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A DELPHI STUDY TO IDENTIFY AND PRIORITIZE NUTRITION RESEARCH FOR GHANA

BY

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ABSTRACT

Background: Nutrition is both a maker and marker of development. Addressing the emerging challenges malnutrition pose especially in Africa and in Ghana requires multisectoral policies based on trustworthy research. Ghana has implemented a range of nutritional interventions. Howbeit, the impact of these interventions has been minimal. A major reason is that policies are often developed and implemented based on single sector mandates without strong evidence-based research to support it, and the lack of nutrition research priorities linked with the policymaking process disengages research from the policy. This study, therefore, aims to identify and prioritize policy and program relevant research questions as part of a national nutrition research agenda.

Method: a two-round Delphi was used to seek the opinion of expert panelists on what nutrition research question they consider relevant for the country. A total of 66 and 56 panel members selected through purposive sampling participated in the first and second rounds respectively. Data was collected online as a google form link or digital copy in MS word document format via email. A total of 38 questions (for round one) and 66 questions (for round two) were presented to the panel members to indicate which question was relevant for nutrition research in Ghana.

Results: Of the 38 questions presented to expert panelists in the first round, 35 (95%) were frequently (>75% responses) selected by panel members as relevant nutrition research questions.

In the second round, consensus was achieved for 61 (88.4%) of the 69 (including the 35 that achieved consensus in round 1) questions presented to panel members. 23 questions of the total 61 questions presented were ranked by expert panel members as top research questions. expert panelist further prioritized these questions into 10 using a prioritization criteria.

Conclusion: the expert panel members identified ten research questions as the top priority nutrition research for Ghana. The main barriers identified for the effective nutrition research implementation in Ghana were lack of interaction between researchers and policymakers and lack of funding. Availability of nutrition policy and political will were seen as the opportunities that exist for accelerating nutrition research in Ghana.

Recommendation: The top ten identified research questions should be used by Ghana Health Service and other relevant decision making institutions for nutrition in Ghana. Additionally, there is a need for a national framework to ensure that policymakers make input regarding nutrition research agenda-setting to enhance the linkage between policymakers and researchers.

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LIST OF ACRONYMS

AUDA	Africa Union Development Agency
CMAM	Community Management of Acute Malnutrition
CSIR	Center for Scientific and Industrial Research
DFID	Department for International Development
FAO	Food and Agriculture Organization
GHS	Ghana Health Service
GPRS	Growth Poverty Reduction Strategy
GSGDA	Ghana Shared Growth Development Agenda
HIV	Human immune-deficiency Virus
IDD	Iodine Deficiency Disorders
IDRC	International Development Research Center
IFAD	International Fund for Agriculture Development
ILO	International Labour Organization
IYCF	Infant and Young child feeding
JICA	Japan International Cooperation Agency
LEAP	Livelihood Empowerment Against Povert
MOH	Ministry of Health
MICS	Multi Indicator Cluster Survey
MOFA	Ministry of Food and Agriculture
NCDs	Non-communicable Diseases
NGOs	Non Governmental Organizations
NDPC	National Development planning commission

PhD	Doctor of Philosophy
PFJ	Planting for Food and Jobs
RHNP	Regenerative Health and Nutrition Programme
SDGs	Sustainable Development Goals
SUN	Scaling Up Nutrition
SUNRAY	Sustainable Nutrition Research for Africa
USAID	United State Agency for International Development
UNICEF	United Nations International Children Emergency Fund
UN	United Nations
1V1D	One Village, One Dam
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1. Background

The double burden of malnutrition(undernutrition and overnutrition) is a global problem facing virtually all nations of the world (Haddad et al., 2015). Nutrition is said to be both a maker and marker of development because of its effect on human development throughout the lifecycle. The consequences of poor nutrition start in utero and continued into adulthood expanding across generations. While malnutrition can confine generations in cycles of diseases and poverty, adequate nutrition during early fetal development is a sure foundation for good health and development for the future (University of Ghana et al., 2017)

The cardinal outcomes of chronic malnutrition which is stunting have devastating effects in early childhood. These effects include increased childhood mortality, increased disease incidence, developmental delays, diminished IQ, and inability to learn which results in lower academic output and reduced productivity (Ball, Barnes, Laur, Crowley, & Ray, 2016)

Malnutrition is a universal issue holding back development with unacceptable human consequences. The burden of malnutrition across the world remains unacceptably high and progress is unacceptably slow (Development Initiatives, 2018).

The UN General Assembly in 2016, declared the next ten (10) years as a Decade of Action on Nutrition globally. The declaration is especially relevant in the African context, considering the high burden of malnutrition and its related consequences such as diabetes and hypertension. (Aryeetey et al., 2017). According to the WHO, about 38.3% representing an estimated 220

million people in Africa are energy deficient (WHO, 2017.). Additionally, micronutrient deficiencies are widespread and affect the most vulnerable (children and women).

The 2018 Global Nutrition report shows that anemia affects about 613 million women of reproductive age with about 20% of them in sub-Saharan Africa (Development Initiatives, 2018) Stunting is the devastating result of chronic malnutrition in early childhood. Children suffering from stunting may never grow to their full potential. It is estimated that globally about 155 million children suffer from stunting with about 33% of them living in Sub-Saharan Africa. addressing malnutrition requires good nutrition during the most critical period of life (starting from conception through infancy (first 1,000 days).

In recent times, obesity and overweight are the new emerging face of malnutrition with nearly 4 million overweight /obese children affected, globally (University of Ghana et al., 2017). The consequence of this includes the high burden of nutrition-related non-communicable diseases such as hypertension and diabetes. The WHO currently estimated that one-quarter of the global burden of overweight and obesity in children is found in Africa (WHO, 2017). The emergence of overweight has been shaped by industry marketing and greater access to processed foods along with lower levels of physical activity.

