (with milk) were preferably served to the head of the household (father). Although rarely eaten, there were indications of cultural beliefs in the consumption of cooked poultry. Drumsticks, cloaca, and gizzard were indicated as served to the head of the household or the mother-in-law if the son is dead. Serving these parts to someone else was considered as usurping of power. Consumption of the choicest part of poultry, use of milk in tea preparation, and egg consumption seemed to be a preserve for the father of the household. A 61-year-old female stated she could only buy fruits upon the visit of her son-in-law. Most physical activities among the adult population were mainly mandatory domestic work which included farming and household chores. However, voluntary engagement in physical activity seemed to be more acceptable among men;

'*The chicken rear parts cloaca, the gizzard, and the drumsticks, if you eat like a woman you are taking away the father's authority* (Ksm_Urb_Wom_1); '*...when I prepare chicken I take the cloaca and the gizzard to my mother in law because my husband died long ago so she is the owner of the home'* (Ksm_LM3_Wom_3); '*...there are some families that you will be forced to tell the children to go and sleep then you eat your egg'* (Ksm_LM3_Men_1); '*If milk remains, it is used to prepare tea for my father'* (Ksm_LM3_Child_2); '*…our husbands leave very early in the morning to go for jogging* (Ksm_Urb_Wom_2).

**Non-use of water treatment chemical for fear of harm and dislike of taste**

Though chemicals for water treatment were available at some water points, some individuals opted not to use them. Adult female participants from HmB_LM3 did not treat water because their husbands did not like treated water, while another female participant from the same locality expressed fear of harm from treated water:

> *'Yes the treatment is there but only a few people use it because you are allowed to use the treatment if you so wish'* (HmB_LM3_Wom_3); '*No me I get water from the borehole but I don't treat because my husband doesn't use treated water'* (HmB_LM3_Wom_1); '*there is a treatment to be used but people have refused that they don't want that treatment and that that kind of treatment just cause harm to people so the treatment is there even now it is there with a big tank but people have refused to use it'* (HmB_LM3_Wom_3).

Treated water was indicated as having an unacceptable taste:

> *'It says we should use treated water but, you know the chlorinated water you cannot use to prepare ugali it has some very sharp smell that will make you throw up immediately'* (HmB_LM3_Adol_2); *'I when I use treated water to cook food or even to cook vegetables the smell of water treatment chemical…. is what I get the food does not smell nice'* (Ksm_LM4_Wom_3); *'That kind of water, if you use the ugali, will smell like a tick'* (HmB_LM4_Men_3).

**Only drinking water was perceived as required treatment**

Most participants treated only drinking water. Water used for other household chores was not treated as quoted:

> '*We don't do it because once we know we have treated drinking water, the others we can just use the remaining untreated water' (*HmB_LM4_Wom_2); '*I am talking about what I do, maybe someone else boils but I can boil or treat the one for drinking but the one for cooking I just use the way I get it from Nyando (river), immediately I reach the house I just use it to cook*' (Ksm_LM4_Wom_1).

Water collected from river Nyando was stated as unclean and yet participants used it without any treatment as quoted:

> '*Let me say people who are living across the river (Nyando), the river is contaminated at times you can find a dead dog inside the water and people just take the water and take at*

*home they don't even boil it they don't put any chemical in it but they just use it directly'* (Ksm_LM4_Adol_1); *'According to me where I come from sometimes there might be a shortage of water so for you to get that clean water is very rare so after getting that clean water for drinking and cooking the one for washing or cleaning you can get it from the nearby let's say a dam'* (Ksm_LM4_Adol_1).

The Lake water was a time visibly dirty, yet it was a source of water for household chores and only sieved before use:

'*...we get water from the Lake so you will find that it is only the drinking water that we treat the rest we just use it that way'* (HmB_LM4_Adol_3); *'There are times the Lake water is very dirty so we don't just usually use it at times we sieve it with a piece of cloth because it's too dirty and cannot be used that way* (HmB_LM4_Adol_2).

Participants believed that cooking kills germs and that it was not necessary to treat water used for cooking as quoted:

'*This message nine (9) is a bit challenging you to know most people say that germs are not aware and that all the germs get killed when you cook so they don't bother to treat the water they just use any water they find'* (HmB_Urb_Wom_1); '*Us what we know is that treated water is for drinking then water for food preparation boils as we cook so we do not treat the one we use for hand washing is also not treated as well'* (HmB_LM4_Men_3).

**Untreated water perceived as safe**

Lake water was considered clean early in the morning. Therefore, water collected at this time in the morning was either used as it is or only sieved before use. Similarly, borehole water was perceived as clean and only sieved and used as quoted: as quoted:

'*Us when it's not raining we go to the Lake very early in the morning because water is clean at that time then we sieve it and use for drinking'* (HmB_LM4_Child_3); '*Us we go to the Lake very early then keep the water for even 3 days then we can now drink'* (HmB_LM4_Child_2); '*They filter Lake Water using a clean piece of cloth so the piece of cloth filters all the unwanted particles and germs* (HmB_Urb_Child_1); *'We use water from a borehole, after pumping; we sieve it into a pot where we store drinking water'* (Ksm_LM4_Adol_2).

River water is already blessed by God in the words of a child participant from Ksm_LM3 and an adolescent participant from HmB_LM3 as quoted:

> '*Because some people when they go to the river and feel thirsty they just drink directly while others say that God had already blessed the water'* (Ksm_LM3_Child_1);
>
> *'Sometimes let us say you were grazing the cows then you take them to the river to drink water then you are also very thirsty so you just decide to drink that water as well because after all God had already blessed all waters so it is not possible to drink clean and safe water'* (HmB_LM3_Adol_2).

Rainwater was equally thought of as being safe irrespective of the storage condition as quoted;

> '*For me, I am very strict with drinking water. I don't fetch from the borehole or dam, I wait until it rains and I store the rainwater, I can store even a year's supply. Then I put in the pot'* (Ksm_LM3_Wom_2).

**Thirst as a conditioning factor for water intake**

Thirst was widely expressed as a necessary condition to regulate water intake. Thirsty was associated with hard labour or sunny conditions as quoted:

> *'I only drink water when am feeling thirsty'* (HmB_LM3_Men_3)*; 'I do not drink because at times I do not even feel thirsty* (HmB_LM3_Wom_3); *'I am quite different I can even go for two days without drinking water but whenever I do some hard labour I can take even more than 1 jug'* (HmB_LM3_Men_1); '*...like someone working in a construction sites drinks a lot of water* (Ksm_LM4_Adol_2); *'Sometimes the temperature of the day determines how I drink water. For example, if it is too hot then I am always thirsty* (Ksm_LM3_Adol_3); 'I don't take water the whole day but during dry seasons I can take at least 4 glasses' (Hmb_LM3_Adol_2).

**Association of water intake with meal consumption**

Drinking water after meals was considered a normal practice. Some participants even wondered how one can drink water when there is no food to eat:

> *'I can only take water during meals but sometimes I can even go without taking the water'* (HmB_LM3_Adol_2); '*We only drink water when we feel thirsty then again you can only drink water after you have eaten but now if there is no food to eat when will we drink water?'* (HmB_LM4_Men_2)*;* '*At times I just take 1 glass because at times am*

*hungry and I can't take water on an empty stomach'* (HmB_LM4_Child_3); '*I cannot drink because when am hungry I just feel nausea when I drink water so it is just at night when I come back and eat something that is when I can drink water so it is just maybe twice in a day* (Ksm_LM4_Men_2).

A child participant could not comprehend how to contain so much water after a meal as quoted:

*'At times you have overeaten so when you again drink 8 glasses of water you feel like your stomach is going to burst'* (HmB_Urb_Child_2).

**Use of soap to wash hands was perceived as adequate irrespective of water quality**

Irrespective of water quality, washing hands with soap was considered safe as quoted:

*'I can't wait for the water to be treated so that I use am only concerned about the one used for drinking but the one for washing hands once I find water and soap am good to go'* (HmB_LM3_Wom_2); *'I want to respond in terms of water in this area we believe that when you handle something bad or dirty, you just take your raw/untreated water and wash your hands with soap, and all the germs will be removed. And if my hands are clean as they are now, I just wash my hands with water only and eat ugali'* (Ksm_LM3_Wom_2).

**Negative attitude and cultural unacceptability of exercises in rural settings**

Rural participants thought that engaging in voluntary physical exercises in the community would be viewed as 'idleness', or if walking instead of using motorized transport as 'stinginess', not attending the gym as a 'waste of time' as quoted:

'*The community members can be really surprised how idle we are'* (Ksm_LM4_Wom_3). *'Women are committed people when you wake up and start jogging people will be surprised and actually, they will wonder how idle you are to an extent of deciding to jog'* (HmB_Urb_Wom_2); *'Sometimes I can also just decide to walk instead of using a motorbike but you see these people when they see you walking they say that you are stingy but they don't know you are just doing an exercise'* (HmB_LM4_Men_1); *'We don't go to the gyms that are a waste of time'* (HmB_LM4_Men_3).

Adult female participants feared being judged wrongly by the community as 'mad' or 'wizards' as quoted:

*'They will say look at those women are they mad or something, instead of going to the farm they are busy going around the field' (*Ksm_LM4_Wom_3); *'They will think you are mad you will be considered a witch that one you will be sent back to your home that you are a witch'* (Ksm_LM4_Wom_1).

**Foods with a lot of sugar and oils were perceived as appealing, tasty, conveniently accessible and available**

To children and adolescents, food prepared with a lot of sugar and oil is appealing, sweet, and enjoyable as quoted:

*'They are appealing to our taste'* (Ksm_Urb_Adol_3); *'It is sweet, stopping will be hard'* (HmB_Urb_Child_3); '*We may eat sugary foods at least once a week'* (Ksm_Urb_Child_3).

When asked if they could reduce their intake of these foods, some participants felt threatened and expressed desperation as some of the foods such as 'mandazi' were affordable and readily available, conveniently hawked to the door steps as quoted:

*'Me I get shocked because this mandazi I buy at 5/- so where will I get the money to buy a whole packet of flour? So it will be unfair'* (HmB_LM3_Wom_1)*; 'This issue can stress me up because sometimes I have just 10/= and this cannot buy a whole packet of flour so I just have to buy the already cooked mandazis'* (HmB_LM3_Wom_1)*; 'Reducing the intake of such foods isn't easy because they are the ones we can afford and again they are always available for example if I want to have breakfast in the morning and I only have 20/= and you know very well bread costs 50/= so in such a case I will just buy my mandazi and take my breakfast'* (HmB_Urb_Wom_1); *'There are people who walk with them from door to door'* (HmB_LM3_Men_3); *'You find that sometimes you wake up in the morning and have prepared your tea, and a vendor comes to your house selling mandazi, you are forced to buy the mandazi'* (Ksm_LM3_Wom_2); *'The only thing that can make us reduce eating them is that there are times we hear news on the radio about outbreaks of diseases like cholera and it is said that they are caused by foods that are vended so that can make us stop other than that there is no other reason'* (HmB_LM3_Men_2).

The vended starchy, fatty, sugar-added foods were sold at the school, making them conveniently available to school-goers who might have skipped breakfast, and have money given by parents to purchase the snacks as quoted:

> *'My children do not drink anything in the morning, instead of taking something they ask me to give them money so I give 10/= and the older one 20/= If I ask him, he tells me he bought 2 samosas and the remaining 10/= he will buy things like sweets He buys like a lollipop and ball gum, that's for breakfast with samosas for 10/='* (Ksm_Urb_Wom_1);
>
> *'For our children in school it will be hard because these foods are sold in the schools'* (HmB_LM4_Wom_3); *'They are sold just outside the school there'* (HmB_Urb_Child_2); *'Just if you check around in our school now that we are coming across most of the time you will have to go and purchase one* (Ksm_LM4_Adol_1); *'Like me if my dad gives me ksh.10 I can't go without taking mandazi'* (HmB_LM4_Adol_1).

**Production and sale of the starchy sugar added foods as a business venture**

To some participants, the sale of starchy, fatty, sugar added products was a business venture and a source of income as quoted:

> *'Me my mother always prepare chips so I must taste it so telling me not to eat chips will be like punishment* (HmB_Urb_Adol_1); *'Many people are in the business of selling those things meaning many people eat them'* (Ksm_LM4_Adol_2); *'My wife sells the vended foods and I do eat a lot of them so you should first go teach her that she should not put a lot of oil and sugar and also tell her the side effects'* (Ksm_LM4-men_2).

Indicating inadequate nutrition knowledge, an adolescent participant described reduced energy in refined flour as due to chemicals added during processing as quoted:

> *'The one for the posho mill is the best because it has all nutrients, but that one of the factories, if you read the ingredients maybe they have mixed with other chemicals which reduces energy from the maize'* (Ksm_Urb_Adol_2).

**Unavailability and inaccessibility of treated water**

The unavailability of safe water seemed to contribute to the consumption of fruits without washing. Moreso treated or boiled water was not always available. Drinking treated or boiled water was perceived as only feasible when one was within the homestead as quoted:

*'It is not easy for community members to eat fruits washed with clean water every day because it is difficult to get water in this area'* (Ksm_LM4_Chil_1); *'At times there is no water so you tell the person selling to cut it into pieces so you eat the flesh and throw away the cover'* (HmB_Urb_Adol_3); *'Sometimes there is no water around so you just decide to take it as it is'* (HmB_LM3_Adol_2); *'Sometimes you cannot find water in the taps'* (Ksm_Urb_Child_3); *'in school here, sometimes there is no water so it will force you to take just 1 glass of water or even a half and you are thirsty'* (HmB_Urb_Adol_3); *'...for me mostly, the doctor told me to drink boiled water so I try but there are times the boiled water gets finished and I just drink unboiled* (Ksm_Urb_Wom_2); '*Boiled water is not possible because we are out, you can boil in your house but when out you take unboiled'* (Ksm_Urb_Men_1); '*You know most of the times during school days we come to school and in school here during the day they get water from the lake and its dirty water which is not treated so you can't drink it so* (HmB_LM4_Adol_3); *'...for us who work at the Lake we eat in the morning and leave the house we cannot get water elsewhere so we just use our hands to drink the lake water Lake even with the green thing(hyacinth) that is usually on water us we just drink'* (HmB_LM4_Men_1).

**Failure to own the guidelines**

An adult male participant suggested that the guideline on 'washing fruits' needed to be directed to mothers who would in turn teach the children:

'*think it is possible but this message ought to have reached the mothers so that they make sure the children wash the fruits before they eat because this message is talking is talking about washing fruits with clean water and in most cases it is the mothers who have the children back at home'* (HmB_LM4_Men_2).

Due to poverty and exposure to hard manual labour regularly, engagement in voluntary exercises was viewed as unnecessary and a waste of time as quoted:

'*...due to poverty we overdo some of these things like when we go to the shamba we don't do it as a form of exercise but we do it and strain to make sure we do a certain size of the whole farm'* (HmB_LM3_Men_1); '*That one cannot be possible because like, for example, I went to the farm I have been there up to 3 pm when I come back after getting something to eat I feel really tired then I would also want to sleep early and wake up*

*early so that I go finish up the remaining part of the farm so suppose I wake up and go jogging won't I be wasting time that I should be using in my farm?'* (Ksm_LM4_Men_2); '*…me I work in the Lake so we do enough exercise that even if we don't do the others we are just okay'* (Ksm_LM4_Men_2); '*You know; the kind of activities we do we can't even find time for running'* (HmB_LM4_Wom_3).

This FBDGs message statement was therefore viewed as may only be appropriate to those working in offices and not for the general public in the Region as quoted:

*'It is trying to advise those working in offices or those who have hired maids that when you come back home try and even go and fetch water and lift'* (Ksm_Urb_Men_2).

A male participant from Kisumu perceived the message as regulating his food choices as quoted:

*'These people are regulating the food we eat, like I had said before, in the past I used to eat ugali and vegetables and that's it. But these people are trying to say that I mix food, not just ugali and vegetables on the table, they are trying to say you serve three things on the table like if fish, and with legumes, beans'* (Ksm_Urb_men_2).

Adult male participants felt that the message needed to be directed to mothers or their wives. A male participant from Kisumu perceived the message as a threat to regulating food choices. Sugar added, fatty starchy food 'mandazi' was affordable and conveniently hawked to the doorstep and it would be impossible for them to moderate consumption:

'*…this message ought to have reached the mothers so that they make sure the children wash the fruits before they eat …in most cases its the mothers who have the children back at home'* (HmB_LM4_Men_2); *'My wife sells the vended foods and I do eat a lot of them so you should first go teach her that she should not put a lot of oil and sugar and also tell her the side effects'* (Ksm_LM3-men_2); *'The only thing that can make us reduce eating them is that there are times we hear news on the radio about outbreaks of diseases like cholera and it is said that they are caused by foods that are vended so that can make us stop other than that there is no other reason'* (HmB_LM3_Men_2); *'These people are regulating the food we eat, …they are trying to say that I mix food, not just ugali and vegetables on the table…'* (Ksm_Urb_men_2).

**Dietary shifts from traditional foods to consumption of processed packaged cereal flour**

There seemed to be an emerging shift in diet from consumption of traditional foods like cassava and bananas, to consumption of foods that were appealing, processed, packaged, and readily available in an urban setting but at the same time an awareness of emerging chronic disease conditions;

> *'the way am understanding this message is that we should stop imitating what we see happening currently but we should go back to the foods that people no longer use and despised like cassava, bananas'.* (HmB_LM4_Men_1)*; '... locally milled flour and brown chapati are not very appealing to us, so they are trying to encourage us people in urban areas. For us we enjoy things that are appealing like packaged flour even if you use it to prepare ugali it is different'* (Ksm_Urb_Men_2); '*because of the current diseases, like diabetes require that we eat energy giving foods like bananas, cereals, and flour mixed with cassava to help prevent these diseases'* (Ksm_Urb_Wom_2).

**Inadequate nutrition care**

Some school-going participants were under the care of guardians who did not take responsibility for breakfast preparation;

> *'...me I always stay with my grandmother and at times she may go out to look for something and comes very late when that time has already passed so it just forces us to prepare lunch of which it may not be prepared by that 1:00 pm by it might be prepared at around 3:30p.m it depends on the time she is back'* (Ksm_LM3_Adol_3); *'At times even mum and dad died long ago so at times the guardians you have are those who don't even care whether you eat or not'* (HmB_LM3_Child_1); *'According to me like us here in town, I stay with a guardian and they can not take that responsibility of preparing my breakfast'* (HmB_LM4_Adol_2).

**More information is required to make an informed choice**

The guidelines were viewed as lacking some education component on the risks or benefits:

> *'We should be given the advantages of adhering to the messages'* (Ksm_Urb_Men_1); *'It will only be possible if people are taught about the side effects of such foods* (Ksm_LM4_Men_2); *'What I think yes we have learned and when you go telling someone about them when they don't know their advantages and disadvantages the message is not complete so the advantages for each message should be included'* (HmB_LM4_Adol_3).

**Availability of motorized transport**

Different modes of transport are currently available. Many individuals in the community no longer walk or cycle as quoted:

> '*It is very difficult because nowadays people use motorbike every t ime'* (Ksm_Urb_Men_1); *'Nowadays you find that you live here you cannot even walk to town as a form of exercise. We are used to 'tuktuk' or 'matatu' (motorized public transport) and when you come back you just sit'* (Ksm_Urb_Men_2).

### 4.3.3 Ease of recall and restatement of the guidelines

At the end of each FGD session, participants were asked to recall the guidelines by restating the statements. This was to assess the understanding and the possibility of committing FBDGs to memory. Each recalled guideline was only recorded once.

**Recall of guidelines per strata**

Secondary school-going FGD participants recalled a total of 144 (73%) guidelines. This was the leading stratum followed by adult females (71%), males (62%), and lastly, the primary school going children (57%) strata respectively (Figure 10).