Key findings from the 2014 Ghana Demographic and Health Survey show that among children under five years 19% were stunted and 11% underweight (Ghana Health Service, 2014). Micronutrient deficiency is prevalent and persistent; 66% of children 6-59 months are anemic with 37% and 2% being moderately and severely anemic respectively. The survey also shows a high rate (40%) of anemia in women aged 15-49 years.

Despite the positive socio-economic development and poverty reduction in Ghana in the past few decades, food security and nutritional challenges persist; high malnutrition especially among children under five years, micronutrient deficiencies among women and children, and increasing rates of obesity and nutrition-related non-communicable diseases. The nutritional situation in Ghana is further compounded by problems of food security, poor hygiene and sanitation, and health care. The adverse effect of malnutrition includes risk for morbidity and mortality, reduction in cognitive ability, especially among children, low economic productivity, increased diet-related diseases such as hypertension and diabetes ((MOH), 2013).

It is therefore important to generate the necessary evidence to tackle nutrition issues in the country. Doing this however requires strong national research system to maximize the inclusion of local context and determinants of malnutirion. Research is therefore pivotal to derive local and national actions to tackle nutrition problems (Mckee et al., 2012). Looking at the public health impact of nutirion problems in Ghana and the scarce resources to address them, evidence based research are critical to guide policy makers and donors to decide on which interventions and policies are effective in addressing the problem of malnutirion (Lachat et al., 2015).

Ghana has implemented a range of nutritional interventions. Howbeit, the impact of these interventions has been largely minimal. A major reason is that policies are often developed and implemented based on single sector mandates and key functions without clear coordination of national guidelines and strong evidence-based research to support it (MOH, 2013).

1.2. Statement Of The Problem

An important component in dealing with malnutrition is the use of high-quality evidence by decision-makers. Evidence-informed nutrition policies and research programs when introduced

and given priority have the potential to encourage the delivery of improved nutrition services and contribute to sustainable development outcomes (Aryeetey et al., 2017;Ghartey, 2010)

Ghana has implemented a range of nutritional intervention. Howbeit, the impact of these interventions has largely been minimal. Major reasons are the absence of clear national nutrition research agenda to inform nutrition policy and programming. Additionally, policies are often developed and implemented based on single sector mandates and key functions without clear coordination of national guidelines and strong evidence-based research to support it (MOH, 2013).

Coupled with this is the lack of clear processes of generating local research agenda that informs policies (Ghartey, 2010). The lack of nutrition research priorities linked with the policymaking process disengages research from the policy.

1.3. Conceptual Framework

This framework which was created based on literature from similar studies identifies 5 stages for generating nutrition reaserch agenda. These stages are identification of research gaps from literature view and program implementation, identification of expert panelist/stakeholders, reaching peer consensus on research agenda, prioritizing and validating nutrition research agenda and promoting the use of prioritized nutrition research agenda.

To begin with it can be argued that nutrition research that is context-specific and need-based is important in addressing the problems of malnutrition as it provides the springboard for action and also provides solutions that work best (Lachat et al., 2015).

Identifying the gaps in nutrition reaserch and program implementation involves a series of action such as review of journal articles, stakeholder engagement, assessment of nutrition policies and

programs to identify what works best. The role of experts/stakeholders in setting research agenda cannot be over emphasize as they play a paramount role in ensuring the provision of objective input throughout the process of prioritizing the proposed research topics (Ball et al., 2016). Reaching peer consensus and experts appraisal of the identified research topic is important as its an indication of which topics are of important to policy makers in adapting to their local context. Evidence is only useful if it reached those who have the power to make decision. Promoting the use of the identified nutrition research agenda through stakeholder engagement is importance as it helps to effectively implement nutrition interventions (policies) that improve health outcomes based on the best available evidence drawn from meaningful research (Lachat et al., 2015).

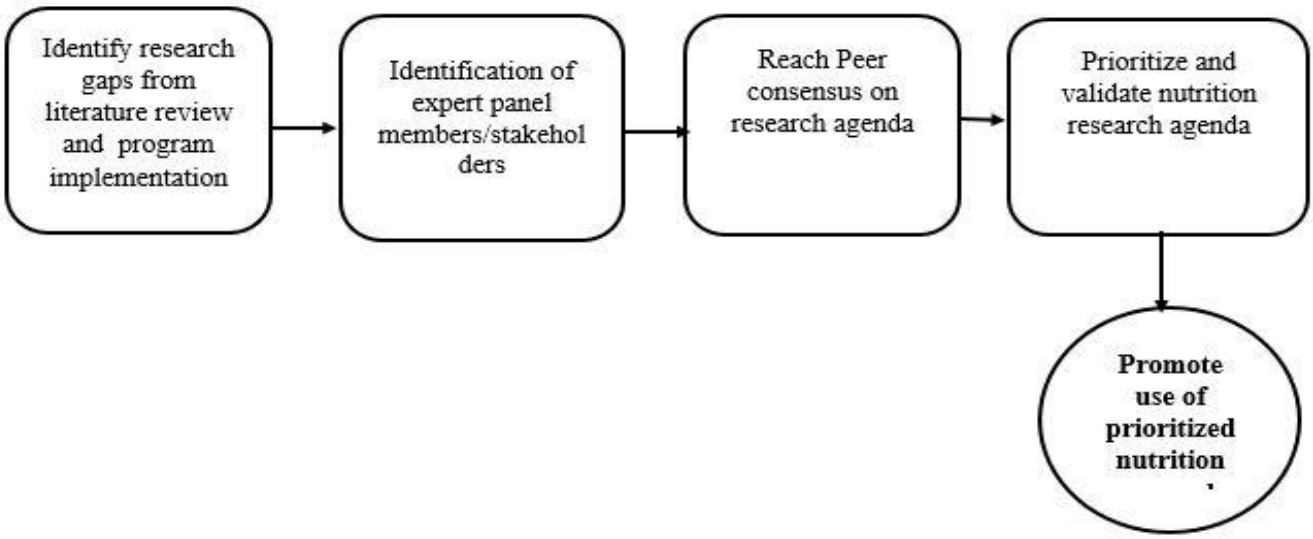

Figure 1. 1: Conceptual framework on setting nutrition research priority for Ghana

Source: Author's construct

1.4. Justification

It has been established that harnessing the power of research evidence for decision making in nutrition is limited in Africa mainly due to lack of prioritization of nutrition issues and insufficient efforts to invest in championing its development and use by policymakers. In places where some research is done, they do not adequately address the priorities of national and local context thereby preventing its use by policymakers (Aryeetey et al., 2017).The resultant effect of the above is that decisions on addressing malnutrition may be done in an ad-hoc manner and not supported by relevant evidence; where it exists, if the evidence is poor-quality, it is likely to result in low impact interventions and a waste of scarce resources (Ghartey, 2010).

Prioritizing nutrition research issues will enable the allocation of scarce resources for actions specific to improving nutrition and focus on interventions with the highest effectiveness. Additionally, the prioritization will help create an enabling environment that will foster the alignment of research funding with the priorities identified and enhance information sharing and better communication between researchers and policymakers. The current study, therefore, seeks to identify relevant nutrition research questions which when answered will inform policy and programming of nutrition issues in Ghana.

1.5. Study Objectives

1.5.1. General Objectives

The main objective of the study is to identify and prioritize policy and program relevant research questions as part of a national nutrition research agenda.

1.5.2. Specific Objectives

- To identify research questions, which when answered, can inform appropriate nutrition policy and program in Ghana

- To prioritize identified nutrition research questions to inform nutrition research in the in Ghana
- Identify opportunities and barriers to implementing the nutrition research priorities in Ghana

1.6. Research Questions

- What research priorities are essential for policymaking in nutrition in Ghana?
- What opportunities and barriers need to be considered to implement the identified prioritized nutrition research?

CHAPTER TWO

LITERATURE REVIEW

2.1 Background

Nutrition status is both a reflection and a key indicator of the health of individuals. The determinants of nutrition and health do not lie with individual factors alone but are influenced by other externalities such as social, economic, political, and geographical environment and recently emerging global threats such as climatic changes and demographic transitions (WHO, 2017). Addressing nutritional challenges, therefore, requires effective, innovative, and context-specific approaches (Lachat et al., 2014).

Nutritional status is the mirror image of health and one of its most accurate indicators while diet is one of its prime determinants. The factors that determine health and nutritional status are not only present within the individual, they are also reflected in the social, geographic, political, and economic environment. Thus indicators of nutrition status of certain population groups collectively are an index of the health and welfare of communities and countries as a whole (WHO, 2017).

2.2 Global Nutrition Situation

Nutrition is a key determinant of health and wellbeing and a contributor to human resource capabilities and performance. The provision of adequate nutrition from the early stages of life is crucial in ensuring good physical, psychological, and social development and total wellbeing of an individual (WHO, 2014.).

Non-availability and inadequate access to food with the right nutritional quality, exposure to conditions that impede absorption and adequate use by the human body are some factors that

account for a considerable number of malnutrition cases (both under and over nutrition) in most part of the world (WHO, 2014.).

The consequences of malnutrition in both children and adults have fundamental implications throughout the life cycle; reduced chances for survival, increased risk of acute and chronic diseases, impaired learning in school, and lower economic productivity. These consequences are transmitted across generations via maternal-child nutrition linkages (Haddad et al., 2015).

Malnutrition encompassing both undernutrition and overnutrition is a problem facing virtually every country in the world. It is considered as a universal issue holding back development with unacceptable human consequences (WHO & UNICEF, 2016)

Globally some progress has been made. Though there has been progressed made in reducing stunting among children under five years, the figures are still unacceptably high with 150.8 million children still stunted. Additionally, there are 50.5 and 38.3 million children who are wasted and overweight respectively, and 2.01 billion adults who are overweight and obese (WHO, 2017; Development Initiatives, 2018)

The extent of malnutrition in Africa is large. As in many other regions, the nutrition problems Africa is facing are multiple and overlapping (Haddad et al., 2015).The burdens in terms of human suffering mortality and disease are large (Sleeman et al., 2019) but so too are the economic burdens.

Reports show that about eight (8) African countries(Botswana, Egypt, Guinea, Lesotho, Libya, Namibia, South Africa, and Swaziland) are facing serious public health issues on three key dimensions, stunting, women's anemia, and overweight/obesity - a triple burden (Hoddinott, 2016)

These different forms of malnutrition place huge social as well as economic costs on society. Some estimates indicate that the annual cost of undernutrition ranges from 3% to 16% of gross domestic product. This figure is expected to go to as high as 7 million between 2011 and 2025 if low and middle-income countries take no action to address the malnutrition issues (Aryeetey et al., 2017)

2.3 GLOBAL NUTRITION TARGETS AND Sdgs

Seeing the impact and the seriousness of malnutrition, the WHO and its member states in 2013 adopted a number of targets to be achieved in order to reduce the double burden of all forms of malnutrition. These global nutrition targets were aimed at reducing the number of children under five years who are stunted by 40%, reducing by 50% the number of women in their reproductive years with anemia, a 30% reduction in low birth weight, ensuring an increase in the rate of exclusively breastfed children in the first six months of life, reducing childhood wasting to less than 5% and ensuring there is no increase in childhood overweight. (Nutrition target) These targets coincided with the SDGs target set by the member state of the UN in 2015 to end malnutrition in all its forms by 2030 (Development Initiatives, 2018).

The significant overlaps in these targets led to the declaration of 2016 to 2025 by the UN general assembly as a decade of action on nutrition globally. This declaration aims at accelerating the implementation of action by member states towards the achievement of the SDGs and the global nutrition target (WHO, 2017).