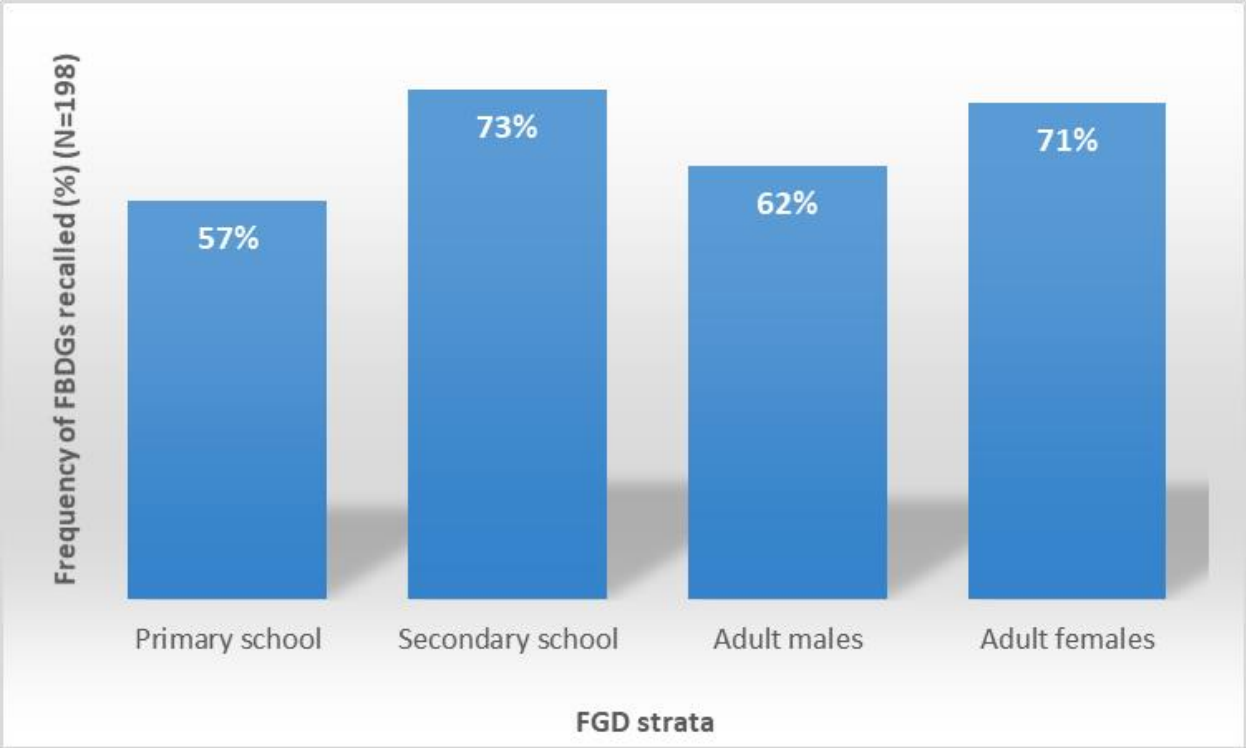


***Figure 10**: Recall of the Guidelines per Stratum*

**Recall of individual guidelines across the focus group discussions strata**

A descriptive analysis of the individual guidelines recalled across the strata showed that the stated guidelines with water and safety or moderation components were the highest recalled. The guideline, *'Drink plenty of clean and safe water every day'* was the highest recalled (90.3%). This was followed by other guidelines which included: *'Eat a variety of well-washed fruits every day* (82%); *'Use clean and safe water in food preparation and hand washing every time'* (76.4%); *'Eat meals prepared in small amounts of cooking oil'* (74%); and *'Eat less of locally vended starchy fatty foods and sugar-sweetened products'* (72%). The least recalled of the FBDGs were those related to food and meal intake, *'Every meal time serve on your meal plate a variety of relishes'* (38.9%) and *'Eat a well-constituted breakfast every morning'* (36%) (Figure 11).

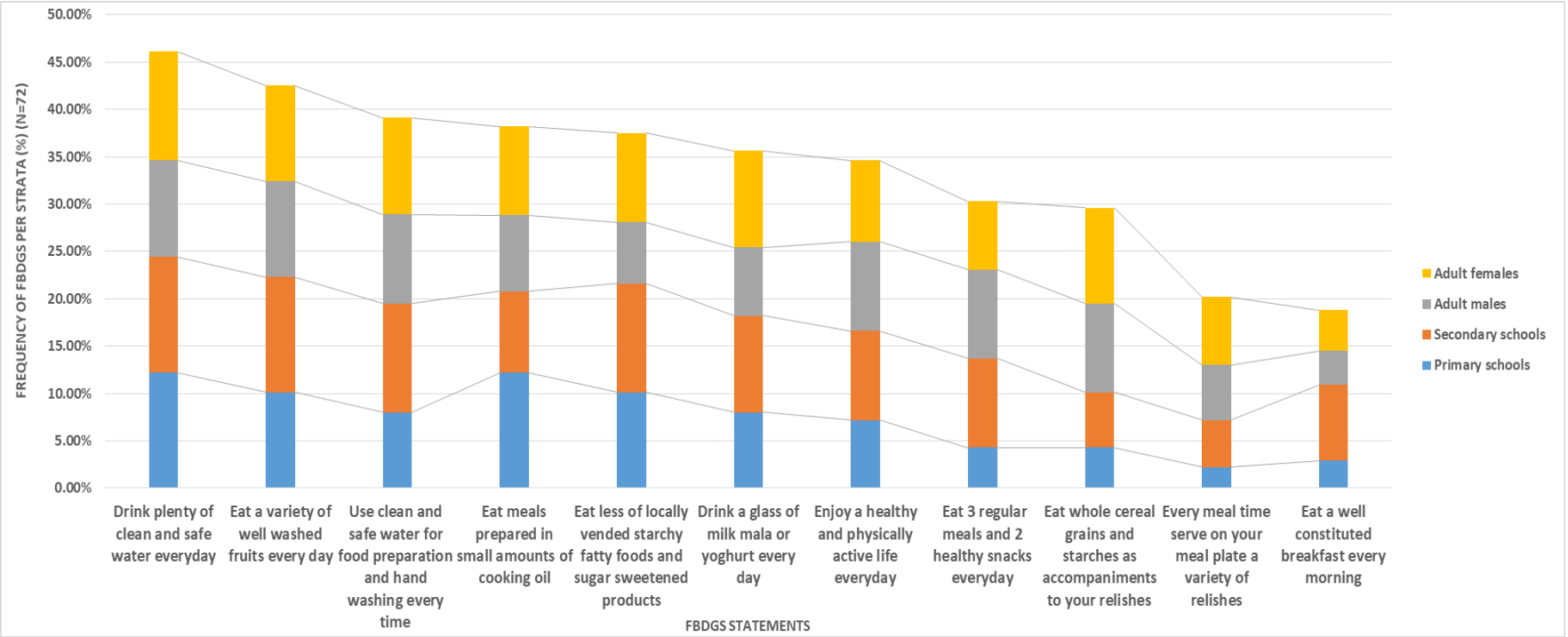


***Figure 11:*** *Recall of the FBDGs Across Strata*

### 4.4 Objective four: Rewording the food-based dietary guidelines

The fourth objective of this study was to build consensus among panel members on rewording the difficult or the least understood words of the preliminary FBDGs. Feedback from FGD was summarized to highlight the message clarity of words and the perception of the guidelines. This was to answer three questions:

i. Were the preliminary FBDGs message intent clear and well understood by the community members?
ii. Which words or terms were not clear?
iii. Which words or terms can most appropriately replace the least understood words or terms of preliminary FBDGs?

### 4.5 Rewording the guidelines

The use of words that included ‘constituted’ ‘relishes’ ‘whole cereals’ and ‘healthy’ used in the preliminary FBDGs were either not understood or polysemous. Participants sought clarification of phrases and words such as ‘three regular meals’ and ‘snacks’. Further, although the guideline to promote milk and milk products and consumption was simple and easy to understand, the translation of ‘fresh milk’ in the local language, implied the use of ‘non-boiled’ fresh milk. Inclusion of fruits was perceived to qualify a meal as ‘complete’, however, the focus of the guideline, *‘Eat a variety of well-washed fruits every day'* shifted from the need to consume fruits daily, to safety issues arising if fruits are not washed. Similarly, the use of the word 'vended' on the guideline '*Eat less of locally vended starchy, fatty and sugar-sweetened foods*' diverted discussion from the need to moderate consumption of the energy-dense foods to a focus on the safety concerns from the 'vended foods' as opposed to home-cooked foods. The words which were not clearly understood were either replaced or rephrased as shown on Table 11.

**Table 11:** Rewording FBDGs Message Statements

| Preliminary FBDGs message statements | Words/phrases found difficult during FGD | Suggested Words to include/omit | Reworded guidelines |
|---|---|---|---|
| Eat a well constituted breakfast every morning. | The word constituted was difficult to pronounce.Not easily understood.Breakfast items are 'drunk' and not 'eaten'. | Proposed words, terms such include; well mixed diet, well prepared food, balanced diet. | Eat well-balanced breakfast every morning. |
| Eat 3 regular meals and 2 healthy snacks everyday. | Most participants found it difficult to conceptualize the message. They sought for explanation of what the 3 meals and the snacks were. Confused the statement '3 regular meals' for the 3 food groups; carbohydrates, proteins and vitamins or food items in a main meal associated with these nutrients. Some participants viewed the message as stating that, out of the 3 regular meals, there is an option of taking 2 light meals or 2 heavy meals. Rice commonly referred to as light food in the region. | Name the regular meals as breakfast, lunch and supper. Remove the word snack or just use the term light meals in the translated version. | Eat lunch, supper and 2 healthy snacks every day |
| Every meal time, serve on your meal plate a variety of relishes made from | The term 'relishes' was difficult to pronounce. Practice in the community was consumption of one relish at a time. Message perceived as stating | Omit the word relishes | Eat legumes, nuts, fish, poultry, insects, meats, or eggs interchangeably |

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| fish, meats, legumes and vegetables | that all listed foods be served on a meal plate each serving time. | | every mealtime.<br>Eat plenty of diverse freshly prepared vegetables every mealtime. |
| Eat whole cereal grains and starches to include 'ugali' from maize/sorghum/millet, cassava, matoke, rice, brown chapati as accompaniments to your relishes. | To most participants, the word accompaniment was long and difficult to pronounce. The whole cereal grain flour was better understood as 'locally milled' or 'posho mill'. The term 'to include' was well understood described by term such 'changing of the diet' or 'interchange' 'replace'. | Omit the word accompaniment. Use words such as locally milled, 'changing of the diet' or 'interchange'. | Eat diverse energy giving foods to include;non-processed locally milled maize, sorghum, millet and wheat products cassava, arrow roots, yams, sweet potatoes, green bananas, rice, interchangeably. |
| Eat meals prepared in small amounts of cooking oil. | -Participants found this message simple and easy to understand. Restated in simple terms as 'not to use a lot of oil when cooking', ' not to put a lot of cooking oil, 'should eat food cooked in small amount of oil' | Indicate the amount of oil the message is referring to. | Eat foods prepared with small amounts of cooking oil always. |
| Eat a variety of well washed fruits every day. | Message perception was fragmented in three parts; first the eating of fruits every day, second, | Omit well washed.Keep focus on fruit | Eat variety of fruits every day. |

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| | was consumption ‘of variety of fruit and lastly, the washing of fruits. In some instances, the attention shifted to washing of fruits instead of consumption. | consumption. | |
| Drink a glass of milk, fermented milk or yoghurt every day. | One glass viewed as the recommendation amount for a day. This was disputed. More familiarity with a cup and not a glass. Some participants did not understand whether the term ‘fresh milk’ referred to boiled milk or non-boiled fresh milk. | Use the word at least one cup. Specify boiled milk. | Drink at least one cup of boiledfresh or locally fermented milk or yoghurt everyday |
| Drink plenty of clean and safe water everyday. | No suggested changes. | No suggested changes. | Drink plenty of clean and safe water throughout the day. |
| Use clean and safe water for food preparation and hand washing every time | Participants understood the message as ‘use of clean water. clean water was identified as water ‘not contaminated’, ‘boiled’ or ‘chlorinated’ water | No suggested changes. | Usecleanandsafewater to wash your hands andtopreparefoodeveryt ime. |
| Enjoy a healthy and physically active life everyday | - The term ‘healthy’ was translated to mean absence of diseases.‘Health’ was understood as a prerequisite for exercises. No clear link between preceding guidelines on food consumption and this guideline on Engage in physical activities every day.physical activity. | Omit the term ‘healthy’. | Engage in physical activities every day. |

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| Eat less of locally vended starchy, fatty foods and sugar sweetened products | - The word vended was perceived as expressing that it would be ok to eat starchy fatty sugary foods made at home. Even though salt did not feature on the message statement, there was awareness that salt consumption also needs to be limited in intake | Omit the word vended for message to include all foods. Include moderated consumption of salt | Eat less fatty, salty, sugar-sweetened food products. |

# CHAPTER FIVE

# DISCUSSION

## 5.1 Involvement of multisectoral panel and community members

As recommended by FAO and WHO (1998), this study sought collaborative input from a panel of policymakers and implementers in nutrition and nutrition-related from the County Governments in the Lake Victoria region. The panel proposed 11 preliminary FBDGs which were consumer-tested and revised to 12. Although Tetens *et al*. (2018) recommended the inclusion of views of behaviour scientists, psychologists, environmental scientists, urban planners, educators, and communicators to ensure that science is properly translated and that messages include all relevant aspects of healthy and sustainable diets, due to financial constraints, this study engaged officers from nutrition, health, and agriculture only. The involvement of the stakeholders is intended to raise awareness and seek their commitment to the integration of the guidelines into departmental policies and their inclusion in educational materials to aid in the dissemination of the messages to the public (Wijesinha-Bettoni *et al*., 2021).

The 30-member panel explored, deliberated, and prioritized issues of nutrition concern in the Lake Victoria region. The issues included; skipping of meals, inadequate consumption of energy foods, low consumption of vegetables, seldom consumption of fruits, low consumption of animal source foods, and less variety in kind of food consumed. Other practices included; sale of family food produce, use of unsafe water in food preparation, seasonality in food production, lack of money to purchase food and low food production. These became the basis for developing FBDGs in the region. Desirable behavior change to address the issues of concern formed the key message content of the guidelines developed for Lake Victoria (Herforth *et al.,* 2019). Hill *et al.* (2008) similarly engaged a panel of experts to identify dietary practices and desired behaviours to define the message content to inform the development of a home-based neonatal care intervention in rural Ghana. Consumer testing of the FBDGs was necessary to verify clarity, perception, and barriers to implementing guidelines in the study area. Tetens *et al*. (2018) noted that clear, simple and positively expressed FBDGs message statements were better accepted by consumers. The 12 proposed guidelines targeted all individuals above five years of age in the lowlands region of the Lake Victoria region. The study area LM zone is a region near Lake

Victoria categorized into LM2, LM3, LM4, and LM5 zones. Agricultural potential decreases from LM2 to much lower productivity in the LM5 zone. The predominant LM3 and LM4 zones were selected for this study as they were found to have high levels of malnutrition (Cheserek *et al.*, 2012; Waudo *et al*., 2006). The Kenyan ecological zones version is best suited to advise farmers since it shows yield probabilities and risks (Otolo & Wakhungu, 2013). Potentially leading crops that can be grown in these zones are cotton and groundnuts and hence the names, lower cotton zone, and the marginal cotton zone respectively (FAO, 1996). Agroecology zoning has gained greater recognition as a scientific and policy approach to transforming the food system (Guyomard *et al.*, 2020; HLPE, 2019; Mbow *et al*., 2019; Pimbert, 2018).

### 5.2 Rationale for developing guidelines for lowlands of the Lake Victoria region

In general, the developed FDBGs for the Lake Victoria region and the Kenyan guidelines (MOH, 2017) bear similar features to the global FBDGs. Herforth *et al*. (2019) found that the developed FBDGs generally promoted the consumption of a variety of foods, high fiber foods, fruits and vegetables, legumes, and moderate consumption of animal-source foods, but encouraged limited consumption of sugar, fat, and salt. Although the proposed guidelines for the Lake Victoria region were developed before the launch of The Kenyan National Guidelines they align with the national guidelines. Both the national and the proposed FBDGs for the Lake Victoria region categorized foods into five groups; starchy foods, vegetables and fruit, legumes and nuts, meats, and dairy products (Table 12).

**Table 12:** A comparison of The Kenyan National Guidelines with the Proposed Guidelines for Lake Victoria Regions

| Revised FBDGs for LM3 and LM4 zones Lake Victoria Region-Kenya | The Kenya National Dietary Guidelines for Healthy Diets and Physical Activity (MOH, 2017) |
|---|---|
| Eat lunch, supper and 2 healthy snacks every day | - |
| Eat well-balanced breakfast every morning | - |
| Eat diverse energy giving foods to include;non-processed locally milled maize, sorghum, millet and wheat products cassava, arrow roots, yams, sweet potatoes, green bananas, rice, interchangeably. | Eat a variety of foods from different food groups every day. Include whole or unprocessed starchy foods as part of meals. |
| Eat legumes, nuts, fish, poultry, insects, meats, or eggs interchangeably every mealtime. | Eat lean meat, fish and seafood, poultry, insects or eggs at least twice a week.<br>Eat beans, peas, lentils, cow peas, pigeon peas, soya, nuts and edible seeds regularly (at least four times a week). |
| Eat plenty of diverse freshly prepared vegetables every mealtime.<br>Eat variety of fruits every day. | Eat plenty of green leafy vegetables, red and yellow vegetables and fruits every day; and include a variety of other vegetables and fruit. |
| Eat foods prepared with small amounts of cooking oil always. | Use oil or fat in moderation in meals; limit the amount of solid fat. Use fortified oil |
| Drink at least one cup of boiled fresh or locally fermented milk or yoghurt everyday | Drink fresh milk, fermented milk or yoghurt every day. |
| Drink plenty of clean and safe water throughout the day. | Drink plenty of safe water |
| Use clean and safe water to wash your hands and to prepare food every time. | Wash hands with clean water and soap or ashes before, during and after preparing food or eating and after visiting the toilet |

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| Eat less fatty, salty, sugar-sweetened food products. | If you use sugar, use it sparingly. |
| | Use iodised salt, but use it sparingly. |
| Engage in physical activities every day. | Engage in physical activity. |

Although the proposed guidelines compared well with The Kenyan National Guidelines, the proposed guidelines address issues that are specific to the Lake Victoria community. Community members regularly skipped breakfast and lunch. To address this, proposed guidelines for the lowlands of Lake Victoria have additional guidelines; *'Eat well-balanced breakfast every morning'* and *'Eat lunch, supper, and 2 healthy snacks every day*. These guidelines were intended to promote the consumption of regular diets in the study area. Although literature review revealed that the region has the potential to be self-sufficient in food production, there is prevalent food insecurity, low intake of calories, vegetables, fruits, and animal source foods (Cheserek *et al*., 2012; CFSVA-WFP, 2016; GOK-ASDSP, 2014; Waudo *et al*., 2006; Waudo *et al.*, 2005). The additional guidelines aimed at promoting consumption of regular meals in the Lake Victoria region, concur with the suggested need to encourage LMIC including Kenya to increase the daily consumption of fruits, vegetables, nuts, and legumes and up to 20% of the total daily food intake (g/day) (WWF, 2020). The Kenyan Guidelines combined fruits and vegetables in one group, but separated legumes and nuts from the meats and meats alternatives group, while the proposed guidelines separated fruits and vegetables, but combined legumes and nuts with meats and meats alternatives in one group. The National Guidelines also indicated moderate use of either oil or fat and to limit the use of solid fat, the developed FBDGs for the Lake Victoria region were categorical on the use of cooking oil a practice which is on the rise. The rationale for these guidelines are as presented on table 13.