In the African context, this declaration is relevant considering the high levels of malnutrition and nutritional related non-communicable diseases such as obesity, hypertension, and diabetes. According to the WHO, about 38.3% representing an estimated 220 million people in the African

continent are energy deficient. Additionally, micronutrient malnutrition deficiencies are widespread and affect the most vulnerable (children and pregnant women).

2.4 Nutrition Situation In Ghana

Ghana has seen a matured and stable democracy over the last 3 decades. Currently, the country is ranked in the lower-middle-income status with gains made towards achieving the SDGs. Despite the positive socio-economic development and poverty reduction, food and nutrition challenges still persist in the country with the highest-burden in the Northern and Savanah regions of the country. The burden is even high in children less than five years with nutritional problems such as micronutrient deficiency, suboptimal feeding practices, and undernutrition, and increasing rates of obesity and nutrition-related non-communicable diseases (NCDs) (MOH, 2013).The malnutrition situation in the country is further compounded by problems of food insecurity especially in the northern regions, food safety, poor hygiene and sanitation, and health care (USAID, 2018).

Though Ghana in 2015 was awarded by the UN (FAO) for halving the proportion of Hungary people, studies have shown that a significant proportion of the population cannot meet their energy requirement (Aryeetey, 2014). The multiple indicator cluster survey (MICS) in 2017 shows that the prevalence of chronic malnutrition (stunting) is 18% among children under five years with the highest rate of 29% in the Northern region.

Three regions namely the northern upper east and central regions have the highest prevalence of acute malnutrition (wasting) in children under five years. Stunting and wasting are associated with mortality in children under five years, especially where both conditions are present (GSS et al.,2015).

Ghana is among the countries experiencing the double burden of undernutrition and overweight/obesity. However, over the years the country has seen a decrease in childhood obesity from 5% in 2003 to 3% in 2014. On the other hand, the prevalence of overweight among women continues to see an upward trend from 30% in 2008 to 40.1% in 2014 while those considered obese are also on the rise; from 9% in 2008 to 15.3% in 2014. The highest rate of overweight/obesity was recorded in the Greater Accra Region (57.3%) with the lowest in the Northern region (12.4%)(GSS et al., 2015). The increase in the prevalence of overweight and obesity needs to be addressed since it's a modifiable risk factor in the development of NCDs.

2.5 Adolescent Nutrition

Adolescents are the posterity of any nation and ensuring they have access to an adequate nutritional foundation is good for their health and well-being in the future. According to the WHO, adolescent comprises one-sixth of the world's population and 90% of them are in Sub Saharan Africa and Southeast Asia (WHO, 2017). The adolescent period is an important transitional phase because of the increased requirement for both macro and micronutrients to support pubertal growth and development (Arora et al., 2017).

According to Spear 2002, 50% and 60% of adult height, skeletal mass, and weight are gained during the adolescent period. Inadequate nutrition through this developmental phase may result in dire health-related consequences and poor reproductive outcomes later in life. Many (36.1%) adolescents in Ghana begin childbearing by age 19 (GSS et al., 2015). This has dire consequences because pregnant adolescent girls are more likely to be malnourished and have low birth weight babies who are also likely to be malnourished because of the competing nutrients of both mother and baby.

The prevalence of anemia among adolescents varies by residence, education, and wealth status. Among adolescents (Both boys and girls), the prevalence of anemia is higher among rural dwellers (48.9%) compared to urban dwellers (46.3%). By wealth status, however, there is an increased prevalence among wealthy adolescents (59.3%) as against a prevalence of 44.5% among poorer adolescents (Benedict, Schmale, & Namaste, 2018). Overweight/obesity is a problem affecting the majority of adolescents in Ghana partly due to poor eating habits and the preference for junk foods that are high in calories. According to the GHS, 2014. 8.7% of adolescent girls and 1.7% of adolescent boys are overweight/obese (GSS et al., 2015).

2.6 Adult Nutrition

The burden of malnutrition in Ghana is not limited to children alone, adult men and women are affected as well. Both under and over nutrition in adults have been documented through many surveys to be a health challenge. The 2014 Ghana demographic and health survey shows a 6.7% and a 2.7% underweight (BMI <18.5) among adult men and women aged 40-49 years respectively. while 56.2% of adult women aged 40-49 and 22.5% of men aged 40-49 are overweight/obese (BMI $\geq$25.0) (GSS et al., 2015).

2.7 Micronutrient Malnutrition

The burden of malnutrition transcends beyond the double burden of undernutrition and overnutrition (overweight/Obesity) to include micronutrient deficiency (Asiedu, 2019). The latent effect of micronutrient deficiency pervades across many countries, especially in Asia and Sub- Saharan Africa. The common micronutrient deficiencies globally are iron, zinc, vitamin A, folate, and iodine (Bailey, 2015). The most common indicator of micronutrient deficiency is anemia. Worldwide it is estimated that about 1.6 billion people (25% of the global population) and 50% of children suffer from anemia (the most common micronutrient deficiency) In Ghana,

it is estimated that 66% of children 6-59 months are anemic and 42% of women aged 15-49 years are anemic. This rate conversely, is far above the WHO threshold of 40% Micronutrient deficiencies are of great public health concern since their effects are damaging and irreversible. Short periods of these deficiencies in utero or during early childhood can permanently damage a child's future, physical ability, cognitive capacity, and civic and economic productivity (Barrett & Bevis, 2015).

Iodine deficiency disorders (IDD) which can begin before birth endangers the mental health and often the survival of children. Severe deficiencies during pregnancy may lead to stillbirths, spontaneous abortions, and congenital abnormalities such as cretinism (which is a grave and an irreversible form of mental retardation) (WHO, 2017). IDD results in a global loss of 10-15 IQ points at a population level and constitutes the world's greatest single cause of preventable brain damage and mental retardation (Zahrou et al., 2016).

According to the 2011 MICS, Iodine deficiency disorders are still widespread and the majority of households (65%) do not use adequately iodized salt in meal preparation. Around 40 percent of school-age children have iodine deficiency, with a higher level in the Northern Region. More than 70 percent of children under 5 years suffer from vitamin A deficiency (Ministry of Health, 2017).

2.8 Policy And Programs To Address Malnutrition In Ghana

2.8.1 The Chronology Of Nutrition Policies In Ghana

The nutrition policy landscape in Ghana over the past 52 years has predominately been programmed to address undernutrition in the population. The trajectory of nutrition policy implementation can be traced back to post-independent when the government and other actors

implemented activities to address issues with undernutrition. These trajectories can be arranged into various transitional period:

The period immediately after independence: this period focused mainly on food demonstration coupled with nutritional education. This period was seen as a new dawn for nutrition programs and activities in Ghana, though at the time the scope and details were not clear to the various actors of the program (SPRING, 2017)

Transition into behavior change communication: (1960-1974): a phase marked by low priority for nutrition activities mainly due to inadequate knowledge among various professionals about the role of nutrition and health and the effect other factors such as exclusive breastfeeding, micronutrient deficiency, and hygiene has on nutrition outcomes. Nutrition was mainly seen as food intake without any correlation with the other factors. However, advancement in knowledge led to a shift/change from food demonstration and nutrition education to include the other factors such as micronutrient deficiency, food hygiene and storage, and presentation, ways to address knowledge gaps, skills, and attitude to respond to behavior in nutrition (SPRING, 2017)

Focus on Weaning foods, supplementary food, and malnourished children (1974–1987): there was an amalgamation of the attitude and behavior change communication which was started in the preceding stage of the trajectory with community-based and school-based education and food demonstration. Weaning food became the main emphasis and was introduced to help deal with the growing nutritional needs of malnourished children in the country.

Transition into addressing micronutrient requirements (1987 – 1990): following the international conference on Ending Hidden Hunger, the nutrition focus for the country changed principally to address iodine deficiency which was achieved through salt iodization. This period was marked by massive educational activities on the use of iodized salt and legislative activities

to ensure salt produce and imported into the country were iodized. This was done concurrently with nutrition education, attitude and behavior change communication, and weaning foods.

Planning and mobilizing for action: Addressing micronutrient deficiencies and exclusive breastfeeding (1990 – 2000): According to SPRING (2017), this period was marked by increased resource allocation for nutrition and the introduction of new policies to address micronutrient deficiencies, attitude and behavior change, and weaning foods. The period also saw high governmental commitment in pursuant of policy decisions and implementation. What was lacking, however, was financial and human resource allocation and placing a central coordination mechanism and effective monitoring and evaluation to ensure sustainability. Most activities (funding and mobilization of key actors for nutrition) in this phase were majorly driven by donors and partners. There was a wider inter-sectorial engagement in nutritional activities following the international conference on Nutrition which sorts a multi-sectorial coordination committee and thematic working groups in pursuing nutrition policies which led to the development of a Nutrition Action Plan for Ghana. There was also heightened awareness of the need for governmental and donor support/commitment for nutrition activities.

Consolidation of strategies for addressing micronutrient deficiencies, exclusive breastfeeding, and community-based growth monitoring (2000 – 2008): this period of the transition was marked by an increased need for policies to address micronutrient deficiencies, exclusive breastfeeding, and community-based growth promotion. Government commitment to funding, coordination, and sustainability remained a major challenge. This period ushered in the current era of nutrition policy implementation.

Developed draft policies and programs related to dietary practices, treatment of severe malnutrition, nutrient supplementation care practices: (2008 to date): this period saw a

massive change and implementation of specific nutrition policies though there was no nutrition policy at the time. However, there existed a considerable commitment to nutrition as evidenced by numerous initiatives championed by high-level policy-makers and relevant policies and strategies. Nonetheless, there existed government policies and legislation which had specific targets for nutrition; the Growth Poverty Reduction Strategy (GPRS) I and II and the Ghana Shared Growth and Development Agenda (GSGDA) I and II.

Other health policies and regulations related to nutrition which were implemented were the Breastfeeding Promotion Regulation (L.I1667), Food and Drugs Law (Public Health Act 851526), Vitamin A Policy, Anaemia Strategy, Infant and Young Child Feeding Strategy, and Universal Salt Iodization Policy (Ministry of Health, 2017).

In 2011, the government saw the need to provide a framework for the various key actors and sectors to align their programs and policies around specific nutrition objectives to enhance effective coordination and collaboration. This need led to the development of the National nutrition policy which was done with guidance from the National Development Planning Commission (NDPC) and leadership from the Ministry of Health. The present nutrition policy was based on activities proposed by the Lancet series on Maternal and Child Nutrition in 2008 and was to span from 2014 to 2017 (MOH, 2013).

The main nutrition-specific strategies being implemented presently are:

Community management of acute malnutrition (CMAM), Infant and young child feeding (IYCF), early initiation and exclusive breastfeeding, Vitamin A supplementation, and iron-folic acid supplementation. These nutrition-specific strategies are being implemented simultaneously

with other interventions such as child growth promotion, promotion of insecticide-treated bed net usage, and deworming.

Additionally, the country is implementing nutrition-sensitive interventions in other sectors to address the key determinant of nutrition including improved hygiene, water supply, and sanitation, poverty reduction through microfinance, disease prevention and treatment, and free health insurance for indigents.

In the Agriculture sector interventions such as bio-fortification of foods, such as Quality Protein Maize; orange-fleshed sweet potatoes; and dietary diversification are being implemented to improve the quality of diet.

To increase school enrollment and retention among pupils, the government through the GES its partners implemented the school feeding program in selected basic schools in the country. The aim is to improve nutritional status of pupils and improve academic performance((MOH), 2013).

2.9 Agriculture Level Activities To Address Malnutrition In Ghana

The singular and most essential role of agriculture in addressing, malnutrition is the provision of nutritiously adequate and accessible foods, to meet the needs of people of all ages, at all times, either from the market or from farmers' own production (IFAD; International Fund for Agricultural Development, 2014)

The Agriculture sector in Ghana has the mandate of ensuring food security among households, especially among farm families. The government of Ghana through the MOFA, over the years, has implemented a number of interventions to ensure the achievement of its objectives.