**Table 13:** Rationale for Developing FBDGs for Lowlands of Lake Victoria Region

| Proposed FBDGs | Rationale for developing FBDGs for Lake victoria |
|---|---|
| Eat lunch, supper and 2 healthy snacks every day | Most community members regularly skipped breakfast and lunch meals. Meal frequency is an important determinant of nutrient intake and diet quality (Leech *et al.,* 2016). Reasons for skipping especially breafast were associated with poverty included lack of food, time, firewood, match sticks. Meal pattern with omission of breakfast, lunch and dinner was found to relate to a clustering of less healthy lifestyle factors and food choices leading to a poorer nutrient intake (A Sjo ¨berg *et al*., 2003) and underweight (Viljakainen*et al.,* 2019).A higher eating frequency of meals, maintaining the same energy intake, was found to contribute to healthy body weight among Portuguese children (Vilela *et al.,* 2019) and beneficial effects on fasting lipid and postprandial insulin profiles and thermogenesis (Farshchi *et al.*,, 2005). |
| Eat well-balanced breakfast every morning | Breakfast was the most skipped meal in the day. From a physiological perspective, breakfast is unique among other meals in that it is eaten after the longest postprandial fasts (Gibney *et al.,* 2018). Cereal based meals provide vitamins and minerals and they are lower in fat (William, 2014). Carbohydrates and fibres, in a breakfast meal directly improve glucose metabolism and the insulinemic response over the morning hours. The resulting greater sense of satiety in the morning is responsible for the lower caloric intake during the following meals (Blom*et al*., 2005; Björck, Elmstahl, 2003; Truswell, 2002). For children, breakfast consumption has been associated with learning and better school performance ( Adolphus *et al*, 2016; Widenhorn-Mu¨ller *et al*., 2008; Yang & Jong-Hyock, 2016) ). Breakfast should provide 20%-35% of daily energy needs (Timlin &Pereira, 2007; Wardlaw, 2003). |
| Eat diverse | Meals were prepared on the basis of availability, accessibility, quantity (satiety) with less thought on the nutrient |

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| energy giving foods to include;non-processed locally milled maize, sorghum, millet and wheat products cassava, arrow roots, yams, sweet potatoes, green bananas, rice, interchangeably. Eat legumes, nuts, fish, poultry, insects, meats, or eggs interchangeably every mealtime. | quality.Instead of regular meals, tea seemed to be the most consumed beverage throughout the day. When prepared, meals consisted mainly ofa starchy staple food with one type of relish which was either *'omena'*or vegetables. Only one type of relish was consumed at a time to reserve any other relish for the next meal. A study by Othoo *et al.* (2014) similarly observedthatpregnant women in Homa Bay ate two meals a day which consisted of '*omena*'or vegetables relishes. The main staple in Kisumu was maize. The traditional foods (sweet potatoes and cassava) were not considered as important starches in their diets (Waudo*et al.,* 2005; Waudo*et al.,* 2006). Cereals are an excellent source of carbohydrates, a significant source of protein, a good source of B-complex vitamins, a rich source of polyunsaturated fats, high in both soluble and insoluble fiber and resistant starch, a good source of many minerals such as iron, magnesium, copper, phosphorus; zinc, and a good source of antioxidants and phytochemicals (Laskowski*et al.,* 2019). However, most of the grains used for human foods are milled to remove the bran (pericarp) and germ. The milling process strips the grains of important nutrients including dietary fiber, phenolics, vitamins and minerals. Whole kernel or coarsely milled grains contain more dietary fibre and phytochemicals with potential anti-inflammatory and antioxidant properties than refined grains (Ludwig *et al*., 2018). Specialized milling machines to refine cereals were available in rural areas.<br>Generally, relishes in the region were meant to just accompany the starches '*terokuon'* and not the main parts of a meal. The further an individual lived away from the Lake, the higher the cost of fish. Meat was rarely consumed and only stated as eaten in occasions such as '*when a diseased cow died' 'when there are visitors'* or '*during funerals'.*Chicken were reared in most household for financial reasons while eggs were left for the chicken to brood to multiply chicks. Legumes were referred to as the 'bank', and it was sold soon after harvested. In the study area, legumes were mainly consumed as protein sources and not as vegetables while fruits were seldom consumed (Waudo *et al.,* 2006).Animals such as sheep, goats, chicken and cows are used as food and for paying bride price (Owino, 2019). Although lack of fuel was not viewed by panel members as limited consumption of food, firewood |

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| | was stated as a challenge in cooking legumes. |
| Eat plenty of diverse freshly prepared vegetables every mealtime. | Although the WHO/FAO (2003) recommended inclusion of variety of vegetables in every meal and also in snacks, with emphasis placed on fresh vegetables in season, vegetables are hardly served uncooked as salad, but cooked and probably overcooked. Cooked vegetables are low in ascorbate (Nyakundi, 2020). Variety in vegetable consumption was also limited to green leafy vegetables, with amounts of vegetables served described as just enough to *'terokuon'* (escort ugali). An earlier study in the region described the serving of vegetables as a 'flavour' added to accompany the staple-based diet (GOK-ASDSP, 2014). Access to vegetables during the sunny season was limited and if accessible very little was eaten. Moreover, diversity in vegetable consumption is a necessary condition for a healthy diet, which requires a proper integration of dark, deep yellow, and starchy vegetables as well as tomatoes and beans in household meals (Oniang'o *et al.*, 2003). The Kenyan guideline placed emphasis on the need for diversity in kind and colour of the fruits and vegetables. |
| Eat variety of fruits every day. | Purchase of fruits was not part of the family food budget nor menu plan. Fruits were stated as bought if money remained after purchase of other necessities such as vegetables and flour which was considered as food for the whole family. Due to cost, individuals bought and ate fruits at the vendor's stall instead of purchasing for the entire family. |
| Drink at least one cup of boiledfresh or | Milk was stated as scarce in the region. Rearing of cattle was stated as a challenge due to lack of grass for grazing especially during drought seasons and also due to zoonotic diseases. Due to high cost, purchase of milk was not part of the family budget and if milk was bought it would be used to make tea. There is need to revaluate the |

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| locally fermented milk or yoghurt everyday | feasibility of this guideline considering prevalent consumption of small fish in the region. The Kenya Food Composition Tables indicate that 100 g of edible portion of omena, dried, and stewed (without salt) contained 1270 mg of calcium, while: milk, cow, whole, fermented (Lala - mursik) had 65mg; milk, cow, whole, fresh, boiled 140 mg:and milk, cow, skimmed, boiled contained 153 mg (FAO/GOK, 2018). Further, drought limited accessibility to fodder feeds for the cows. Low precipitation, heat stress and dry spells are known hazards contributing to agricultural risk in the region. Besides drought, rearing of cows was stated as expensive due to zoonotic diseases. Further, milk production from the few cows was little. |
| Eat foods prepared with small amounts of cooking oil always. | Though most research participants were increasingly using oil instead of fats in their cooking, oil was stated as more expensive and viewed as only rational to use very little when cooking. This holds true for most rural communities. However, the challenge in contextualizing this message is the need to address the excess among the affluent in the community who may need to moderate the use of oil/fat. |
| Drink plenty of clean and safe water throughout the day. | Although many children and adolescents understood the purpose of treating water as '*to kill disease causing pathogens 'germs"* to prevent diseases, water for drinking was not always treated. Lake water fetched early in the morning and borehole water was perceived to be safe and only needed to be sieved before use. Further, water from the river was thought of as '*already blessed by God'* and it was safe for use. Lake water was considered clean early in the morning. Therefore, water collected at this time in the morning was either used as it is or only sieved before use. Similarly, borehole water was perceived as clean and only sieved and used. River water was thought of as already blessed by God. Treated water was indicated as having an unacceptable taste and possible harm and boiling of water was not an option for lack of firewood. |
| Use clean and safe water to | Safe food handling procedures and food production require adequate supply of clean water. Athough there was a general understanding of the need to wash fruits as a preventive measure against stomach related diseases, the |

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| wash your hands and to prepare food every time. | practice was ignored on the premise of a long standing quote '*germs are not aware'*. More so participants did not feel obligated to wash fruits like bananas, avocado and pawpaw which are peeled before consumption. Most participants treated only drinking water. Treated water was indicated as having an unacceptable taste. of water quality, washing of hands with soap was considered safe. To facilitate use of treated water at the household level, provision of containers would be necessary. Achoki*et al.* (2016) noted that unsafe water, sanitation and hand washing was the leading risk factor in Kenya, Alarcon *et al.* (2017) observed that risk of disease and hygiene factors were in general not a priority concern to most individuals. For many living at or below the poverty line, foodborne illness perpetuates the cycle of poverty. World Health Organization has recommended use of Five Keys by food handlers and consumers for food safety: Keep clean; Separate raw and cooked; Cook thoroughly; Keep food at safe temperatures; Use safe water and raw materials (Bhagwat, 2019: WHO, 2006). |
| Eat less fatty, salty, sugar-sweetened food products. | Ease of access to the market and refinery machines with capacity to remove bran from grains made processed flour accessible in the rural areas, seemed to promote use of refined maize flour. The urban dwellers easily accessed the refined flour in the supermarkets in appealing packages.Rice grown in Ksm_LM3 and sorghum in HMB_LM3 were sold upon harvesting. Most participants described ugali made from sorghum flour as making the stomach tight, leading to constipation and difficult passage of stool. Besides, some participants disliked the brown colour of sorghum, taste and consistency. Likewise, some participants expressed dislike for whole wheat flour products (brown chapatti) and treated water on the basis of taste. It was generally believed that mixed flour form maize, millet sorghum, cassava and chappati made from whole flour is food for diabetic patients |
| Engage in physical activities every day. | Many individuals in the community no longer walk or cycle due to availability of different modes of transport. However, most rural community members were exposed to hard menual labour and engagement in voluntary exercises could be viewed as a sign of 'idleness' waste of time. For the adult female participants, they feared being judged wrongly by the community. It was therefore viewed as only appropriate to those working in offices |

and not for the general public in the region. Office workers were perceived as leading sendetary lifestyles. A study by Gichu, (2018)found that most Kenyans (92.3%) are physically active.The study found that physical inactivity (7.7%) was associated with female gender, middle age (30–49 years), and increasing level of education, increasing wealth index and low levels of High Density Lipoproteins (HDL).Sedentary behaviour is defined as any working behaviour characterized by an energy expenditure ≤ 1.5 metabolic equivalents, such as sitting, reclining or lying down (Tremblay *et al.,* 2017). For different health outcomes, different types and amounts of physical activity are required, with a minimum of at least 30min of regular, moderate-intensity physical activity (e.g. fast walking) on most days (WHO, 2020).Message statement for the Lake Victoria region and the Kenyan guidelines were similar promoting active lifestyle.

### 5.3 Use of FBDGs as a tool to communicate healthy eating in the Lake Victoria

As observed in other studies responses in this study were mentioned about the past or others and not participants' own current experiences. Similar observation were made by Laura *et al.* (2019). Although some concepts and words presented by the proposed FBDG were not familiar or polysemous, the guidelines were generally perceived as promoting the consumption of a balanced diet. Cues that included food safety, the risk of diseases, and the naturalness of food were perceived as important in healthy eating.

**Polysemous and unfamiliar concepts of the proposed guidelines**

The community's perceptions of the FBDGs' message statements within the agro-ecological setting were essential in the design of the guidelines (Keding *et al.*, 2013; Sucher & Kittler, 2007). Besides use by healthcare professionals, policymakers, and others, the guidelines serve as an approach to increase awareness and provide the public with evidence-based practical dietary and lifestyle advice using understandable language (Aranceta-Bartrina *et al.*, 2019). It is therefore important for the public to perceive the guidelines as intended. In this study, all except two or three participants in every FGD sought clarification of phrases and words 'three regular meals' and 'snacks' before they could engage in meaningful discussions. A study on South African food-based dietary guidelines (FBDGs) for children aged 6–12 months living in the Little Karoo area of the Western Cape Province South also found that majority of caregivers did not understand some of the guidelines without prior explanation (Merwe *et al.*, 2007). There was the need to restate the phrase 'three regular meals' by naming the three regular meals as breakfast, lunch, and supper. However, the word 'snack' was retained as some participants were either unfamiliar with the kind or time of snack food consumption. Snacks were viewed as foods eaten 'alongside regular meals'; at 'leisure time'; when 'swimming'; or 'when on a journey. Despite the use of the term 'healthy snacks', intended to point to desirable snack food composition, some participants identified snack foods as including cakes, sugar added beverages, French fries, and biscuits. To the local community, a meal composed of rice and tea was a light meal. Unnecessary consumption of high-energy snacks is likely to contribute to a positive energy balance (Bellisle, 2014) which could lead to obesity and associated conditions. An increase in consumption of foods with added sugars, fats, and refined carbohydrates is a characteristic feature of nutrition transition in many low-income and middle-income countries (Popkin *et al.*, 2012). Further, the word 'healthy snacks' as used on this guideline was misinterpreted to mean

that ‘healthy snacks’ were snacks that an individual needed to consume to attain good health. For clarity, it will be important to list examples of healthy snack foods (nuts, fruits, porridge, boiled maize, sweet potatoes) when communicating this guideline to educate the population on the same.

Similarly, the phrase ‘whole grains’ was literally translated by word rather than meaning. ‘Whole cereal grains’ was understood as the use of the seed grain and not their processed products. In the local language, ‘whole cereals’ was translated to mean ‘locally milled flour’ which was adapted when rephrasing the guideline. Further, the guideline ‘*Enjoy a healthy and physically active life every day* was a misfit among the dietary guidelines. Since the preceding guidelines focused on foods, the participants found it difficult to link this concept of physical activities with the issues earlier discussed. The word ‘healthy’ as presented in the guideline was misconceived to mean that a person had to be in 'good health' to engage in physical activities. There was a need to clarify this guideline before any meaningful discussions could proceed. The word ‘healthy’ was removed from the revised guideline. Harrabin *et al.* (2003) noted the need to communicate balanced scientific information effectively in ways that serve both public understanding and the objectives of communicators. Consumers are not a scientist and they already have pre-formed views.

**Perception of the guidelines based on the balanced diet concept**

Over 80% of participants perceived the proposed guidelines as communicating the need to eat a ‘balanced diet’. A study in Nepal also found that participants described healthy eating in terms of a 'balanced diet' (Shrestha *et al.,* 2017). However, the ‘balanced diet’ concept in the region was understood to mean the consumption of meals consisting of three food groups; carbohydrates, proteins, and vitamin-rich foods without any reference to minerals and fats/oils as other significant nutrients in regular diets. Vegetables and fruits were understood as significant sources of vitamins while consumption of meat, fish, poultry, and milk was associated with proteins, and foods high in carbohydrates were correctly stated as energy foods. Except for calcium and milk, participants seemed to lack knowledge of the role played by animal source foods as significant sources of vitamins and minerals. Similarly, a study conducted in western Kenya (Vihiga) described a ‘balanced diet’ as a good meal consisting of foods rich in the three nutrients eaten daily on one plate namely 'ugali', fish/beef, vegetable, and fruits (Frohberg, 2017). The associations of the balanced diet with the three food groups and the three nutrients as existed in

the community were linked to basic nutrition education as structured in the school curriculum. This suggests the need to revise nutrition education materials to incorporate other dietary principles in meal planning. Nutrient adequacy of diet improves with an increasing variety of foods both between and within food groups.

**Food safety a cue in healthy eating**

The nutritional superiority of the locally milled maize flour was ascribed to satiety and energy and the absence of added chemicals. The 'locally milled flour' was described as 'heavy', having '*more energy*' with enhanced '*satiety*'. The high fiber content in the locally milled flour is likely to increase bulk in meals, delay digestion, give a feeling of fullness for a longer time, and thus delayed the onset of hunger pangs. A similar description of whole maize meals was reported from a survey done in Nairobi (Muyanga *et al*., 2005). It was also perceived that the locally milled whole grains were without added chemicals or preservatives. Alongside the locally milled flour, traditional foods such as cassava and bananas were described as 'natural', 'harvested directly from the farm' 'without chemicals'. The use of a little amount of cooking oil or fat was perceived as a way to reduce the consumption of 'chemicals' synonymous with 'cholesterol' in participants' view. High amount of 'cholesterol' in fat or oil was perceived to interrupt the body system if taken in large quantities. Similarly, despite the provision of water treatment chemicals at some water points, adult participants expressed dislike of water chemical treatment because of taste or fear of harm. Research in Canada found that characteristics of food such as naturalness, freshness, and unprocessed were important in people's perceptions of healthy eating (Marie-Claude, 2005).

Discussions on the guideline '*Eat a variety of well-washed fruits every day'* shifted the focus of the discussions from the need to consume fruits daily, to safety issues arising from the consumption of unwashed fruits. The word 'ended' on the guideline ''*Eat less of locally vended starchy, fatty and sugar-sweetened foods*' diverted the discussion from the need to moderate consumption of the energy-dense foods to a focus on the safety concerns arising from the 'vended foods' as opposed to home-cooked foods. Other studies observed that homemade foods were regarded as fresh and hygienically prepared (Shrestha *et al*., 2017). The translation of the words 'fresh milk' as *'machiew'* which was perceived as the use of 'non-boiled' which to the community was not acceptable due to the possible presence of pathogens in non-boiled milk. The translation of the phrase 'fresh milk' to raw milk in '*Dholuo'suggests* the need to pretest

nutrition materials even those translated to the local language to ensure that the messages released to the public are perceived as intended and congruent with other health policies.

**Disease risk is a cue in moderate consumption of fats, sugar, salt, and in consumption of traditional foods**

The guidelines with moderate components were easily recalled to memory by participants across strata. Generally, the population seems to have a heightened awareness of diseases. Though beef was hardly consumed, participants knew that excessive consumption of meat could lead to gout and arthritis. Although explanations on the use of oil being perceived as 'healthier' compared to fat, was in a layman's physio-pathology use of a lot of oil was rightly associated with '*heart problems'*, '*blood pressure'*, '*coating of the heart'* '*blockage of capillaries, preventing blood flow*' and '*cancers*'. Further, the use of a lot of sugar and oil was perceived as associated with '*obesity*', '*heart diseases'*, '*hypertension*', '*cancer'* and '*diabetes*'. Consumption of fruits was widely perceived as providing '*vitamins*' which function as '*disease preventive'* playing an important role in '*wound healing'*. Hygiene and food safety issues were understood as necessary to prevent diseases which included cholera, typhoid, and dysentery. Disease outbreaks in the region seemed to be communicated to the public through mass media, and radio.

Further, there seemed to be an emerging shift in diet from consumption of traditional foods like cassava and bananas, to consumption of foods that were appealing, processed, packaged, and readily available. Concurrently there was an awareness of emerging chronic disease conditions associated with the dietary shift. Traditional foods were perceived as important in the prevention of emerging diseases including diabetes. However, despite such association, the consumption of traditional foods was viewed as a diabetic diet and not a healthy eating choice. It may be necessary to in-cooperate simple explanations of benefits accrued from adherence to the FBDGs when developing educational materials for the community.

**Guidelines with food and water safety components were easy to recall**

In a study to increase and maintain physical activity among children aged nine to 13 years in America, Huhman *et al.* (2005) found that processing and remembering a message was a prerequisite to behavioral change in a successful national mass campaign. In this study, at the end of every FGD discussion, participants were asked to recall as many guidelines as possible, avoiding a repeat. All the guidelines which had water and safety issues components were the

most recalled. Although critical hand washing points were not incorporated in the design of these guidelines, hand washing after visiting the toilet and before handling food was cited. Heightened awareness of hand washing could have been due to ongoing activities by a number of key water, sanitation, and Hygiene (WASH) non-governmental partners during the time of this research. They included; Plan International, Plan Kenya, Sustainable Aid in Africa International, Kenya Water for Health NGO, and Netherlands Development Organization. The nutrition department in the Region should take advantage of WASH programs in the region by aligning their nutrition agenda (Black *et al.*, 2013).

### 5.4 Challenges to implementation of the proposed FBDGs in the Lake Victoria region

A number of challenges which include poverty, food insecurity, inadequate nutrition knowledge, patriarchy in food choices and consumption were some of the factors found to likely act as barriers to healthy in the lowlands of the Lake Victoria region. These are challenges that may need to be targeted to reduce barriers and promote the consumption of healthy diets in the region.