Planting for food and job: the MOFA in 2017 launched the planting for food and Job initiative in the country. This initiative aims to ensure food security through immediate and adequate

availability of selected food crops in the country, increase employment opportunities and reduce poverty (Ghartey, 2010).

The Government of Ghana in 2017 developed a framework known as "The Coordinated Program for Economic and Social Development Policies 2017–2024. This framework aimed to ensure food security and promote good nutrition. Amongst the intervention being implemented to ensure the achievement of this aim include measures to prevent food losses; promoting the production and utilization of locally grown and nutrient-rich foods; developing and implementing a nutrition strategy that adopts a life-cycle approach to reduce malnutrition at all levels; reviewing and scaling up the Regenerative Health and Nutrition Program (RHNP); eliminating child and adult overweight and obesity; and promoting research and development in food and nutrition security (USAID, 2018).

2.10 The Role Of Research In Nutrition Policy And Programs In Ghana

The role research play in nutrition cannot be overemphasized. Ayeetey et al mentioned that harnessing the power of research has numerous benefits. Amongst such benefits is the development of context-specific and evidence-based policies that address the nutritional needs of the people to whom such policies are made. They again mentioned that though numerous opportunities exist for research in nutrition, these are not adequately implemented due to limited resource allocation for research, especially in Africa. The few nutrition researchers which are done oftentimes remain on the shelves due to lack of sufficient intervention based evidence to support their implementation.

The Government of Ghana in 1990 with support from the Netherland government collaborated with local stakeholders in setting the national research agenda. The aim was to make health research more relevant to national development. Since then, research that matched the national

research priority agenda has been implemented and recommendations fed into national policies (Kok, Gyapong, Wolffers, Ofori-Adjei, & Ruitenberg, 2017).

2.10.1 Current Nutrition Research In Ghana

Evidence provided by various studies in Nutrition in Ghana suggests that the country is making progress in addressing malnutrition though the pace has been slow. Given the numerous opportunities that exist in the country, it is expected that the rate of decline in malnutrition should be faster than its being observed. The challenges with nutrition in Ghana can be attributed to factors such as poor child feeding practices, suboptimal micronutrient status, household food insecurities, and low coverage of nutrition interventions (Aryeetey, 2014a). On the flip side, however, the reverse scenario of over nutrition and increasing cases of nutrition-related non-communicable diseases have emerged as the new public health threat.

To achieve a headway in addressing the nutritional challenges, various research has been implemented or are presently being implemented to understand the major determinants of improved nutrition in Ghana. Among such research are the RING project, the LINKS project, the Ghana Nutrition improvent project and Iodine deficiency disorders survey among others.

2.10.1.1 Iodine deficiency disorders Survey

this was a nationwide survey funded by IDRC, Canada, and UNICEF. The objective was to determine the level of Iodine deficiency disorders in Ghana. The results from the study informed the passage of a law on the iodization of salt in Ghana in 1995 (ICF Macro, 2010).

2.10.1.2 Research To Improve Infant Nutrition And Growth (RIING Project)

The RIING project was a collaborative nutrition research project between the University of Ghana, Iowa State University, and the University of Connecticut. The project which was

implemented in Lower Manya and Yilo Krobo Districts of the Eastern region of Ghana had its objectives of determining the association between maternal HIV status and the growth of infants in the first year of life. Findings from the study indicated that children born to HIV-positive mothers had reduced growth (weight and height) compared to those born to HIV-negative mothers. Several factors were implicated. The socioeconomic status of HIV-positive mothers was found to influence the growth of their infants. HIV positive mothers with low socio-economic status were found to have an infant with poor growth due to their inability to provide the right quality and quantity of diet their infants need for growth and development. Again households affected by HIV have reduced food security which subsequently affects their food intake and the overall nutritional status of family members, especially children (Aberman, Rawat, Drimie, Claros, & Kadiyala, 2014).

2.10.1.3 Enhancing Child Nutrition through Animal Source Food Management (ENAM) Project

The University of Ghana in partnership with the IOWA state university in the United State of America implemented the Enhancing Child Nutrition through Animal Source Food Management (ENAM) Project in Navorong, Techiman, and Winneba between 2004 and 2009. The project was to help alleviate child malnutrition and preventable diseases by making animal food sources accessible and affordable to vulnerable families with children under five years.

The main linchpin of the project was to provide caregivers with nutrition education and financial empowerment (through micro-financing) for them to be able to adequately meet the nutritional needs of their children (Aryeetey, 2014a).

2.10.1.4 Nutrition Links Project

The Nutrition Links Project was a collaborative research project between McGill University, University of Ghana, Heifer International, Farm Radio International, Population Council, and Ghana Health Service, with funding from the Canadian government and implemented in the upper Manya Krobo district of the Eastern region in 2014. The objectives of the project was to help improve food security, dietary quality and nutritional status of children under five years and women while diversifying their economic activities. The project provided training in health, nutrition and agriculture, gender equity and financial literacy. The main thrust of the project was to foster collaboration among different sectors in order to develop capacity of individuals and households in nutrition and to examine integrated approaches to promote food security, health and nutrition. (Aryeetey, 2014a).

The project impact include 93% increase in the number of children above 6months of age eating animal source foods, 93% mothers with children less than 6 months practicing exclusive breastfeeding, 87% of women had poultry related income. Among the health impact of the project was a 30% decrease in anaemia among adolescent girls and 55% district-wide increase in attendance at child growth monitoring sessions.(World Vision, 2018)

2.11 How Nutrition Research Agenda Are Generated

2.11.1 Various Approaches Being Used Elsewhere

Priority setting for nutrition research is exigent especially in low-income countries given that nutrition research is ever-growing but there is limited resource allocation for its implementation. Nutrition research in sub-Saharan Africa is often driven by donor interest rather than the needs of the countries where such research is conducted. If research priorities are not in sync with national-level context and more especially the country's' needs, it can protract or hold up result-

oriented and impactful interventions and may lead to waste of resources and discord in policy development(Aryeetey et al., 2017).

Identifying research priorities that will have the maximum impact on policy and practice is extremely important and cannot be overlooked. However, the research priority setting process is often complex and difficult. The process may be susceptive to biases and liable to being donor or funder driven. It is therefore imperative to use systematic, robust, inclusive, and lucid processes that are devoid of external influences and donor biases. When this is done, both policymakers and funding agencies have their interests and priorities jointly align within the local context thereby making their investments worthwhile (Arora et al., 2017; Mador et al., 2016).

Numerous approaches to health research priority-setting have been published in the literature. Nonetheless, there is no golden standard or a perfect approach for this prioritization.

A study conducted by Yoshida (2016), on the approaches, tools, and methods used for setting priorities in health research in the 21st century found the following approaches as the most commonly used:

2.11.1.1 Child health and nutrition research initiative (CHNRI):

The CHNRI is a method for research priority setting developed in 2007 through the global forum for health research in Geneva. The method clearly defines the text for health research which includes the focus of the health research, the risk or affected population, the period for expected impact is to be achieved, and the expected outcomes.

In a classical CHNRI, a group of management teams usually 5-10 make contact with researchers in varied fields to contribute their research ideas. These research ideas are compiled and consolidated into workable concepts. Several researchers are then invited to score the proposed

research topics against a priority setting criteria set by external stakeholders. The ranking is done on a scale of 0-100. The scored topics are then prioritized using critical priority-setting criteria to select the topic that meets the needs and the value system of the broader community. This approach has been used in several countries including India where research priority setting on maternal and child health and nutrition was done involving experts from 256 indigenous institutions and contributed over 400 research ideas(Arora et al., 2017; Yoshida, 2016)

2.11.2 Council on Health Research for development approach (COHRED)

this approach uses management processes to show important steps for the priority setting process. Participants for the process are selected based on the steps outlined in the COHRED guide. These steps are

- Assess the situation: understand the environment in which priority setting takes place
- Set the scope: define the focus and scope of the priority setting process
- Choose the best method: use methods best suited to local context and needs
- Plan priority setting: develop a management framework to ensure best use of resources
- Set the priorities: implement the plan of work
- Make priorities work: ensure action after the priority setting, and continuous review of progress

Brazil, Cameroon, Peru, and the Philippines are among the countries that used this approach in research priority setting.(Yoshida, 2016)

2.11.3 Essential National Health Research (ENHR) Approach:

this approach is a progressive and consistent method for research priority setting which focused on equity in health and development. Developed in 1990 by the commission on health research development with its main strategy as ensuring inclusiveness and a wider participant based

consultation in developing priorities in research. Participants who have a major stake in health and development are selected through a series of consultations. These participants are then categorized into four key areas: research, decision-makers, and providers of health service and community. Research ideas are identified through situation analysis which is based on scientific evidence. The consensus is then reached on the various ideas through processes such as voting and brainstorming. The research idea with the highest score is selected based on a set of criteria. (Yoshida, 2016)

2.12 Delphi Technique For Generation Research Agenda

The Delphi technique is a systematic and structured approach where a series of questionnaires known as "rounds are sent to a group or panel to gather information. The process is done in iteration until a consensus is reached (Keeney et al., 2006).

The technique originated from Greek and was named after the Greek goddess in the town known as Delphi due to her precognition abilities. The first use of the techniques was by Olaf Helmer and Norman Dalkey of the RAND cooperation in the 1950s to construe and to predetermine military priorities through consensus of view without the regular face to face engagement with those who support them (Harmsen et al., 2015).

The method involves the collection, collation and, analysis of opinion from a group of reliable and informed individuals known as "experts" to seek their opinion and establish a group agreement (McDonough, McKenna, Keeney, Hasson, & Ward, 2011).

The process is conducted in an iterative multistage manner with a series of questionnaires combined with guided and controlled feedback to the group (Thangaratinam & Redman, 2005). It is an anonymous process which allows the inclusion of large numbers of individuals with varied expertise from across different location. (McDonough, et al, 2011)

In each round of the Delphi, data is analyzed and feedbacks are sent to participants to appraise their opinion (Msibi et al., 2016). Data is analyzed to determine the rates of group consensus by calculating median and interquartile range (Hsu & Sandford, 2007).

2.12.2 Modification Of The Technique

From the outset of the technique, varied modifications have advanced from the classical Delphi. These modifications as describe by Keeney et al. (2001), include, the policy Delphi (Crisp, Pelletier, Duffield, Adams, & Nagy, 1997), the decision Delphi (Couper, 1984), the real-time Delphi (Beretta, 1996), and most recently the e-Delphi (Anthony et al., 2005).

2.12.3 Expert Panel

The "expert" in the Delphi study as define by McDonough et al., (2011) is a group of informed individuals with relevant knowledge in their field, according to Keeney et al., (2006) an expert is a person who has knowledge or expertise in the subject under investigation. Selecting an expert panel for the study is based on a "criteria" and is the bedrock of the Delphi study because experts' knowledge of the subject under study is puissant of a quality outcome (Hsu, 2006).

The criteria often used according to Keeney et al. (2006) in selecting experts in the Delphi study are expertise or knowledge in the subject area, willingness to partake in the study, and for those in the Academia having published at least a paper in the area under study. Other studies included such criteria as membership in an organization or professional group. Regarding the number of experts to use in the study, there are no universally accepted standards. Keeney et al. (2006) have shown reports of studies where the expert panel ranged from a hundred to thousands. Shakila & Charles (2005) also indicated studies where the numbers ranged from four to three thousand.