#### 5.4.1 Poverty

Lack of food at the household level and money limited the quantity and quality of foods consumed in the region**.** A child participant stated that sometimes they get home for lunch only to find no food. This child could have skipped breakfast and now lunch. Such a child might not benefit much from free education. Despite food availability in the market, most participants had no money to purchase food. Lack of money was often times was a reason to skip meals, limit variety in the diet, fail to treat water, and use too little oil when cooking. Other factors which contributed to children skipping breakfast included lack of 'charcoal', 'firewood' or 'match sticks'. Consumption of breakfast was perceived as only possible for individuals with regular income like teachers. Although the Kenya National Nutrition Action plan priority areas included improved nutrition in schools by providing institutional feeding to promote adequate nutrition (MOH, 2019a), only the secondary school students had breakfast and lunch provided. Nutrition education and the promotion of good nutrition practices in schools are known to have a significant effect on fostering healthy eating habits. Lunch programmes in the study area were available for high schools and not primary schools. Although cooking food with oil was stated as the *'*sweetness of food' *'moo e mitchiemo'* cooking oil was indicated as expensive and only used in small quantities to make it last longer. This finding seems to explain an earlier finding by

Waudo *et al*. (2005) which indicated that the caloric energy contribution from fat was < 15 % in Kisumu. The FBDGs message statement on the use of oil in food preparation needs to be accompanied by documentation, stating the significance of the use of enough oil in cooking and at the same time the need to moderate its use.

### 5.4.2 Unfavourable climatic conditions

Unlike many countries, where irrigation is sustained by non-renewable groundwater, to source nearly all their staple crops (Dalin *et al*., 2017) the Lake Victoria region has the potential to irrigate the land with fresh water from the Lake. Due to low exploitation of this potential, food production in LM3 and LM4 zones in the region was stated as low and even accessibility to large fish was limited. The zones especially the LM4 zone were described as sunny, and dry with only a little rain. There was little production of maize, beans, fruits, and sweet potatoes as the weather was indicated to favour the growth of sorghum only. Further, drought limited accessibility to fodder feeds for the cows. Low precipitation, heat stress, and dry spells are known hazards contributing to agricultural risk in the region (MoALF, 2016a; MoALF, 2016b). The prevalent limited food production is likely to deteriorate further due to increasing climate variability and extreme weather (Holleman *et al.,* 2020; Wabwire*et al.,* 2020). Climate change which is already evident in the region (Wabwire*et al.*,2020) has a diverse effect on the environment (IPPC, 2019) which include reduced food production and nutrient content (Pecl *et al.,* 2017; Smith *et al.,* 2018). A simulated study on crop productivity by Kabubo-Mariara and Kabara (2018) found that climate change in Kenya will adversely affect food security, with up to a 69% decline in yields by the year 2100 if the status quo remains. Besides drought, the rearing of cows was stated as expensive due to zoonotic diseases. Further, milk production from the few cows was little. Other studies in the region indicated that livestock keeping in the region was not commercialized (Juma *et al.,* 2017; Kandagor & Nyandoro, 2018). This suggests the need to reassess and prioritize the entry points to improve food production in the region. This can be through sustainable intensification in agriculture defined by Garnett *et al*. (2013) as increasing food production from existing farmland in ways that reduce environmental pressure and do not undermine the future capacity to produce food.

Although a statistically significant increase in household income ranging from 27 to 115% was attributed, to dairy cow ownership in LMIC including Kenya (FAO/GDP/IFCN, 2018) the global livestock sector contributes 14.5% of anthropogenic GHG emissions, accounting for both direct

and indirect emissions, including land-use change, with 20% of the total coming from the dairy sector and 41% from the beef sector (Gerber *et al*., 2013). Unlike high-income countries like the United States where milk production increased (163%) as a result of milk yield improvements (271%) while the population of lactating cows decreased (60%) considerably, developing countries rely primarily on increasing the number of dairy animals to meet the growing demand for milk and dairy foods (Tricarico *et al.,* 2020). Too many animals compete for limited resources and may jeopardize growth, health, milk and meat production, and reproduction. Further, global GHG emissions from milk production, processing, and transportation represent 2.7% of global anthropogenic GHG emissions, where global emissions per unit of milk are reported at 2.4 kg of CO2-equivalents (CO2-eq) per kg of fat- and protein-corrected milk (Gerber *et al*., 2010). Enteric methane is responsible for around 50% of all GHG emissions along the production chain of milk in Western countries, and an even higher percentage in developing countries with low-yielding cows (Groot *et al.*, 2012). However, organic and low-input dairy farming has been shown to reduce environmental harm by reducing external input use (Davis *et al.,* 2020). Enteric methane emissions intensity (kg of CO2-eq/kg of milk) decreased as milk yield per cow increased. Livestock raised on range lands can also provide environmental benefits if managed properly (Tilman & Clark, 2014). Although an increase in productivity of dairy cattle increases nitrous oxide emissions where the increase in milk production was about 33%, the net GHG reduction in emission intensity was 0.63 kg of CO2-eq/kg of milk per year (27.6% decrease) in Kenya (Tricarico *et al.,* 2020). The opportunity to increase milk supply to meet growing demand and simultaneously reduce environmental impact through milk yield improvement is particularly attractive in low-income countries because most individual cows produce very low quantities of milk. Tetens *et al*. (2020) proposed that the future reference for the guidelines should read 'Sustainable food-based dietary guidelines' (SFBDGs). Sustainable food security will require availability of food or sufficient food production.

Although there is the potential to grow cassava, sweet potatoes, and maize in some parts of LM3 and LM4 zones, roaming cows and hippos destroyed crops on unfenced farms. The land was therefore left fallow. Similarly, a study in Nyando and Muhoroni observed that some households left their land fallow while other households rented out their land (Juma *et al.,* 2017). This was attributed to several reasons including poverty, old age, and the lack of labour and farm inputs. Low-income producers and consumers lack the resources to invest in adaptation and

diversification measures for better productivity of the land (UN Convention to Combat Desertification, 2017). Sustainable intensification represents the greatest opportunity for low-income countries to increase the supply of human-edible nutrients to vulnerable populations while reducing pressures on natural resources and environmental impact (Tricarico *et al.,* 2020). There may be the need for suggests a need to reassess and prioritize the entry points to improve food production in the region.

Men influenced decisions on the type of crops planted; ‘‘*Men prefer planting maize and sugar cane and if you plant, for example, sweet potatoes on the farm without his knowledge, he will come and uproot all of them’‘* (HmB_LM3_Wom_2). This finding concurs with an earlier study in Homa Bay which showed that men dominated decision-making for market-oriented crops such as beans, green grams, kales, and maize, while women were more prominent in groundnuts and sweet potato farming (GOK-ASDSP, 2014). Empowering women could improve the food security situation in the region (Wambua *et al.,* 2014).

### 5.4.3 Sale of family food produce

Although over 60% of the participants were farmers, food production in the region did not necessarily translate to household food availability. The chicken was reared for what was described as ‘emergency cash’, eggs were left for the hen to brood and hatch. Other farms' produce sold in the region included legumes, referred to as "our bank", sorghum, rice, cassava, groundnuts, vegetables, and milk. Instead of a focus on a billboard in ‘Homabay town read ‘*mtamanimali’* (sorghum is wealth) implying that sorghum planting was promoted not for ‘family consumption’ but solely for income. Selling the family food produce meant that households sourced their foods from the market. This finding concurs with other studies in the region and Africa. A study in Kisumu found that subsistence food farmers depended on the market for household food supplies (Hayombe *et al.,* 2019). Similarly, a study in Ethiopia, found that rural markets and not subsistence agriculture played a much larger role in dietary diversity (Sibhatu & Qaim, 2017). Also, research in Northern Ghana observed that the production of smallholder farming households was not related to children's dietary diversity and nutrient adequacy (de Jager *et al.,* 2018). Low income obtained from the sales of family foods and the meager wages obtained from menial jobs in the Lake Victoria region was often insufficient to buy food to add variety to the diet. The money was often spent on non-food items such as paying

for school. Households with limited income in Kenya were found to face unwelcomed trade-offs between food and other types of household necessities (Wambua *et al.,* 2014).

### 5.4.4 High cost of food

Except for small fish '*omena',* consumption of animal source food was low due to high cost. Most participants in the region rarely consumed large fish due to cost. Although a study in Kisumu found an association between meat with high socioeconomic status in Kisumu urban (Owino, 2019) not less than eight (68%) participants in every FGD stated that meat was inaccessible due to cost. More meat consumption at higher incomes is driven by preferences rather than prices or nutrient requirements since nutrient adequacy can be reached at the lowest costs with meat and fish typically providing less than 2% of total dietary energy (Bai *et al.,* 2021). Milk was preferably used to prepare tea which was served to everyone including children. Low consumption of animal source food was not unique to the region. Similar findings were observed in Kakamega County (Ombogo, 2017). Throughout SSA Africa, animal source foods have been noted as prohibitively expensive for the poor (Headey & Alderman, 2019). Bai *et al.* (2021) noted that high prices lead dairy and eggs to be omitted entirely from least-cost diets in almost all LMIC, while they are included in large quantities providing around 8% of dietary energy in the least-cost diets in high-income countries. Besides animal source foods, fruits were also stated as costly in the region. Participants preferred to purchase vegetables rather than fruits. A study done in Nairobi to inform policy reported similar findings (Ayieko *et al.,* 2005). The study found that households could only afford the basic foods such as vegetables, a 'necessity', but devoted little to fruit consumption which the researcher referred to as luxury goods. Further, the use of oil rather than fatwas indicated as more expensive. Therefore, the amount of cooking oil/fat had to be rationed to prolong use. For participants who depended on the sale of farm produce, the return was too little to afford the purchase of other foods to ensure adequacy and dietary diversity. This finding is in agreement with the global report where the cost of healthy diets has generally been indicated as above the poverty line and unaffordable for the poor (FAO, *et al.,* 2020). Studies that have indicated a high cost of food as a factor in low consumption of healthy diets include studies by Viljakainen *et al.* (2019), Shrestha *et al*. (2017), and Seguin *et al.* (2014). Since most people depended on the market for food, additional strategies may be needed to increase the food availability and accessibility of the households, especially that of fruits and vegetables (de Jager, *et al.,*2018). Further, diversification of the

crops grown, increased production of specific crops, and market-based strategies are necessary. Animal source foods, including milk and dairy foods, are desirable and their consumption increases with increasing population and household incomes (FAO, 2020).

### 5.4.5 Skipping of meals

Although meal frequency is an important determinant of nutrient intake, diet quality, and nutritional status, breakfast and lunch meals were regularly skipped in the region. Supper seemed to be the only square meal planned for by most families, while breakfast was the most skipped. This concurs with findings on barriers to access healthy food which was associated with less frequent consumption of breakfast and lunch (Wolfson *et al.,* 2019). Family composition and size seemed to influence the skipping of breakfast meals in the region. The women and elderly siblings often skipped meals in favour of the younger family members. This finding agrees with another study in Kenya where the mothers or some older members often skipped breakfast to leave food for younger members of the family (Monari, 2018). A study among Swedish adolescents (15 – 16y) found that meal patterns with the omission of breakfast or breakfast and lunch were related to a clustering of less healthy lifestyle factors and food choices leading to a poorer nutrient intake (Sjoberg *et al.,* 2003).

### 5.4.6 Consumption of inadequate quantity and quality of food

During dry seasons, the number of vegetables served was stated as very little or none. During such lean periods. The only relish cooked then was *'omena'*. Fruits were purchased and shared out in small pieces. As expressed by a child participant, the choice to wash or not to wash hands before meal consumption depended on the amount of food served and the number of persons set at the table to share the meal. Little food meant that the child ate without washing the hands. Foods in the region are served and eaten from one plate. Similar findings, a study among residents in Nairobi slums found that individuals in food-insecure households ate little food inadequate in quantity (Kimani-Murage *et al*., 2014). An increase of up to 20% of total daily food intake to meet dietary guidelines goals in Kenya has been recommended (World Wide Fund for Nature, 2020).

Due to the limited availability of food, only one kind of relish was served in a meal to 'conserve' any other relish for the next meal. Foods eaten at lunch were mainly snacks which included, ''tea, porridge, roasted maize, and water. The only main relishes were '*omena'* and vegetables.

Food insecurity can worsen diet quality and consequently increase the risk of various forms of malnutrition, potentially leading to undernutrition as well as overweight and obesity (FAO *et al*., 2020). Haddad *et al. (*2016) pointed out that when seeking to improve diets, a focus on food systems and the food environment is key, particularly as regards the availability, accessibility, affordability, and acceptability of healthy, sustainably produced food choices. To address the issue of low consumption of animal source foods, the South African FBDGs recommend daily consumption of animal source foods; chicken, fish, meat, or eggs (Bailey *et al.*, 2013). The Kenya guidelines recommend consumption of the same but including, insects at least twice a week (MOH, 2017).

### 5.4.7 Purchase of fruits and milk were not part of family food budget

Participants in this study indicated that the purchase of fruits and milk was not part of the family food budget or menu plan. Adult female participants in the study area stated that the purchase of fruits was never in their minds. A study by Ducrot *et al. (*2017) found that meal planners were more likely to have higher adherence to French national nutritional guidelines, higher overall vegetable and fruit variety, and thus a higher variety of the diet compared to non-meal planners. In this study, purchase of fruits was not part of the budget. Fruits were only bought if money remained after the purchase of necessities such as vegetables. Similarly, milk was majorly used to prepare tea. Individuals in this study preferred to purchase ingredients like sugar to prepare tea without milk, rather than purchase milk. A study done by Ayieko *et al.* (2005) in Nairobi noted that as income increased, the number of fruits and vegetables consumed per adult equivalent increased as well. The researchers further observed that, as household income rose higher, the share of the vegetable in the total food expenditure decreased while the fruits increased. Besides fruits, milk in LM3 and LM4 zones in Lake Victoria seemed to qualify to be referred to as luxury goods.

Although the proposed FBDGs for Lake Victoria promotes consumption of at least one cup of milk per day, the region is a milk deficit zone. The low milk intake could be compensated by intake of *'omena'*. Small fish are important source of calcium, particularly for people who do not consume dairy products (Ruxton, 2011). A study by Resten *et al.* (2020) found that small fish species commonly consumed whole contained significantly higher concentrations of micronutrients such as calcium (960 mg/100 g), iron (3.3 mg/100 g), zinc (2.1 mg/100 g), vitamin A (295 µg/100 g), and eicosapentaenoic acid and docosahexaenoic acid (0.14 and 0.32

g/100 g), respectively. The Kenya Food Composition Tables indicate that 100 g of the edible portion of *'omena',* dried, and stewed (without salt) contained 1270 mg, while: milk, cow, whole, fermented '*Lala'* had 65 mg; milk, cow, whole, fresh, boiled 140 mg: and milk, cow, skimmed, boiled contained 153 mg/100 g (FAO & GOK, 2018). A study among 19 healthy men and women (21-28 y) in Bengali found that calcium in skimmed milk and fish bones had the same bioavailability (Hansen *et al.,* 1998). There may be a need to assess the amount of small fish in the daily meals of individuals in the Lake Victoria region to determine adequacy in the provision of calcium.

### 5.4.8 Inadequate nutrition knowledge

Though the term *'variety'* was referred to as a principle in diet planning, translation to menu plan indicated limited nutrition knowledge. The exchange of boiled maize and roasted maize was viewed as introducing variety to a meal, while the consumption of fish, other meats and legumes was viewed as a replication of nutrients.Nutrition knowledge as existed in the community was linked to the school curriculum structure. Eatwell week, a nutritionally balanced 7-day menu that satisfies nutritional guidelines of the Food Standards Agency in Scotland found that consumers often lacked the knowledge to make informed substitutions of menu items during the week (Leslie *et al.,* 2013). Marie-Claude (2005) found that concepts related to healthy eating, such as balance, variety, and moderation were often mentioned by participants, but they were found to be polysemous. Findings suggest the need to revise nutrition education materials to incorporate evidence-based dietary principles in meal planning and lifestyle choices.

Although children and adolescents understood the purpose of treating water as 'to kill disease-causing pathogens 'germs'' to prevent diseases, water for drinking was not always treated. Sieving of water was viewed as adequate before use of Lake, dam, or river water. Drinking treated or boiled water was stated as only feasible when one was within the homestead. Valtin (2002) noted that, although probably not in the majority of instances, encouraging the population to drink an increased amount of water might lead to the drinking of a poorer quality of water with exposure to pollutants. In this study, washing dirty hands with soap without necessarily considering water safety was thought to be adequate. Although Wolf *et al. (*2018) in a meta-analysis found that interventions promoting hand washing by soap reduce diarrhoea risk by 30%, Curtis *et al*. (2000) noted that hand washing with soap was often not adequate in settings where the environment and water are highly contaminated. The Lake Victoria region is hot, semi-

humid and most individuals in the rural areas engaged in strenuous activities. involuntary water intake was limited. The participants indicated that they only drank water when thirsty or after meals. To communicate the need for voluntary intake of safe drinking water, both the Lake Victoria Region and the Kenyan Guidelines included the water safety aspect. Similar to the need to drink clean and safe water, the design for guidelines on water for hand washing and for cooking incorporated the clean and safety aspects.

### 5.4.9 Beliefs and attitude

Dislike of some foods, perception of 'ideal' meal composition, water and safety issues were some of the factors which contributed to inappropriate practices in the study area.

**Dislike of sorghum and vegetables**

Sorghum, a cereal referred to as a hunger crop is agronomically suited to hot and dry AEZs where other crops do not grow easily (Muui *et al.,* 2013). Although more sorghum was grown in HmB_LM3, consumption was limited. According to Schipmann-Schwarze *et al*. (2013) maize is more likely to be consumed because of habit and availability, whereas sorghum and finger millet are deliberately consumed by choice. The participants described sorghum as tasteless. Others disliked it because of colour (Brown), consistency, hardening of stool, and difficulty in defaecation. Although sorghum was described as tasteless, some varieties are known for their bitter taste which may be due to trace quantities of low molecular weight phenolic compounds such as flavonoids (>10.0mg/g dry weight), microbial metabolites, rancid oils, and hydrolysed proteins (Drewnowski& Gomez-Carneros, 2000). Farmers have been noted to prefer the adoption of sorghum seed varieties based on consumption attributes which included taste (Andiku *et al.,* 2021; Timu *et al*., 2014). A study to measure consumers of sorghum composite flours in porridge in Western Kenya results from the mean sensory scores of sorghum flour with different tannin levels low tannin and no tannin varieties scored higher means in acceptability, an indication that during further food processing, low and free-tannin sorghum varieties will be suitable in the development of composite flours as well adoption by the community members (Mugalavai *et al*., 2019). Apart from sorghum, participants who were familiar with whole wheat flour expressed dislike of products such as brown chapati terming them as tasteless. Wheat is the second largest consumed cereal in Kenya. However, some participants were not familiar with whole wheat flour. There may be a need to increase the exposure of the whole wheat grain to the population. A study to evaluate the effect of mere exposure to whole cereal grains on liking,

acceptability, and consumption of whole cereal foods found that a 6-Week exposure to whole cereal grains resulted in improved ratings of liking, flavor, texture, and willingness to include whole grains in the regular diet (De Leon *et al*., 2020).

Although the most consumed relishes in the region were stated as vegetables and *'omena',* the quantity of vegetables served during dry seasons was indicated as very little or none. Further, adult males and female participants expressed dislike for vegetables, while mothers reported that their children averted vegetables. In the study area, vegetables were associated with low socioeconomic status. Consumption of vegetables other than cabbage with foods such as chapati beef and legumes was thought of as not 'rhyming'. Studies by Kimiywe *et al.* (2007) in Kenya and Ineke *et al.* (2007) in South Africa observed that more women than men preferred vegetables to consume vegetables. A study conducted in Nairobi, Nakuru, Kisii, and Kakamega found that rural dwellers ate leafy indigenous vegetables on daily basis during the study period as opposed to about four times a week among the urban dwellers (Gido *et al.,* 2017). The rural dwellers were more informed about the medicinal benefits associated with indigenous vegetables and perceived that retail prices were more affordable. Although Van der Lans *et al.* (2012) found that lower disposable income hinders vegetable intake, Ayieko *et al.* (2008) noted that as income increased the quantity of fruits and not vegetables consumed per adult equivalent prominently increased in Kenya. Education about the importance of vegetables and variety in diet should be integrated into healthy eating education and promotion.

### 5.4.10 'Ideal' breakfast meal

The FGD participants described a good breakfast as a set menu composed of 'tea with milk and bread', or 'tea with eggs', besides 'porridge'. In the Lake Victoria Region, tea with milk and porridge were perceived as the main item in a breakfast meal. Other studies also found that beverages were the main breakfast food items. A descriptive cross-sectional study to assess intake of breakfast and choice of food consumed by school children (4-12 years) in Sri Lanka found that, out of 211 school children, the first food consumed by 90% was a beverage i.e. tea with milk (70%) full cream milk (16%) (Senanayake & Parakramadasa, 2008). A study in Malawi to explore the food consumption patterns and diet adequacy for school going children (78) aged 7-9 years in Kalira of Ntchisi district found that, though only 28.4% were provided with breakfast before going to school, the meal consisted of black tea or porridge made from whole maize flour (Katungwe, *et al.*, 2015).

### 5.4.11 Water safety and beliefs

Lake water was considered clean early in the morning. Therefore, water collected at this time in the morning was either used as it is or only sieved before use. Similarly, borehole water was perceived as clean and only sieved and used. River water is already blessed by God in the words of a child participant from Ksm_LM4 and an adolescent participant from HmB_LM3. Rainwater was equally thought of as being safe even on long storage. Water is likely to be clear in the morning. This is because the sediments transported by water settle out of the water column onto the surface at night when there is the least disturbance on the water mass. However, the microscopic impurities like bacteria, viruses, and parasites that contaminate water are not visible to the naked eye. Safe drinking water, as defined by the Guidelines, does not represent any significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages. Safe drinking water is required for all usual domestic purposes, including drinking, food preparation, and personal hygiene. Indeed, a continuous effort should be made to maintain drinking water quality at the highest possible level. An important concept in the allocation of resources to improving drinking-water safety is that of incremental improvement towards long-term health-based targets. Priorities set to remedy the most urgent may be linked to long-term targets of further water quality improvements (e.g. improvements in the acceptability of drinking water in terms of its taste, odour, and appearance (WHO, 2017).

### 5.4.12 Patriarchy and diet quality

Consumption of the choicest part of poultry, eggs, and use of milk in tea preparation seemed to be a preserve for the father of the household. Drumsticks, cloaca, and gizzard were indicated as served to the head of the household or the mother-in-law if the son is dead. Serving these parts to someone else was considered as usurping of power. A 61-year-old female, she could only buy fruits upon the visit of her son-in-law. According to Owino (2019) when an in-law comes to visit, then a chicken has to be slaughtered. Most physical activities among the adult population were mainly mandatory domestic work which included farming and household chores. Voluntary engagement in physical activity was observed in urban settings. Engagement in voluntary physical activity seemed to be more acceptable among men. A study by Morrow *et al.* (2016) found a higher proportion of men report meeting the recommended weekly exercise duration compared to women. This could be due to perceived gendered norms and relations (Nunan & Cepić, 2020). A study among the Mijikenda fishing community in coastal Kenya to explore

contradictions in gendered power relations found that women's capacity to maintain their own and their children's everyday security, including their daily meals, is built on their gender roles and relationships within patriarchal structures (Kawarazuka *et al.,* 2019). A woman participant in the study stopped her business to cook food for her husband and his friends. She did not serve herself food or her children, stating that, she only cooked lunch if her husband was around.

### 5.4.13 Easy access to starchy fatty sugar added snacks

Snacks were vended to door steps as well as outside the school gates. These snacks were affordable and when asked if they could reduce their intake of these foods, some participants felt threatened due to their accessibility. Some parents indicated that, instead of giving breakfast to their children at home, they gave them some money to buy snacks at 10.00 am during school break. A study of eating behaviour among children in Liverpool showed that missed breakfast was replaced by eating convenience food on the way to school (HHackett *et al.*, 2002). Individuals who took a diet high in micronutrients and lower in calories were found to experience less uncomfortable physical and emotional symptoms of hunger (Fuhrman *et al*., 2010; Sarter *et al.,* 2008). A study among urban school children in Nairobi aged 8–11 years found that, even though almost all children carried money to school and made a decision on foods to buy, 64.9 % of them reported that they did not care about what they ate since they were still young (Mbithe *et al*., 2015). There is a need to outline the risks and benefits of the FBDGs when presenting the concept to the community (Murray *et al*., 2008).

### 5.4.14 Biodegradation and diminishing biodiversity

There were also some indications of reduced biodiversity within the ecosystem and ongoing destruction of the natural habitat. According to a 67-year-old female participant, wild fruits were no longer available in LM4 unlike in the 'olden days. Further, some participants were engaged in charcoal burning 'up the hills. There was also an evident shortage of firewood. School-going participants skipped breakfast for lack of firewood or charcoal to cook. In the absence of water treatment chemicals, water for drinking could not be boiled citing a lack of firewood. Similarly, the long duration taken to cook beans was seen as wasting cooking fuel. Besides feeding the growing population, the agriculture sector in Kenya which has four major sub-sectors, namely, crops, livestock, fisheries, and forestry is key to creating wealth, reducing poverty, and managing the degradation of natural resources (MoALF *et al*., 2017). The situation is anticipated to get worse with climate variability if the status quo is maintained. According to Roy *et al.* (2018)

projections, climate-related risks of adverse consequences which include health, food security, and livelihoods will increase with global warming of 1.5°C and increase further to 2°C if the status quo remains. Food production is estimated to contribute to some 20–30% of GHG; is the leading cause of deforestation, land-use change, and biodiversity loss; accounts for 70% of all human water use; and is a major source of water pollution (Johnson *et al.,* 2014; Smith *et al.,* 2014). With GHG emissions, animal-sourced foods are indicated as having higher footprints (Poore & Nemecek, 2018). It is estimated that 30% of global biodiversity loss is linked to livestock production, driven by livestock's role in deforestation and land conversion, overgrazing and degradation of grasslands, and desertification (Vanham *et al.,* 2018). The current global conversation is therefore centered on how to produce healthy diets which are sustainable within the planetary boundaries while meeting the food demand of the increasing world population (Fischer & Garnett, 2016).

A planetary health plate 'should consist by volume of approximately half a plate of vegetables and fruits and the other half, displayed by contribution to calories, which should consist of whole grains, plant protein sources, unsaturated plant oils, and (optionally) modest amounts of animal sources of protein' (Fischer & Garnett, 2016). Willett *et al.* (2019) proposed the consumption of a 'healthy reference diet' by reducing over-consumption of animal-source foods, by increasing the relative consumption of plant-based foods which confers both environmental and health benefits (win-win) as opposed to win-lose, lose-win and lose-lose. The focus is on the shift of global dietary patterns to the extent that we did not waste food, overconsume calories or demand excessive amounts of the most environmentally damaging foods to significantly reduce total demand for food and hence total demand for land and other natural resources (Clark *et al*., 2020). Besides feeding the growing population, the agriculture sector in Kenya is stated as key to creating wealth, reducing poverty, and managing the degradation of natural resources (MoALF *et al*., 2017). Sustainable agriculture has been defined as the management and use of agricultural ecosystems in a way that maintains, both today and in the future, biological diversity, regeneration capacity, vitality, and productivity (Meng, 2015).

# CHAPTER SIX

# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Conclusions

i. Nutrition and nutrition-related health issues considered as the basis in drafting FBDGs for Lake Victoria region included; Micronutrient deficiencies (vitamin A, iron, prevalence of anaemia), insufficient calories, underweight, high starchy diets, low consumption of vegetables, fruits, and animal source foods, limited access to safe water for drinking and food preparation. Others included emerging overnutrition and health-related concerns in the Lake Victoria region. Although deficiency of zinc, cultural influence on food choices were prevalent in the region, lack of cooking fuel and low consumption of food providing inadequate calories including low use of fat/oil, the 30-member panel failed to agree on these as issues of consideration in designing the FBDGs for the Lake Victoria region.

ii. Eleven preliminary FBDGs were developed. These were consumer-tested among 850 community members and revised to 12 FBDGs. To draft FBDGs the 30-member panel of policymakers and implementers in the nutrition, health and agriculture sectors explored dietary and lifestyle behaviours which contributed to poor quality diets as outlined in (i) above. Factors cited included; skipping meals, dependence on maize as the main starchy food, little variation in the type of relishes consumed, limited consumption of milk, and seldom consumption of fruits were issues associated with poor quality diets in the study area. Desirable dietary and lifestyle changes to address identified practices in the region became the key message content in crafting the FBDGs message statements. Although the proposed guidelines compared well with The Kenyan National Guidelines, the proposed FBDGs for the Lake Victoria region address other issues which are specific to the community.

iii. The proposed FBDGs were perceived as promoting the consumption of a balanced diet. As a concept, a balanced diet was misrepresented as composed of only three nutrients; carbohydrates, proteins, and vitamins. Based on this, meats, fish, and milk were rightly grouped as body-building foods, carbohydrates as energy-giving foods while vegetables and fruits were placed in one group as sources of vitamins. Animal source foods were not recognized as important sources of minerals and vitamins. Consumption of diverse foods

within the same food group was viewed as a replication of nutrients. Concepts such as naturalness of food, no use of chemicals, and moderation in the consumption of fat and sugar were perceived by community members as reducing the risk of emerging chronic diseases. Most of the issues identified by the panel members were validated by the community. Although the development of the FBDGs emphasizes personal responsibility in choosing a good quality diet, challenges observed in the region were beyond the control of individuals. Elements of food insecurity existed in the community. They included limited food production, unavailability, inaccessibility, and unsustainability. Other factors were poverty, lack of income, sale of family food produce, family size, beliefs and attitude, patriarchy, inadequate nutrition knowledge, and poor dietary practices. Supper was the only meal planned for the day. Poultry and eggs were rarely eaten. Legumes were only eaten during harvesting and in secondary schools where lunch programmes existed. Due to cost, meat and large fish (Tilapia, Nile perch) were occasionally consumed. Further, cost limited availability and accessibility to milk and fruits. These factors present challenges in the adaption of FBDGs. Other factors which may hinder adaption of desirably behaviour change included beliefs and associated practices. Water collected from the river was believed to be blessed by God. While the Lake Water collected in the morning was regarded as clean and therefore safe to use without treatment. Engagement in physical exercise by adults in rural areas was perceived as unacceptable more so among females adult.

iv. Concepts which included, ‘three regular meals’, ‘snacks’ ‘food variety, and ‘healthy and physically active lifestyle’ were either unfamiliar or polysemous. The translation of the words ‘fresh milk’ as *‘machiew’* which was perceived as the use of 'non-boiled'. There was a need to rephrase these words for clarity in the final draft of the FBDGs.

### 6.2 Recommendations

i. The proposed FBDGs for the Lake Victoria region address issues which are specific to the community. Development and consumer testing of food-based and lifestyle guidelines for other defined population in the Country may be necessary to assist in formulation of relevant policies, programmes, and resource mobilization within the population of interest.

ii. Healthy eating guidelines will not be feasible if food insecurity is not addressed. There is need to generally improve food security status, in LM3 and LM4 zones of Lake Victoria Region-Kenya. Comprehensive intervention which facilitate access to efficient food system

and adequate economic resources is required to overcome challenges beyond control of individuals. The County Nutrition Department should continuously engage related departments to influence the development of nutrition-sensitive programmes in the region to encourage positive food and lifestyle choices.

iii. The concept of promoting healthy eating based on the principle of a 'balanced diet', and the three food groups should be revised to to align content with current evidence-based information. Also, there is a need to develop nutrition education materials to communicate the FBDGs to the community. The education materials should incooperate simple explanations of benefits accrued from adherence to the FBDGs.

iv. It is important to pretest nutrition materials even those translated to the local language to ensure that the messages released to the public are perceived as intended and congruent with other health policies.

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# APPENDICES

## Appendix I: Summary of the Global Food-Based Dietary Guidelines (Hertfort *et al.*, 2019)

| Food group | Review of FBDGs by Hertfort *et al.* (2019) from 90 countries including Kenya | Kenya |
|---|---|---|
| **Starchy staples** | Out of 90 countries, 66% included key messages concerning starchy Staples, 16% imply their consumption within a general dietary variety message, 14% provide a quantitative recommendation for either starches as a whole or whole grains specifically, 27% advising daily consumption of starchy staples or as part of most meals,11% recommend consumption as "plenty," "mainly," or "more", 6% used as "adequate," "enough," or "appropriate" amounts, in one-quarter of countries the message was exclusive about whole grains, 29% have key messages on starchy roots and tubers together with grains higher probability of a roots/tubers mention in Africa (57% of countries with FBDGs) and in Europe(42%). | 'Include whole or unprocessed starchy foods as part of meals'. General reference is made to whole grains, no mention of the word 'cereals' nor roots and tubers, whether intake should be increased or decreased, but to just make the whole grains as part of meals. |
| **Fruits and vegetables** | Key messages given in 93% of countries, structure of message was either simple and cover one dimension "Eat plenty of vegetables and fruit every day"(South Africa), or multidimensional, such as "Eat various types of vegetables and fruits several times a day (at least 400 g/day) preferably fresh and locally produced" (Albania), other recommendations included consumption daily (69%), variety (42 %), to eat "plenty," "a lot," or "more" (38%), specific on servings One-third of countries, amounts in grams expressed only by European countries (21%), variety of colors (19%), green leafy vegetables (10%), orange fruits and vegetable (6%), specific mention on berries (Four countries in Europe), fruits and vegetables that are fresh (10% of countries), local (8%), or seasonal (7%), whole, raw, or unprocessed forms of fruits and vegetables (11%), consumption in various forms (3% e.g., cooked, part of sauce, etc.), consumption in terms of vitamin and mineral content (8%), for fiber content (7%), for maintaining a healthy, weight or preventing disease (3%), variety within fruits and vegetables (59% of countries especially in Latin/Caribbean America, 36% in Europe, 29% in Asia and only one country in African). | 'Eat plenty of green leafy vegetables, red and yellow vegetables and fruits every day; and include a variety of other vegetables and fruit'. The massage is multidimensional specific on colour (green, red yellow) and leafy vegetables and consumption on daily basis. |
| **Protein foods (**Including animal and plant-source proteins | Key message about protein foods (74%, 67 countries), meat (53%), poultry (29%), fish (58%), eggs (31%), legumes (41%), and sometimes dairy (9%), nuts/seeds (8%), and insects (only Kenya), include a quantitative message (38% of 67 countries), almost all of these refer to times or servings per week: Pulses/vegetable protein ($n$ = 12): 6 times or servings per week; Meat/egg/poultry/animal source foods (variously defined) ($n$ = 15): 5 times or servings per week. Of the 15 countries with quantitative recommendations, 11 specified it as a target, and 4 as a limit/maximum. Red | 'Eat lean meat, fish and seafood, poultry, insects or eggs at least twice a week'; All animal source foods, no quantities mentioned. Message implies all the listed foods serves as alternatives to be eaten |

| Food group | Review of FBDGs by Hertfort *et al.* (2019) from 90 countries including Kenya | Kenya |
|---|---|---|
| | meat ($n$ = 3) only appeared in terms of an upper limit amount (<500 g/wk by Finland and Sweden), 4 times per month(Greece), the most common themes; "lean meat" or removing of fat from meat (34%); positive message about consuming fish (27%); limiting or moderating meat consumption (23%); Only a small amount of processed meat" (Sweden); one-quarter (27%) special message about fish that is positive; imply that fish is not substitutable (17%); moderation/limit of fish (Canada and Belgium to limit exposure to mercury); key messages include both animal and plant sources of protein (33 of 67); Five Latin America and the Caribbean (North America) imply that meat is nonsubstitutable, on the basis of providing iron/preventing anemia; in 23 of 67 countries, non-animal source food presented as substitutes for animal source foods; 9 of 11 countries in Asia Pacific region listed vegetable protein and animal source food in the same general message ( implying use as alternatives). | twice a week only. |
| **Legumes and nuts** | Key messages concerning legumes and/or nuts included in 58% of countries and an additional 10% imply encouragement to consume all food groups including legumes and sometimes nuts in their food guides. Countries were more likely to include key messages about legumes (56%) than about nuts (19%). Only 3 countries (Malaysia, Belgium, and Malt) recommended "moderate" consumption of legumes, all the others encourage consumption of legumes. Legumes (with or without nuts) were presented as a separate food group in 26% of countries, grouped with "protein foods" in the two countries of North America, 73% of countries in the Asia Pacific region and 74% in Europe, not usually grouped with animal source food in 8% of countries in North America, more likely to be grouped with vegetables in Europe (30% of countries); outside of Europe, only 3 countries group legumes with vegetables. Legumes (or legumes and nuts) are most likely to be given their own group in the Near East (50%) and in North America (54%), only grouped with starchy food in North America where legumes are commonly grouped with starchy staples (33%). | Eat beans, peas, lentils, cowpeas, pigeon peas, soya, nuts and edible seeds regularly (at least four times a week). Conutiesexplicity placed legume as proptein or vegetables |
| **Dairy** | Out of the 90 countries, 75% included dairy in their FBDGs. Dairy messages distinct from other "protein foods" in 59% of countries, 63% of include dairy foods in any key message, In food guides, dairy is its own food group in 64% of countries, and grouped with protein foods in 31% of countries, whereas only 3 countries (4%) have no visual representation of dairy, and in 1 country (China), dairy and soy are grouped. All dairy messages include mention of milk; 51% (comprising 46 of the 53 countries with dairy messages) include "milk products," yogurt, or cheese in addition to fluid milk; 11% (10 countries, distributed across various regions) include nondairy alternatives to milk such as soy-milk or other calcium-rich foods; and in only 3 countries in North American does the dairy message also | 'Drink fresh milk, fermented milk or yogurt every day' the Key message is distinctively presented not as part of proteins, mentions milk and other milk products, daily consumption not quantified. |

| Food group | Review of FBDGs by Hertfort *et al.* (2019) from 90 countries including Kenya | Kenya |
|---|---|---|
| | include eggs. Over half of the countries with dairy messages recommend dairy consumption "daily" (27 of 51 countries). A quantitative message is conveyed in key messages of 14% of countries. Half of countries' dairy messages include a mention of "low fat" (29% of all countries, *n* = 26), whereas low salt and low-sugar dairy are mentioned by only 4 and 5 countries, respectively. Six countries include calcium in their key message about dairy. Four countries guide consumers to consume "more" dairy, whereas 2 countries include guidance to limit or moderate dairy consumption. | |
| **Fats and oils** | Most countries (89%) were found to have a key message on limiting fat, 44% on the quality of fats apart from limiting consumption, 18% on healthy fats that should be consumed regularly (100% in North America, Europe (33%), and 3 countries in Latin America (11%), 29% indicate preference for unsaturated over saturated fats, in the food guides of 35% of countries, healthy and unhealthy fats are grouped together in the same "fat" group, and in 36% of countries there is a mixed or double visual message about the fat group. For example, the food guide might include clear examples of healthy fats (e.g., "olive oil" or "sunflower oil"), and also say "use sparingly." Twenty-three percent of fat graphics include nuts, seeds, or peanut butter, and 24% include avocado or coconut. | Use oil or fat in moderation in meals; limit the amount of solid fat. Use fortified oil. |
| **Foods and food components to limit** | All countries have at least one key message to limit certain types of foods or components of foods: 90% of countries had key message about limiting salt; 89% fat (53% of countries was interpreted as related to total fats); 84% sugar (46% mention sugar-sweetened beverages); 70% about all 3; 28% highly processed foods; 2 countries eggs; 2 countries refined grains; 23% limit or moderate consumption of meat of some kind (meat in general (13%), red and/or cured meats(11%)). Messages to limit meat consumption are absent in North America and Africa. 8 countries have a quantitative message about salt intake. A message to use iodized salt is included by 18% of countries. Only one country (the United States) includes a quantitative message on limiting sugar. . Guidance to limit at least some type of fat is given by 89% of countries: ; only 2 countries (Albania and Mongolia) set a quantitative limit on total fat consumption, of <30%; 43% of countries have messages about limiting saturated fat; and 13% of countries advise limiting *trans* fats (or "margarine"). By way of providing further guidance, 22% of countries suggest cooking methods to reduce fat, and 29% suggest healthier alternatives to saturated fat. | 'If you use sugar, use it sparingly; Use iodised salt, but use it sparingly' combine sugar and salt in one message. Sugar presented as optional, and if used then it should be sparingly, while the use of iodised salt is recommended but yet use should be sparingly. |

## Appendix II:List of Panel Members

| | |
|---|---|
| 1. Amos Odiwour | Siaya Rarieda Sub-County Nutrition Officer |
| 2. Anastasia Ocholla | Homa Bay Nutritionist |
| 3. BenadetteGesare | Nutritionist |
| 4. BernadOuma | Agriculture |
| 5. Brenda Achieng | Kisumu Nutritionist |
| 6. Caroline Andango | Homa Bay Crops Officer |
| 7. Celestine Owira | Siaya Community Health Worker |
| 8. Charles Okatch | Homa Bay Health Promotion |
| 9. David Mboya | Siaya Fisheries |
| 10. Dolfine Odongo | Homa Bay Rachuonyo North Sub-County Nutrition officer |
| 11. DorrantJuma | Siaya Crops Officer |
| 12. Elijah Oyolla | Kisumu Community Focal Person |
| 13. Elizabeth Odero | Kisumu Nutritionist |
| 14. Eric Abongo Ogado | Kisumu Livestock Officer |
| 15. Felix Ngira | Homa Bay CHSFP |
| 16. Francis Aila | Homa Bay County Nutrition Coordinator |
| 17. GoergeOketch | Homa Bay Fisheries Officer |
| 18. Hillary Oracha | Homa Bay Nutritionist |
| 19. JenipherAluochOdour | Kisumu Fisheries Officer |
| 20. Jeremiah Ongwara | Kisumu County WASH Coordinator |
| 21. John Oloo | Homa Bay Nutritionist |
| 22. Joseph Odinde | Siaya Nutrition Officer Siaya Sub-County |
| 23. Lizzy Adhiambo | Homa Bay Nutritionist |
| 24. Mary Ogadi | Kisumu County Crops Officer |
| 25. Monica Onyango | Kisumu East Sub-County Nutrition Officer |
| 26. Oscar Kambona | Siaya County Nutrition Coordinator |
| 27. Peter Stima | Kisumu Public Health Officer |
| 28. Rael Mwando | Kisumu County Nutrition Coordinator |
| 29. Renata Atieno | Siaya Livestock Officer |
| 30. Scholar Achoki | Public Health Officer |

## Appendix III: Research Permit

THIS IS TO CERTIFY THAT:
*MS. EMILY CHEROTICH KORIR*
of EGERTON UNIVERSITY, 0-20100
Nakuru,has been permitted to conduct
research in *Homabay , Kisumu Counties*

on the topic: *DEVELOPMENT AND TESTING OF FOOD BASED DIETARY GUIDELINES FOR INDIVIDUALS ABOVE 5 YEARS OF AGE: THE CASE OF LAKE VICTORIA*

for the period ending:
*25th May,2019*

Permit No : NACOSTI/P/18/12634/22291
Date Of Issue : 25th May,2018
Fee Recieved :Ksh 2000

.....
*Applicant's Signature*

.....
*Director General*
*National Commission for Science, Technology & Innovation*

## Appendix IV: Participant Information Leaflet and Consent Form

**Title of the Research Project: Food-based Dietary Guidelines (FBDGs) for Individuals who are >5 years old in the Lake Victoria Basin.**

**Reference Number :**

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any question about any part of this project that you do not fully understand. Kindly note that your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you agreed to take part at first.

**What is this research study all about?**

Panel members from the County Ministries of Health and Agriculture have developed FBDGs appropriate for the Lake Victoria Region. The purpose of my visit is to invite you to participate in consumer-testing of the developed FBDGs for clarity and appropriateness to the community members. If you accept to participate, you will be expected to attend a focus group discussion of 12 individual members within this community. The moderator will lead the session and you will be expected to participate in discussion. The sessions will be audio taped to ensure that your input is captured. Your opinion is of immense importance in designing the final draft of the FBDGs for the Lake Victoria Region. **This study has been approved by the** Committee for Human Research at Egerton University **and NACOSTI. This research will be conducted according to the ethical guidelines and principles as given by the Committees.**

**Are there any risks involved in your taking part in this research?**

No. This research seeks for your opinion in the development of the FBDGs messages and will not involve any experimental studies.

**Will you be paid to take part in this study and are there any costs involved?**

No. You will not be paid to take part in the study. But, your transport will be covered. There will be no costs involved for you, if you do take part.

**Is there anything else that you should know or do?**

You can contact:

- **Ms. Emily C. Korir at telephone 0721-341 701 if you have any further queries or encounter any problems.**
- **You can contact the Committee for Human Research at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed.**

**Declaration by participant**

By signing below, I ……..……. agree to take part in this research study entitled '***Food-based Dietary Guidelines (FBDGs) for Individuals who are >5 years old in the Lake Victoria Basin****'.*

Signed at (place) .....…....…….. (date) ……...……..

Signature of participant Signature of witness

## Appendix V: Issues of Nutrition and Health Concerns in Lake Victoria Region

| **Issues of concern in Lake Victoria** | **Prevalent conditions and desirable population goals** |
|---|---|
| Prevalence of vitamin A, anaemia and zinc deficieny | About 91.2% children, 61% women, 23.6% adult men, elderly men 34.2% and elderly women 32.9% were anaemic in the region. Prevalence of acute and moderate vitamin A deficiency was 4.7% and 37.4% respectively (mean±SD levels of 23.65±9.67ug/dl) while, 78 % of the adult women consumed less than 40% of the reference value for zinc (Waudo*et al*., 2006; Waudo*et al*., 2005). It is therefore necessary to promote consumption of foods that are naturally rich in iron and to use combinations of foods to enhance iron absorption (fruits and cereal products) (European Food Safety Authority 2015; Brink *et al.,* 2019). In nertherlands analysis of 200 g of vegetables daily resulted in a somewhat lower vitamin A and folic acid provision in specific subgroups. The recommend intake of vegetables was therefore set at 250 g per day (Brink *et al.,* 2019). The use of sufficient leafy green vegetables to provide pro-vitamin A is also recommended. |
| Inadequate intake of calories | In Kisumu, mean caloric intake for men was (1938±693) as opposed to recommended caloric intake of 2, 895 Kcal/day and women 1505.556 kcal/day. The study concluded that only 15.6 % of both men and women in Kisumu consumed the required amounts of calories. The mean caloric consumption was even lower among the elderly men (1454.6±736.8) compared to females (1516.0±769.0). (Waudo*et al*., 2006; Waudo*et al*., 2005). In Homa Bay 84% of household's diets in the county did not meet minimum daily calorie requirement for adult of 2,260 kcal (GOK-ASDSP, 2014). |
| High carbohydrate diet | Diet in the region was high in carbohydrates composing 69%. The study by Waudo*et al*., (2006) found that sugar was consumed highly by 86.1% of the women respondents on a daily basis. This was sugar mainly in tea. Although total carbohydrate as recommend by WHO/FAO (2003) is 55-75%, whole grains should provide125 g (100–150) per day with fibre content of 24 g (19–28) per day (GBD, 2019). |
| Low fat intake | Study among women indicated that 61.9% of the households used oil daily in their cooking and 20.6% used fat (Chipsy, Kimbo and Kasuku-containing trans fatty acid). However, the study by Waudo*et al*., (2006) and Waudo*et al*., (2005) observed that the caloric energy contribution from fat was < 15 %. An indicator that though fats/oils were consumed by the majority, total amount of fat/oil consumed may be inadequate. Recommended intake of fat byWHO/FAO (2003) is 15-30% of the total fat energy; saturated fatty acids<10%; polyunsaturated fatty acids (PUFAs) 6-10%; n-6 PUFAs 5-8%, and trans fatty acids<1%; while the range given by GBD (2019) is higher for PUFAs 11% (9–13) of total daily energy the range for trans fatty acids 0·5% (0·0–1·0) of total daily energy is similar. |
| Low consumption of legumes | Generally, beans were not considered as important relish in Kisumu but as a casserole in *'githeri'* (Cooked mixture of maize and beans) by only 25.5% individuals. Although Marinangeli*et al*. (2017) recommeded consumption of 100 grams of legumes daily, other reccomendation is intake of 60 g (50–70) per day of legumes or about ¼ cup legumes daily intake (Willett *et al*., 2019; WHO/FAO, 2003). Population goal for nuts and seeds is approximately 21 g (16–25) per day (GBD, 2019). |

| | |
|---|---|
| Inadequate intake of milk | Milk (50.8%) was consumed mainly in tea(Waudo*et al*., 2006). Reccomended intake by FAO (2004) is 421ml per adult equivalent per day (2 glasses of milk) with calcium supply of about 1·25 g (1·00–1·50) per day (GBD, 2019). |
| Inadequate intake of meats | Poultry, beef meat in Kisumu and now emerging pork in Siaya were stated as only eaten in special occasions (Waudo*et al*., 2005; Waudo*et al*., 2006). There was low consumption of fish contrary to expectation due to proximity to the Lake Victoria. WHO/FAO (2003) reccomneds protein intake of 10-15% of total energy; cholesterol<300 mg per day. General reccomndation of red is 23 g (18–27) per day; Processed meat2 g (0–4) per day or 2 servings (each 100 gms) per week (Hertfort *et al.*, 2019). Moderated intake of meat requiremeat replacements with sufficient protein and enriched with iron and thiamin or vitamin B12 (Brink *et al.*, 2019). |
| Low consumption of fruits and vegetables | There was general prevalence of low consumption of vegetables and seldom consumption of fruits in the Lake Victoria Basin (Waudo*et al*., 2005; 2006). WHO/FAO (2003) recommended fruits and vegetables consumption of ≥400 g per day. The population goal as indicated by the GB (2019) is 250 g (200–300) of fruits per day; and 360 g (290–430) vegetables per day. Most national have common themes that promote consumption of fruits and vegetables for the prevention of obesity, other chroniNCDs, besides nutrient nutrientdefificiencies(Hertfort *et al.*, 2019). The type of vegetables consumed was mostly kales followed by cowpeas and cabbage. Wild fruits was viewed as for children. |
| Food insecurity | Granaries in the homesteads were diminishing and food reserves within the households was little (Waudo*et al.*, 2005; Waudo*et al.*, 2006). Food availability depended on seasons. Intermittent floods or drought in some areas destroyed crops and peoples livelihoods. Although some families may not have enough food, they still sold the little food produce to meet family needs other than purchase of food e.g. payment of school fees. Most community members therefore depended on the market for food supplies. |
| Reliance on maize | The main source of carbohydrates in Kenya is maize. Traditional foods (sweet potatoes and cassava) were not important starches in their diets. Sorghum grows well in the region, it has not been widely consumed because of taste. However, it was noted that there are new varieties of sorghum which are indicated as sweet |
| Water and food safety issues | Approximately 68.2% of the respondents did not take any precaution to avoid contamination and nutrient loss in food preparation, storage and preservation (Waudo*et al.*, 2005; 2006). Overall, less than half (48 per cent) of the population is using unimproved source of drinking water in Kisumu County. In Homabay County, 35 per cent of the population use improved drinking water (piped into dwelling/ plot/yard, other improved), In Homabay County, a place of hand washing is observed in merely 3 per cent of the households. The remaining 97 per cent of households did not have their handwashing place observed as this designated area is not in the dwelling/plot/yard (MICS, 2013). Out of approximately 80% of hospital attendance due to preventable diseases in the country, about 50% of these diseases are Water, Sanitation and Hygiene (WASH) related. In Homa Bay County, diarrhoea (11 per cent) is the third common disease.The average distance to the nearest water point stands at five km (GoK, 2013). The vision in the setting of Environment Sanitation and Hygiene policy in Kenya in 2007 (MoHS) was to create and enhance an enabling environment to motivate all Kenyans to improve their hygiene behaviour and environmental sanitation.In Kenya, unsafe water, sanitation and hand washing was estimated to account for 6250 age-standardised disability adjusted life years (DALY) per 100,000 in 2016, while diarrhoeal diseases accounted for 244.2 years lost to disability and 5689.9 years of life |

| | |
|---|---|
| | lost per 100,000 in the same year (Achoki*et al*. 2016). |
| Availability of cooking fuel | Fuel was indicated a factor affecting type of food cooked the cooking method and quality of the food prepared. This would limit the variety of foods consumed and sometimes forcing the individuals to purchase precooked vended foods prepared. |
| Lifestyle issues | Sharp rise of motorized transport Bodaboda'. Non-insulin dependent diabetes mellitus which is now seen more among children. Major concern was vended street food cooked in open air or environment not meeting the expected sanitary standards. With more and more blame put on unemployment more youth were indicated as getting more involved in the consumption of alcohol. |
| Excess consumption of caloric foods | Sugar was consumed highly by 86.1% of the women respondents on a daily basis. This was sugar mainly in tea (Waudo*et al*. 2006). Free sugars <5% (50g (or about 12 level teaspoons); Sodium chloride (sodium) <5 g per day (<2 g per day) (WHO/FAO, 2003). Free sugars sugars 3 g (0–5) per day Sodium chloride (sodium)3 g (1–5) per day(GBD, 2019). The non-insulin dependent diabetes mellitus which is now seen more among children. The overweight issues were noted to be emerging not only in urban setting but also in the rural areas. In the urban areas it is generally attributed to increased energy intake and less physical activity due to motorized teleportation.While highly processed cereal based and sugar added foods are easily available in the super markets, ready prepared Potato chips, '*chapattis'*, *mandizis* are vended along the streets in the urban centers. This practice is also cropping up in small shopping centres in the rural. |
| Cultural influence on food consumption. | Cultural practices influence utilization of food within the households. In the Luo culture, relish made from pumpkin is not served to men; Eggs are not to be consumed by children and pregnant mothers; and certain meat parts are to serve specific gender. When serving family meals, men are served first before everyone else in the family. |
| Alcohol consumption | Alcohol consuming individuals do not like vegetables. A study by Shimotsu, *et al.,* (2012) observed that the relationship between fruit and vegetable intake and alcohol consumption varied by social economic status. Individuals with lower household incomes who consumed five or more servings of fruits and vegetables per day were less likely to engage in binge drinking relative to those consuming zero to one serving of fruits and vegetables per day. No association was observed for higher-household-income individuals. Similarly, a study among adults in Ghana ofound that alcohol consumption was significantly associated with inadequate fruit and vegetable intake (Tachi *et al*., 2020). |

a) Panel member's group discussions

b) Panel member's plenary discussions

## Appendix VI: Questionnaire

### Introduction

This is the first round of the Delphi Questionnaires provided to build consensus on issues presented and discussed in our first workshop which was held at Hill Side Villa-Kisumu on 19th to 21st February 2014. The aim of this questionnaire is to establish the level of agreement on issues which were discussed for the purpose of developing '***Food based dietary guidelines for the Lake Victoria Basin'***. You are requested to give your honest opinion. Your responses will not be used against you in any way as you are not to record your name anywhere on this questionnaire. Collected information will be used for the purpose of this research only.

**Code number:** **Date:**

**Section A: Demographic Information**

1.

**1** a) At your current work station, which is your field of specialization? Tick where appropriate.

i) Facility based Nutritionist ☐ ii) Public health and sanitation ☐

iii) Livestock production ☐ iv) Fisheries production ☐

v) Crops production ☐ vi) Nursing ☐ vii) Researcher ☐

viii) Health promotion ☐ ix) Community focal person ☐

b) How many years of work experience do you have in your field of specialization?

i) > 5 years ☐ ii) < 5years ☐

2. **Section B: Consensus on use of identified issues to develop food based dietary guidelines for the Region**

The following are the food and nutrition related health problems and lifestyle concerns as were discussed as prevalent among community members in the Lake Victoria Basin. Please put a tick mark to indicate your level of agreement on the use of enumerated issue as a basis to develop food based dietary guidelines for the Regiom.

| S.No. | Prevalent food and nutrition related problems and lifestyle concerns | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|---|
| | Inadequate intake of vitamin A | 1 | 2 | 3 | 4 | 5 |
| | Inadequate intake of iron | 1 | 2 | 3 | 4 | 5 |
| | Inadequate intake of Zinc | 1 | 2 | 3 | 4 | 5 |
| | Inadequate caloric intake | 1 | 2 | 3 | 4 | 5 |
| | Inadequate intake of fat | 1 | 2 | 3 | 4 | 5 |
| | Low consumption of fish | 1 | 2 | 3 | 4 | 5 |
| | Low consumption of consumption of meat (beef, pork, mutton) | 1 | 2 | 3 | 4 | 5 |
| | Inadequate consumption of milk | 1 | 2 | 3 | 4 | 5 |
| | Low consumption of fruits and vegetables | 1 | 2 | 3 | 4 | 5 |
| | Consumption of less than three meals a day | 1 | 2 | 3 | 4 | 5 |
| | Monotony in the diet | 1 | 2 | 3 | 4 | 5 |
| | Consumption of highly processed and fatty/fried foods as an emerging trend | 1 | 2 | 3 | 4 | 5 |
| | High consumption of sugary foods (soft drinks) | 1 | 2 | 3 | 4 | 5 |
| | High consumption of alcohol | 1 | 2 | 3 | 4 | 5 |
| | Reliance on maize as staple food | 1 | 2 | 3 | 4 | 5 |
| | Sale of the little family food produce to get money to meet family needs other than food | 1 | 2 | 3 | 4 | 5 |
| | Seasonality in food production limiting availability of food throughout the year | 1 | 2 | 3 | 4 | 5 |
| | Emerging poor harvest due to crop failure | 1 | 2 | 3 | 4 | 5 |
| | Inadequate food in the granary to last up to the next season | 1 | 2 | 3 | 4 | 5 |
| | Food inaccessibility (no money to purchase) | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Scarcity of cooking fuel limiting the type and variety of food to be cooked (avoiding preparation of traditional vegetables perceived to take a long time to cook) | 1 | 2 | 3 | 4 | 5 |
| | Inadequate supply of safe water for washing and cooking | 1 | 2 | 3 | 4 | 5 |
| | Lack of awareness in personal hygiene (lack of critical hand washing points) | 1 | 2 | 3 | 4 | 5 |
| | Lack of awareness in food safety (storage of cooked food in cupboards with humid warm prevailing conditions, poor sanitary conditions in fish landing beaches) | 1 | 2 | 3 | 4 | 5 |
| | Consumption of improperly washed fruits from vendors | 1 | 2 | 3 | 4 | 5 |
| | Vegetables cooked once in the day to be reheated for the next meal | 1 | 2 | 3 | 4 | 5 |
| | Overcooking of vegetables | 1 | 2 | 3 | 4 | 5 |
| | Purchase of improperly washed and cut vended vegetables | 1 | 2 | 3 | 4 | 5 |
| | Food choice is influenced by Culture (it is a taboo to serve pumpkin relish to men) | 1 | 2 | 3 | 4 | 5 |
| | Food choice is influenced by beliefs (fruits belong to the children) | 1 | 2 | 3 | 4 | 5 |

a) Which of the above have you disagreed with? List on the table below and give reason for your disagreement.

| | Food and nutrition related problems | Reason |
|---|---|---|
| 1 | | |
| 2 | | |
| 4 | | |
| 5 | | |

b) Is there any other food, nutrition, health related and lifestyle problem that you feel is important and has not been addressed above? Indicate on the table below.

| | Other food and nutrition related problems which need to be addressed |
|---|---|
| 1. | |
| 2. | |
| 3. | |

## Appendix VII: Development of Key Message Statements

a. Message crafting

| Issue/Current practise | Desirable change | Key message | Message statement |
|---|---|---|---|
| **Cooking oils/fats** –many households have shifted to the use of oils instead of fats<br>-cooking oil is commonly referred to as *'mafutaya salad'*<br>-it is almost impossible to find a household cooking without oil<br>-oil used in cooking is as little as hardly enough to brown onions<br>-many vendors purchase cooking oil in large containers eg 20 litre container and dispense in small quantities<br>-in dispensing hygiene may be compromised<br>-suggesting better ways of dispensing may be necessary | -continued promotion of cooking oil instead of vegetable fats<br>-avoid frequent consumption of deep fried foods<br>-oils sold should be appropriately packaged/ dispensed.<br>-those dispensing small quantities should be educated on hygiene | Use enough oil to cook without necessarily encouraging excessive consumption<br>-cook food in just enough cooking oil to prepare family food and natural spices; onions, dhania, garlic ginger turmeric to enhance taste and utilization of food nutrients in your body<br>-excess calories consumed is stored as unnecessary fat adding extra weight to your body<br><br>-to prepare family food and natural spices; onions, dhania, garlic ginger turmeric to enhance taste | -Use just enough oil (salad oil) to cook family food.<br>**-Eat food cooked in just enough cooking oil to enhance uptake and utilization of food nutrients**<br>-Avoid frequent eating of deep fried foods for excess oil consumed is stored as unnecessary fat adding extra weight to your body<br>**-Avoid consumption of sugary foods with added sugar or frequent consumption of deep fried foods made from cereals roots, tubers to maintain good body weight and a healthy life**<br>**-Drink at least 8 glasses of clean portable water to rehydrate your body and quench your thirst throughout the day for water is life** |
| **sugar sweetened products**<br>-because of climatic condition people drink soda often<br>-wide variety of energy drinks are gained entry into Kenyan market<br>-individuals prefer the big size bottles<br>-a lot of commercials encouraging intake of sweetened products and are readily available<br>-sugar sweetened beverages have excess calories<br>-energy drinks have high caffeine content | -Intensify campaigns against sweetened drinks<br>-campaigns to focus on drinking of cold water to quench thirst instead of sugar added beverages in ice water as presented by the commercials<br>-consumption of cold drinks should not be the norm as practised but occasional<br>- | - drinking of water for rehydration instead of commercial cold drinks<br><br>-consumption of freshly prepared fruit juices without added sugar<br><br>-water is life is a common slogan | |
| **Meal frequency**<br>**-**mainly the rural community even | -to sensitize the community on the importance of | -to have 3 regular appropriately constituted meals and two snacks | -Have three regular meals and two (2) snacks each day |

| Issue/Current practise | Desirable change | Key message | Message statement |
|---|---|---|---|
| school children skip breakfast<br>-lunch mainly porridge made of maize flour or black tea and mandazi are the most commonly consumed foods<br>-sometimes porridge is served without sugar<br>-the thickness of the porridge will depend on the availability of the flour<br>-supper is the only sure meal | breakfast meal especially for school children<br>-Every meal should be properly constituted:<br>i) cereals, roots tubers,<br>ii) green leafy vegetables to include traditional vegetables<br>iii) other vegetables<br>iv) fruits<br>v) Animal source food to include poultry, red meat, fish, insects<br>vi) Milk and other dairy products,<br>vii) legumes and nuts | each day | -Eat 3 regular meals and 2 snacks each day to supply your body with the required energy and to meet the need for other body processes for active productivity throughout the day |
| **Dietary diversity/meal composition Monotonous –**<br>**-** main staple is maize<br>**-**meals presented are high in maize meal products<br>-any relish prepared is to *'escort 'ugali''---'terokuon'*<br>-little or no vegetables,<br>-little omena or omena fried 'hauhau' or cooked with water<br>-strong tea and mandazi<br>-in Ahero rice is an important staple<br>-rice is taken with black tea as a complete meal<br>-in urban setting among the low income earners there is emerging consumption of manadazi cut and mixed with free soup for lunch | -sensitization of the community to understand the significance of eating a properly constituted meal<br>-inclusion of all the necessary food groups in daily meals<br>-Eat appropriately constituted 3 regular meals and 2 snacks each day to supply your body with the required energy and to meet the need for other body processes for active productivity | Every regular meal eaten should be properly constituted<br>-Cook and serve each family member food composed of the following at every regular meal;<br>i) 'ugali' (maize, sorghumcassava) /rice/chapati/mandazi/spaghetti /cassava/sweet potatoes /cooked bananas/irishpotaoes /nyoyo<br>ii) green leafy vegetables (kuogo, name others traditional vegetable)<br>iii) other vegetables (tomatoes, onions, carrots, cabbage, pumpkins, butternut beet root)<br>iv) fruits (jamna<br>v) Animal source food to include poultry, red meat, fish, insects<br>vi) Milk and other dairy products,<br>vii) legumes and nuts | **-Eat appropriately constituted 3 regular meals and 2 snacks each day to meet the need of body processes throughout the day**<br><br>-**Eatappropriately constituted breakfast as one important regular meal to begin the day for good work productivity and school children alertness and attentiveness in school work.** |
| **Total calories-(WHO 55-75%)**<br>- less meal frequency tends to low | **-**encourage adequate consumption of food to | **-**whole cereals<br>**-**include appropriate staples at every | -Eat staple food at every regular meal to include: 'ugali' (maize, sorghum cassava) |

| Issue/Current practise | Desirable change | Key message | Message statement |
|---|---|---|---|
| caloric adequacy in some part of the population while<br>-some part of the population are indulging caloric cheap fried foods eg*manadazi* and soup<br>-meals/ foods presented are high in cereals<br>**Cereals**<br>-maize is the major staple<br>-others available are: rice, wheat, sorghum<br>-sorghum associated with diabetic<br>-processing is tedious<br>-makes the stool hard<br>-associated with low income earners<br>-consumption of cassava is not considered prestigious<br>-there is a growing trend of<br>--individuals find it difficult to cook 'ugali' from cassava flour or sorghum alone<br>-purchase of street food for home consumption is on the rise | supply the necessary calories to the body<br>-to discourage inappropriate snacking/meal composition<br>--Maize flour can be mixed with soghum and cassava flour to prepare 'ugali'<br>- individuals to be encouraged to use posho milled flour | regular meal<br>- cook and serve each family member a staple food at every regular meal to include: 'ugali' (maize, sorghum cassava)<br>/rice/chapati/mandazi/spaghetti<br>/cassava/sweet potatoes<br>/cooked bananas(matoke)/irish potatoes /nyoyo/ | /rice/chapati/mandazi/spaghetti<br>/cassava/sweet potatoes<br>/cooked bananas(matoke)/irish potatoes<br>/nyoyo/<br>-**Eat at every regular meal time food composed of staple food to interchangeably include: 'ugali' (maize, sorghum cassava)/rice/chapati/mandazi/spaghetti/cassava/sweet potatoes/cooked bananas (matoke)/irish potatoes /nyoyo/**<br>**At every regular meal time eat food composed interchangeable of staples to include: 'ugali' (posho meal) maize; sorghum; cassava; cassava; sweet potatoes;**<br>**cooked bananas (matoke); irish potatoes; nyoyo; rice; brown flour chapati/mandazi/pasta** |
| **Food insecurity**<br>-farming is not embraced<br>-Most young people have gone for bodaboda<br>-monocropping<br>-climate change<br>-it is a common practice to sell cereal produce at a cheap price soon after harvesting to meet other family needs | -change of attitude to think farm produce for consumption first<br>-To encourage families retain some food to last the family upto the next harvest<br>-farmers should encouraged to embrace modern technologies in farming<br>-develop kitchen gardens for vegetables and fruits | **-** conserve family harvested cereals and legumes to last the lean period<br>-recommendation by the ministry of agriculture is 1 ½ sacks of cereals to be stored up for each family member annually | **- Preserve stock of 1½ bags of farm harvested cereals for each family member annually to avoid starvation**<br><br>-keep a stock of 1½ sacks of farm harvested cereals for each family member to last up to the next harvest to avoid starvation<br><br>**-Cultivate a kitchen garden to ensure adequate consumption of vegetables and fruits by family members at regular meal times** |
| **Milk and dairy products** | **-**consumption of fresh | **-**drink the recommended 3-4 glasses | - Drink a glass of milk or other dairy products at |

| Issue/Current practise | Desirable change | Key message | Message statement |
|---|---|---|---|
| -it is a common practise to sell milk and remain with very little within the family.<br>-milk within the family is consumed in tea<br>-amount of milk in tea is just enough '*to colour the tea'*<br>-milk is also commonly used to ferment traditional vegetable<br>**-challenge**<br>-large parasites infestation<br>-grazing land | milkand other dairy products which include yogurt, mala should be encouraged<br>-community members to be encouraged to keep dairy goats<br>-better breeds of dairy cows should be introduced<br>-encourage the practise of vegetable fermentation with milk | of milk every day<br>-Serve a glass of milk or other dairy products to each family member at every regular meal | every regular meal or snack time<br><br>**-Drink a glass of milk/sugarless yoghurt/mala dairy products at every regular meal or snack time for strong teeth and healthy bones** |
| **Vegetables**<br>-common vegetables kales, tomatoes, onions, cow pea leaves<br>-kales, cabbage imported from neighbouring counties<br>-bulk cooking of vegetables<br>-traditional vegetables are very expensive<br>-for convenience it's now a common practise to purchase vended cut kales and cabbage<br>-few community members plant vegetables<br>Asian vegetables are not consumed by the locals<br>-it's not appropriate to serve vegetables alone especially to men. Vegetables must be accompanied by at least omena<br>-it is still a common practise to ferment vegetables 'kuogo' | -need to widen variety of vegetables consumed, colour, portion size<br>-avoid overcooking of vegetables<br>-encourage families to purchase and prepare own vegetables at home<br>-encourage community members to have vegetable garden | -each family member to eat vegetables at every regular meal to include:<br>green leafy vegetables (kuogo, name others traditional vegetable)<br>iii) other vegetables (tomatoes, onions, carrots, cabbage, pumpkins, butternut beet root) | **-Eat green leafy vegetables and other variety coloured vegetables served either raw as salads or cooked at regular meal times (kuogo, amaranthus, saget, black night shade, cowpea leaves, sukuma wiki, spinach, tomatoes cabbage, carrots pumpkins, onions, beetroot)** |
| **Fruits**<br>-seldom eaten<br>-wild fruits including guavas, jamna, chua, nyabende, olemo are never | -regard of fruits as important part of the diet<br>- encourage community to plant fruit trees among the | -To consume the recommended amounts of fruits | **-Eat fruits in season or freshly prepared fruit juices without added sugar at regular meal or snack time to include: guavas, jamna, chua, nyabende, olemo, mango, pineapple,** |

| Issue/Current practise | Desirable change | Key message | Message statement |
|---|---|---|---|
| regarded as important<br>-cost of the fruits makes it hard to make it part of the diet<br>- | many other planted trees<br>- encourage consumption of freshly prepared fruit juices whole fruits possible | | **watermelon oranges, ripe banana** |
| **Legumes/pulses/nuts**<br>**-**low production in the region leading to high prices<br>available within the region are beans, soya, ground nuts, green gram<br>-intercropped with maize and the harvest is usually not good<br>-in urban settings, cooking of legumes is confined to weekends because of the amount of time it takes to select soak and cook<br>-beans in githeri<br>-legumes/pulses/nuts are expensive<br>-roasted groundnuts and sesame seeds commonly consumed as snack<br>-beans is cumbersome to prepare<br>-belief that beans is eaten with chapati and rice not commonly available in the rural settings<br>-most people eat food in food kiosk<br>- ground nut relish is prepared for special occasion only<br>-sesame seeds are also produced in kisumu county but consumption is minimal | -sensitization of the community on nutritional value of legumes and pulses<br>-cooking of ground nuts as relish should be promoted<br>-inclusion of ground nuts in nyoyo<br>-promote consumption of sesame seeds<br>-in urban settings families should be encouraged to cook and freeze beans for use<br>-community should be educated to regard legumes/nuts/pulses as | -to include legumes and nuts in the diet | **-Eat legumes, pulses as relishes at regular meal times and nuts at snack time to include beans (red, white, yellow, black), green grams, groundnuts, simsim** |
| **Fish meats poultry**<br>-good quality fish is exported outside the county<br>-tilapia not affordable by the local community<br>-at the moment fish imported from china is sold in kisumu markets<br>-the most consumed fish is omena | **-**good practise of omena consumption should be practised<br>**-**increase consumption of animal source meat,<br>**-**buy fish from reputable suppliers<br>-fish found in plenty during | **-**to include animal source food in the diet to enhance protein and micronutrient bioavailability in regular meals<br>-animal source food should be obtained from reputable suppliers | -Eat adequately cooked beef, pork, poultry, sardines other fish, edible insects and other animal source meats interchangeably in your regular meals<br><br>-Eat adequately cooked beef, pork, poultry, rabbit meat, edible insects, sardines, tilapia, cat fish, other fish and animal source meats |

| Issue/Current practise | Desirable change | Key message | Message statement |
|---|---|---|---|
| -omena carries worms<br>-they should be adequately dried and adequately cooked<br>-younger generation do not know how to prepare some fish<br>-meat and poultry consumed only during occasions<br>-eggs are mainly sold<br>Only the urban community consume more eggs<br>-eggs in the rural are not considered good especially for children. It is believed that it delays speech<br>-eggs are considered fill ups in the diet<br>-eggs are to be left for the hens to hatch<br>-meat is highly valued especially by men and consumed regularly by homes in the urban setting.<br>-keeping chicken is part of the culture in the community<br>-A relish is not good enough without some meat<br>-cost of the meat is prohibitive | the rainy season should be preserved (cat fish, mog fish<br>-promotion of aquaculture<br>-encourage families to keep small edible domesticated animals<br>-encourage adequate cooking of meats<br>-encourage consumption insects<br>-the urban communities should be sensitized in excess consumption of red meats | | interchangeably in your regular meals for appropriate growth, development and maintenance of body tissues<br><br>--**Eat adequately cooked beef, pork, poultry, rabbit meat, edible insects, sardines, tilapia, cat fish, other fish and other animal source meats obtained from reputable suppliers in your regular meals for appropriate growth, development and maintenance of body tissues**<br><br>**-keep small animals** |
| **Food safety**<br>-ignorance of hand washing, poor access to clean water<br>-Intensify hand washing campaigns and include in primary school syllabus<br>-Left overs may not be well handled due to high temperature and humid conditions and may cause contamination -*'kuon ok pim go ji'* to cater for unforeseen guests | **-**Support message on critical hand washing<br>-appropriate storage of leftover food in netted cupboards<br>-prepare enough amounts of food for your family in a clean and safe environment and avoid leftovers | -Always wash your hand with soap and flowing water before handling food and eating for best hygiene practices<br>-appropriate storage of leftover food in netted cupboards | **-Always wash your hands with soap and flowing water before handling food for good hygiene practise**<br><br>**-Always use clean portable water to thoroughly wash food and food preparation surfaces, knives and all other tools to come in contact with food before start of any food preparation as a good hygiene practise**<br>**- Always thoroughly wash food preparation surfaces after meat preparation and before start of vegetable preparation on the same** |

| Issue/Current practise | Desirable change | Key message | Message statement |
|---|---|---|---|
| | | | **surface to avoid cross contamination**<br>**-Always wash vegetables before cutting, cut and cook as near the service time as possible to preserve vegetable quality**<br>**-Keep leftover foods away from pets insects and dust** |

**Appendix VIII: Focus Group Discussion Guide**

**FGD Code:**

**Date:**

**Moderator:**

**Scriber:**

**Starting Time:**

**Ending Time:**

**Introduction**

The moderator greets the participants and introduces the research team and allows the participants to introduce themselves. Participants are introduced to the research consent procedures and given time to ask questions. Willing participants are given consent to sign. Participants are assigned numbers for identification during research process as bio data is recorded.

**Section A: BIODATA**

| **participant** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | | | | | |
| **Age** | | | | | | | | | | | | |
| **Level of education** | | | | | | | | | | | | |
| **Marital status** | | | | | | | | | | | | |
| **Occupation** | | | | | | | | | | | | |

**SECTION B: Food based dietary guidelines message comprehension**

**(The moderator takes posters with FBDGs message statements, one at a time and displays in a position legible to all respondents, then proceeds to asks the following questions)**

**Message One (***OteMokuongo***)**

1. Can participant number one kindly read this message aloud?
   (***Wakwayojachiwparomokuongo mondo osomotenambaachielmatek ma ji tee nyalowinjo)***

2. What do you think this message means?
   **(*Uparo ni ote ni tiendeang'o?)***
3. In your own opinion, what makes up a well constituted breakfast?
   ***(Chiembokinyi (breakfast) maberonegoobedgikabindchiemo mage?)***
4. Is it possible for all of us to have a well constituted breakfast as you have described? Yes/No? If no give reason.
5. Are there words which could be removed/added to this message to communicate well to us on consumption of a well constituted breakfast?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Two (***Ote mar Ariyo***)**

1. Can participant two read this message aloud?
   **(*Jachiwparo mar ariyoosomote mar ariyo)***
2. What do you think this message means?
   ***(Iparo ni ote ni tiendeang'o?)***
3. Is it possible for all of us to eat 3 meals (breakfast, lunch and supper) regularly?
4. Are there words which could be removed/added to this message to communicate well to us on consumption of 3 regular meals and 2 snacks every day?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Three (*Ote Mar Adek)***

1. Can participant 3 read this message aloud?
   ***(Jachiwparonambaadekkiyie to mondo isomote mar adekmatek)***
2. What do you think this message means?
   ***(Uparoniwachnitiende en ang'o?)***
3. Is it possible for all of us to eat fish/meat (poultry, beef, pork, rabbit)/legumes/eggs and variety of vegetables every meal time?
4. Are there words which could be removed/added to this message to communicate well to us on the types of relishes to eat?

***(Bende engimanyalore mondo ji dutomaniealuoraniochamchiemo ma Opogoreopogore kaka rech, ring'o, kothe, kodalodesecheduto mag chiemo?)***

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Four (ote mar 4)**

1. Can participant 4 read this message aloud?
   ***(Jachiwparonamba 4mondo osomnwaote mar 4)***
2. What do you think this message means?
   ***(Uparoniwachnitiende en ang'o?)***
3. Is it possible for all of us here to eat a variety of whole cereal grains and starches every meal time to include '*ugali*' from maize/sorghum/millet, cassava, matoke, rice, brown chapati, sweet potatoes, Irish potatoes as accompaniments to relishes? No/Yes? If no, give reason.
   ***(Be engimanyaloreni ji dutonyalochamokothekodchiemomakeloteko e del sechete mag chiemo ka ginywando "kuon" mar bando/bel/kal, mariewa, rabolo, Michele, chapatmarabuor, rabuon, waru kaka gikmakowochiemomoko?)***
4. Are there words which could be removed/added to this message to communicate well to us on the type of cereal grains and starches to be served as accompaniments to relishes in our homes?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Five (Ote mar Abich)**

1. Can participant 5 read this message aloud?
   ***(JachiwparonambaAbichmondoosomnwaote mar 5)***
2. What do you think this message means?
   ***(Uparoniwachnitiende en ang'o?)***
3. Is cooking with small amount of oil a practice which we all enjoy? Yes/No? If no, why?
   ***(En moo mane mar tedo ma itiyogodokuomtedochiemo e aluora ma kae?)***
4. Are there words which could be removed/added to this message to communicate well to us onuse of cooking oil?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Six (Ote marAuchiel)**

1. Can participant 6 read this message aloud?
   ***(Jachiwparonambaauchielmondoosomnwaote mar auchiel)***
2. What do you think this message means?
   ***(Uparoniwachnitiende en ang'o?)***
3. Is it possible for all of us here to eat a variety of well washed fruits

every day? Yes/No? If no, why?

4. Are there words which could be removed/added to this message to communicate well to us on consumption of fruits every day?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Seven (Ote mar 7)**

1. Can participant number 7 read this message aloud?
   ***(Jachiwparonamba 7mondo osomnwaote mar 7)***
2. What do you think this message means?
   ***(Uparoniwachnitiende en ang'o?)***
3. Is it possible for all of us here to drink a glass of milk every day? Yes/No? If no, why?
4. Are there words which could be removed/added to this message to communicate well to us on consumption of milk?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Eight**(*Ote mar Aboro*)

1. Can participant 8 read this message aloud?
   ***(Jachiwparonamba 8mondo osomnwaote mar 8)***
2. What do you think this message means?
   ***(Uparoniwachnitiende en ang'o?)***
3. Is it possible for all of us here to drink a 8 glasses of water every day? Yes/No? If no, why?
4. Are there words which could be removed/added to this message to communicate well to us on drinking water every day?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Nine *(ote mar 9)***

a) Can participant 9 read this message aloud?

***(Jachiwparonamba 9mondo osomnwaote mar 9 matek ma jii tee nyalowinjo)***

b) What do you think this message means?

***(Uparoniwachmosomnwanitiende en ang'o?)***

c) Is it possible for all of us to use clean and safe water for food preparation and hand washing every day? Yes/No? If no, why?

***d)*** Are there words which could be removed/added to this message to communicate well to us on food preparation and hand washing every day?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Ten (ote mar apar)**

1. Can participant 10 read this message aloud?
   ***(Jachiwparonamba 10mondo osomnwaote mar 10 matek ma jii tee nyalowinjo)***
2. What do you think this message means?
   ***(Uparoniwachmosomnwanitiende en ang'o?)***
3. Is it possible for all of us to engage in physical activities such as jogging, walking briskly, running every day?
4. Are there words which could be removed/added to this message to communicate well to us on engagement of physical activities every day?

**(The moderator posts the next message on the wall and begins the next round of questions)**

**Message Eleven**

1. Can participant 11 read this message aloud?
   ***(Jachiwparonamba 11mondo osomnwaote mar 11)***
2. What do you think this message means?
   ***(Uparoniwachmosomnwanitiende en ang'o?)***
3. Is it possible for all of us here to eat less sugar sweetened products and locally vended fatty, starchy foods? Yes/No? If no, why?
   ***(Be engimanyalore mondo ji dutoochamechiemogi matin ahinya?)(Ka ohoyo, uparonienang'omanyalo mono ji modak e aluoraniduokochienkiwango mar chamochiemo ma wakwanogi?)***
4. Are there words which could be removed/added to this message to communicate well to us on sugar sweetened products and locally vended fatty, starchy foods?

**(The moderator posts all the messages on a wall where all can view)**

**Section B: Food based dietary guidelines message significance**

**1.** In your own opinion, which segment of the population do these messages target starting from the first one? Is it us, children, adolescents, men, women? Give reason?
   **(*gipachuuparoniotegijomagemowinjoreotiikodgiahinya? Gin wan nyithindo, mom kosojomachwoo*?)**

2. After answering all the questions, the moderator removes all the posters and then asks the participants to recall and try to restate as many messages as were discussed**.**

   ***(Bang' duokopenjote, Jatatwakgolootesedutomaniekorotkae to okonojopuonjreotemieparowechemanegigoyoembaka mar jiwowechego kaka gisewuoyoe***)

**Conclusion**

We have come to the end of our session. I thank each one of you for your attendance and participation in the discussions. A document will be compiled from your input and the project team will come back to seek your validation of the content. Kindly collect your transport reimbursement before you leave (for community members not schools). Thank you and God bless you.

## Appendix IX : Rewording of the guidelines

| Messages | Individual Panel member suggested rewording | Group and plenary discussion on message rewording |
|---|---|---|
| Eat 3 regular meals and 2 healthy snacks every day | -Replace 3 regular meals with breakfast lunch and supper for clarity.<br><br>-Though participants crossly misunderstood the word snacks, light meals as substitute for snacks was neither perceived well.<br><br>-Many participants understood meal with rice as light food.<br><br>-there is need for nutrition education and advocacy. | • **Eat breakfast, lunch, supper and 2 healthy snacks every day.**<br>• **Eat breakfast, lunch, supper and 2 healthy snacks between meals everyday.**<br>• **Eat main meals breakfast, lunch supper and 2 healthy snacks everyday.** |
| Eat a well constituted breakfast every morning | -Eat a variety of foods during breakfast (every morning)<br><br>-Breakfast and every morning in the same sentence is a repetition.<br><br>-Substitute well constituted with a variety of foods.<br><br>-Use every morning instead of breakfast to put emphasis on timing of breakfast<br><br>-However since most adult participants were found to postpone breakfast it may be necessary to emphasize that this breakfast should be in the morning, | • **Eat a variety of foods every morning.**<br><br>• **Eat well balanced meal for your breakfast every morning.**<br><br>• **Every morning, eat well balanced meal for your breakfast.** |
| Eat whole cereal grains and starches to include '*ugali*' from maize/sorghum/millet, cassava, matoke, rice, brown chapati as accompaniments to your relishes | -Message should include non-refining (to bring out the aspect of local milling of whole grains).<br><br>-Message should include whole cereal grains (to accommodate "nyoyo").<br><br>-Replace accompaniments with "part of".<br><br>-brown chapati was foreign . preference given to locally milled<br><br>-Eat whole cereal grains (maize, sorghum, millet), locally milled flours and starches (cassava, matoke, potatoes) as part of your meals<br><br>-Every meal time, eat energy giving foods prepared from diverse locally milled , non-refined flour from, maize, sorghum, millet, cassava, arrow roots, sweet potatoes, bananas<br><br>-Every meal time, eat diverse energy giving foods prepared from locally milled flour, maize, sorghum, millet, wheat, rice, cassava, arrow roots, yams, | • **Eat diverse energy foods prepared from; cassava, arrow roots, yams, sweet potatoes, green bananas, rice, locally milled non-refined maize, sorghum , millet and wheat flour**<br><br>• **Eat diverse energy foods to include; cassava, arrow roots, yams, sweet potatoes, green bananas, rice, locally milled non-refined maize, sorghum , millet and wheat flour products**<br>• **Every meal time, eat diverse energy foods prepared from cassava, arrow roots, sweet potatoes, green bananas, rice, locally milled non-refined flour from, maize, sorghum, millet.**<br><br>• **Every meal time, eat diverse energy foods prepared from cassava, arrow roots, yams, potatoes, green bananas, rice, locally milled non-refined maize, sorghum and millet flour** |

| Messages | Individual Panel member suggested rewording | Group and plenary discussion on message rewording |
|---|---|---|
| | sweet potatoes, green bananas interchangeably<br><br>-Eat diverse energy giving foods prepared from locally milled flour, maize, sorghum, millet, wheat, rice, cassava, arrow roots, yams, sweet potatoes, green bananas interchangeably | |
| Every meal time, serve on your meal plate a variety of relishes made from fish, meats, legumes and vegetables | -Replace relishes with a simpler word (not concluded by the group)<br><br>-Restructure the last part of the message to begin with "vegetables and either" (should be included always in a meal plate together with other relishes).<br><br>-List other foods i.e. fish, meats, legumes (use or while listing to mean any of the foods should be served with vegetables.<br><br>--Dholuo translation of accompaniment to "kado" not conclusive. It could mean accompaniments (legumes, meats and fish) to the older generation (>40 years) and mean soup (of meats and fish) to the younger generation.<br><br>-Every meal time, serve on your meal plate a variety of vegetables with either fish, meats or legumes.<br><br>-Every meal time, eat variety of vegetables served with either fish, meats or legumes.<br><br>-Every meal time, eat variety of vegetables served with either fish, meats or legumes interchangeably<br><br>-Every meal time, eat variety of vegetables served with fish, meats or legumes.<br><br>-Eat energy giving foods with variety of vegetables served together with legumes, fish, poultry, other meats, insects, eggs | • **Eat variety of vegetables served together with legumes, insects, eggs, fish, poultry, other meats energy giving foods with variety of**<br><br>• **Eat energy giving foods with variety of vegetables served alongside legumes, fish, poultry, other meats, insects, eggs**<br><br>• **Eat energy giving foods with variety of vegetables served alongside legumes, fish, poultry, other meats, insects, eggs interchangeably**<br><br>• **Every meal time, eat variety of vegetables served alongside legumes, fish, poultry, other meats, insects and eggs interchangeably**<br><br>• **Every meal time, eat energy giving foods served with variety of vegetables alongside legumes, fish, poultry, other meats, insects and eggs interchangeably**<br><br>• **Eat energy giving foods with variety of vegetables served alongside legumes, fish, poultry, other meats, insects and eggs interchangeably** |
| Eat meals prepared in small amounts of cooking oil | -No changes in both English and '*Dholuo*' translation. | • **Eat meals prepared with small amounts of cooking oil** |

| Messages | Individual Panel member suggested rewording | Group and plenary discussion on message rewording |
|---|---|---|
| Eat a variety of well washed fruits every day | -Begin the message with every day to put more emphasis on consumption of fruits every day.<br><br>-Emphasis shifted to washing and not eating<br><br>-other suggestions move the washing part and make it part of the hand washing and food preparation. | • **Every day, eat variety of well washed fruits**<br><br>• **Eat variety of fruits every day** |
| Drink a glass of milk, mala or yoghurt every day | -Drink a cup of boiled fresh milk, locally fermented milk, mala or yoghurt everyday<br><br>-Replace glass with cup.<br><br>-Add fresh to milk, include fermented milk. | • **Drink a cup of fresh boiled milk, fermented milk, mala or yoghurt every day.** |
| Drink at least 8 glasses of clean and safe water everyday | Drink at least 8 glasse/6cups of water everyday<br><br>-Quantify the amount of drinking water and replace 8 glasses with 6 cups(350ml)<br><br>-this may not be standardized<br><br>-Avoid quantification and us the words “generously” or “liberally”<br><br>-Water requirements vary with age, geographical region (hot or cold) etc. | • **Drink at least 6 cups of clean safe water every day.**<br><br>• **Drink plenty of water throughout the day** |
| Use clean and safe water for food preparation and hand washing every time | -intent of message is to encourage use of clean and safe water, in hand washing and all kitchen related chores | • **Always use clean and safe water to wash your hands, fruits, vegetables, all other foods and food utensils** |
| Enjoy a healthy and physically active life everyday. | -Remove “healthy” from the message. | • **Be physically active every day.**<br>• **Engage in physical activities every day**<br>• **Engage in physical activities for optimal health every day** |

**Appendix X: Delphi Questionnaire for Rewording the Guidelines**

i) Delphi Questionnaire for Consensus Building of the final draft of FBDGs Message Statements for the Lake Victoria Region

**Introduction**

This is the first round of Delphi Questionnaires in phase three of this research study. It is intended to build consensus on the final wording of 'Food ***based dietary guidelines for the Lake Victoria Basin'***. The aim of this questionnaire is to therefore give all participants, an opportunity to review workshop three suggested input and make any other personal contribution. Your responses will be used for the purpose of this research only. None of the information obtained will not be used against you in any way as you are not to record your name anywhere on this questionnaire.

**Code number:_____** **Date:**

**Section A: Demographic Information**

**1** At your current work station, which is your field of specialization? Tick where appropriate.

a) At your current work station, which is your field of specialization? Tick where appropriate.

i) Facility based Nutritionist ☐ ii) Public health and sanitation ☐

iii) Livestock production ☐ iv) Fisheries production ☐

v) Crops production ☐ vi) Nursing ☐ vii) Researcher ☐

viii) Health promotion ☐ ix) Community focal person ☐

b) How many years of work experience do you have in your field of specialization?

i) > 5 years ☐ ii) < 5years ☐

**Section B: Rewording of the FBDGs Message Statements**

a) In your own opinion, are the words used in the restatement of the FBDGs clearer to communicate the desired food, nutrition and lifestyle practices to community members and other stakeholders in the Lake Victoria Region? Put a tick mark on the scale given on the table below to correspond to your answer

| **Preliminary FBDGs message statement** | **Reworded FBDGs message statement** | **Message wording not clear to convey meaning** | **Message wording slightly convey meaning** | **Don't know** | **Message wording partially convey meaning** | **Message wording clearly convey meaning** |
|---|---|---|---|---|---|---|
| Eat a well constituted breakfast every morning | Eat breakfast, lunch, supper and 2 healthy snacks every day | 1 | 2 | 3 | 4 | **5** |
| Eat 3 regular meals and 2 healthy snacks every day | Eat well balanced breakfast meal every morning | 1 | 2 | 3 | 4 | 5 |
| Every meal time, serve on your meal plate a variety of relishes made from fish, meats, legumes and vegetables | Eat diverse energy foods to include; cassava, arrow roots, yams, sweet potatoes, green bananas, rice, locally milled non-refined maize, sorghum , millet and wheat products | 1 | 2 | 3 | 4 | 5 |
| Eat whole cereal grains and starches to include '*ugali*' from maize/sorghum/millet, cassava, matoke, rice, brown chapati as accompaniments to your relishes | Eat energy giving foods with variety of vegetables served alongside legumes, fish, poultry, other meats, insects or eggs interchangeably | 1 | 2 | 3 | 4 | 5 |
| Eat meals prepared in small amounts of cooking oil | Eat meals prepared with small amounts of cooking oil | 1 | 2 | 3 | 4 | **5** |
| Eat a variety of well washed fruits every day | Eat variety of fruits every day | 1 | 2 | 3 | 4 | **5** |
| Drink a glass of milk, mala or yoghurt every day | Drink a cup of fresh boiled milk, locally fermented milk, mala or yoghurt every day | 1 | 2 | 3 | 4 | 5 |
| Drink at least 8 glasses of clean and | Drink plenty of water throughout the day | 1 | 2 | 3 | 4 | 5 |

| **Preliminary FBDGs message statement** | **Reworded FBDGs message statement** | **Message wording not clear to convey meaning** | **Message wording slightly convey meaning** | **Don't know** | **Message wording partially convey meaning** | **Message wording clearly convey meaning** |
|---|---|---|---|---|---|---|
| safe water everyday | | | | | | |
| Use clean and safe water for food preparation and hand washing every time | Eat less of processed, sugar sweetened vended or hawked food products | 1 | 2 | 3 | 4 | 5 |
| Enjoy a healthy and physically active life everyday | Use clean and safe water to wash your hands, fruits, vegetables, all other foods and food utensils always | 1 | 2 | 3 | 4 | 5 |
| Eat less of locally vended starchy, fatty foods and sugar sweetened products | Engage in physical activities every day | 1 | 2 | 3 | 4 | **5** |

b) Any further suggestion on the FBDGs messages rewordings?

| Message | comments |
|---|---|
| | |
| | |
| | |
| | |

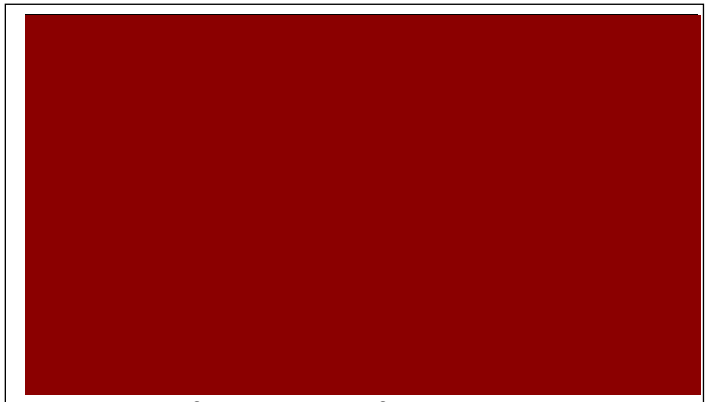
**Appendix XI: Word Cloud**

Eat a well constituted breakfast every morning

Eat 3 regular meals and 2 healthy snacks every day

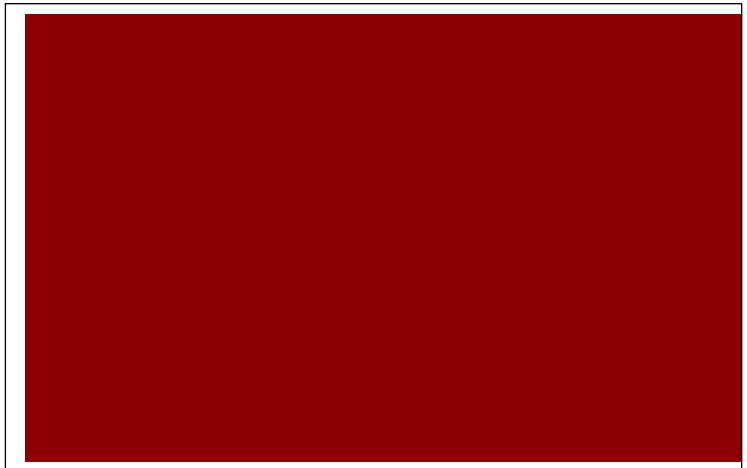
Eat whole cereal grains and starches to include *'ugali'* from maize/sorghum/millet, cassava, matoke, rice, brown chapati as accompaniments to your relishes

Every meal time serve on your plate variety of relishes made



Eat variety of well washed fruits everyday

Drink a glass of milk, mala or yoghurt everyday



Drink at least 8 glasses of clean and safe drinking water everyday

Use clean and safe water for food preparation and hand washing every time

Eat less of locally vended starchy, fatty foods and sugar sweetened products

Eat foods prepared with small amounts of cooking oil

Enjoy a healthy and physically active life everyday

## Appendix XII: Abstracts for publications

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ARTICLE

# Perception of proposed preliminary food-based dietary guidelines for Lake Victoria region of Kenya: findings from a qualitative study among adult community members

**EC Korir[a*], PJ Tuitoek[b] and D Marais[c]**

[a]*Department of Human Nutrition, Faculty of Health Sciences, Egerton University, Njoro, Kenya*
[b]*Murang'a University of Technology, Murang'a, Kenya*
[c]*Warwick Medical School, University of Warwick, United Kingdom*
**Correspondence: korirem@yahoo.com*

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**Background:** Diets in the Lake Victoria region of Kenya have been described as monotonous, consisting chiefly of starchy staple foods, accompanied by green vegetables and oil. To promote healthy eating in the region, 11 food-based dietary guidelines (FBDGs) were proposed.
**Objective:** This study was designed to assess perception of the proposed FBDGs amongst consumers in Lake Victoria region.
**Design and setting:** A qualitative, descriptive cross-sectional design was used to collect data from 36 focus-group discussions (FGD) among adult males (18) and females (18) in Kisumu and Homa Bay Counties.
**Subjects:** A total of 207 adult males (26–74 years) and 211 females (18–71 years) participated in this study.
**Data collection and analysis:** Proposed FBDGs were printed on posters and presented to FGD participants. Proceedings were audio-taped, transcribed, translated and analysed based on themes.
**Results:** The proposed FBDGs were perceived as promoting the consumption of a balanced diet. As a concept, a balanced diet was misrepresented as composed of only three nutrients: carbohydrates, proteins and vitamins. There was no mention of fats/oils and minerals as other significant nutrient constituents of a balanced diet. Other concepts, which included 'three regular meals', 'snacks', 'food variety', 'healthy and physically active lifestyle', were polysemous.
**Conclusion:** The findings provide insight to guide the adaptation of the national FBDGs. The findings also provide a basis for nutrition advocacy programmes and a rationale for the revision of nutrition education materials, including the school curriculum, to align content with current evidence-based information.

**Keywords:** food-based dietary guidelines, perception, healthy eating, Lake Victoria, nutrition education

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# FOOD INSECURITY, A PERCEIVED BARRIER TO HEALTHY EATING IN THE LAKE VICTORIA REGION, KENYA: FINDINGS FROM A QUALITATIVE STUDY

**Korir EC[1]*, Tuitoek PJ[2] and D Marais[3]**

## ABSTRACT

Consumption of poor-quality diets was noted as prevalent in the Lake Victoria Region, Kenya. As a strategy to communicate desirable change and promote healthy eating in the region, a 30-member panel of policymakers and implementers developed and proposed 12 food-based dietary guidelines (FBDGs) in 2017-2018. The objective of this study was to assess barriers in adopting the proposed FBDGs amongst community members in the lowlands of Kisumu and Homa Bay counties. Qualitative, descriptive cross-sectional design was used to collect data from 72 focus-group discussions (FGD). The FGD was conducted among 216 school going children (10-13y), 216 high school students (15-18y), 207 adult males (26-74y) and 211 females (18-71y). The participants were asked to state whether the proposed FBDGs reflected their daily dietary practices? If the answer was no, the FGD participants were asked to elaborate on the perceived barriers. Each FGD consisted of 8-12 participants. The demographics of FGD participants were collected before the start of FGD sessions. All FGD proceedings were audio-recorded and transcribed verbatim. Demographic information of participants was analyzed and presented using descriptive statistics. The FGD responses were coded and analyzed based on the main code, the barriers. Barriers to healthy eating in the study area were mainly linked to low production of food, food unavailability and inaccessibility. Specific factors which contributed to the food insecurity situation included; dry and sunny weather, seasonality in food availability, limited resources to secure potential farmland with fences, gender influence on land use, high cost of food, lack of money to purchase food, low income, sale of farm produce with resultant inadequate quantities of food consumed and inappropriate meal composition. Food insecurity was a perceived barrier to healthy eating in the lowlands of the Lake Victoria region. This research suggests the need to address food systems and economic structures to improve food production, distribution, accessibility and consumption in the region. Coding was done with the aid of NVivo8 (QSR International Pty Ltd Version 8, 2008). This study was registered with the Kenyan National Commission for Science Technology and Innovation (NACOSTI/P/18/12634/22291).

**Key words**: Healthy eating, Lake Victoria, barriers, food insecurity, food