2.12.4 Consensus In A Delphi Study

The important reason for the development of the Delphi was to use it as a means of attaining a point of convergence among groups on an issue especially for areas or issues where it seems highly difficult for the panelist to have a collective agreement (McDonough, et al, 2011). However, attaining a 100% consensus is not possible due to varying views among experts (Keeney, et al, 2001). Therefore determining a priori at what percentage of agreement is equivalent to consensus is crucial. The research topic should, however, be the determining factor in this decision. Though there are no established guidelines on the appropriate level of consensus, various studies have shown a 75% consensus level as the acceptable point for determining consensus in the Delphi. For example Keeney et al. (2001) used a 75% level of consensus. Same with Keeney et al. (2006) and Simler et al. (2006).Others such as Keeney et al. (2006) used a 70% consensus level in their study.

2.12.5 Delphi In Medical/Health Research

The use of the Delphi technique has seen a massive improvement over the years with the introduction of various modifications which has made the technique popular in health and medical research.

McDonough, et al, (2011), used the technique to determine research priorities for the therapy professionals in Northern Ireland. Luise et al, in 2018 used the technique for the development of a consensus-based nutritional pathway for infants with congenital heart disease before surgery. Soul (2000) used the technique to set research priorities for HIV/AIDS so was Butler et al, who used it in Midwifery for policy development. Harmsen et al. (2015) used the Delphi technique in developing protocols for identifying trauma patients in need of care by physician's staffed mobile medical teams.

In Africa, though the technique is not widely used, there exist few numbers of health research on priority setting where the Delphi has been applied. For instance, Adebiyi et al used the modified Delphi techniques to develop a guideline to inform policy in fetal alcohol spectrum disorders in South Africa. again, Msibi et al. (2018) used the e-Delphi to formulate and appraise the guidelines for women's health concerns at a coal mine in South Africa.

2.12.6 Gaps That Exist In The Delphi Study

As with other studies, a number of gaps have been identified with the Delphi study. These gaps as stated by Keeney et al. (2006b), Hsu & Sandford (2007) and Shakila & Charles (2005) are described as follows:

Selection bias: the selection of expert panelists for a Delphi study is based solely on the researcher's decision to get the people with the relevant knowledge. This may lead to potential bias as an expert who shares the researcher's opinion and interest are those likely to be selected. Again, since those who respond positively to the initial invitation are the same people likely to participate, the result of the expert panel may affect the outcome of the study.

Various studies have shown that panel composition influences ratings. Ratings also vary across specialties and between a mixed or single-specialty panel. To enhance credibility, the panel selected should reflect the full range of stakeholders as well as specialty areas who have an interest in the result of the study.

Generalizability of the Study: The use of nonprobability sampling techniques in the selection of panel does not ensure adequate representation and therefore results from the study cannot be generalized to the entire population and more especially to other settings.

2.12.7 Validity And Reliability

Many critics of the Delphi technique assert the likelihood of panelists changing their views to conform to the view of the majority. More so when the majority views are shifting towards a consensus on key topics or policy statements. The critics believe the feedback on consensus may seriously affect validity and reliability when the majority of panelists unflinchingly hold on to their views or give in to the view of the majority to conform to the group's rating.

CHAPTER THREE

METHODOLOGY

3.1 Study Design

A two-round classical Delphi technique was used in the study. Delphi is a structured process that involves the presentation of a questionnaire to a panel of 'informed individuals' (experts) to seek their judgment on a particular issue (McDonough, et al, 2011). This technique uses questionnaires known administered in multiple rounds to gather information continually until a consensus is reached (Keeney et al., 2001).

3.2 Consensus Level

The threshold consensus level for the current study was set at 75% (Keeney et al., 2001).This means that for any research topic to be considered relevant, it should be considered important by at least 75% of the expert panelist.

3.3 Study Area

Expert panelist for the study will be recruited across the country (Ghana). Ghana is a country located along the Gulf of Guinea and the Atlantic Ocean, in the sub-region of West Africa. Spanning a land mass of 238,535 km^2 (92,099 sq mi), Ghana is bordered by the Ivory Coast in the west, Burkina Faso in the north, Togo in the east, and the Gulf of Guinea and the Atlantic Ocean in the south. The 2010 population and hosing census estimated the population of the country to 30 million. Ghana has a youthful population with 2 out of every 5 people being children under fifteen years. About 80% of employment in the country is in the informal sector. Within the past two decades, the country has experienced moderate economic growth. In the

occupational categories of employment, 41.2% which forms the majority are in the field of agriculture, forestry, and fishery. The professional category forms 5.3% (2010, PHC)

3.4 Study Population

Expert panelists were professionals working in institutions involved in food and nutrition research, policies, and programs, and who satisfy the inclusion criteria (described in section 3.4.1 below). The relevant institutions from which experts were selected included: Government agencies such as Ghana Health Service (GHS), Ministry of Health (MOH), Ministry of Food and Agriculture (MOFA), Ghana Education Service (School health Coordinators-SHEP), Research institutions/Evidence brokers (e.g CSIR, IITA), United Nations, (UNICEF, FAO), Private Sector (Yedent,) NGOs and CSOs, and International organization/funders(e.g USAID, and DFID).

3.4.1 Inclusion Criteria

To qualify to participate in the study, expert panelists must have at their first degree and least three years experience in their current position.

3.5 Sampling Technique

A purposive sampling technique was used to identify suitable participants for the study. Purposive sampling allows the researcher to indentify and select participants that are especially knowledgeable about and experienced with the subject of interest (Palinkas et al., 2015). Based on the criteria, a list of panelists was generated which included the following:

Policymakers (n = 8), Program managers (n=7), selected from Ghana health service head quarters

Dieticians (n=12), Nutrition officers (n=10), Researchers and academia (n=5), Funders of nutrition programs/International donors (n=7) None governmental organizations and civil society

organizations. (n=8), Food and nutrition industry (3), School Health Education Programme coordinators (n=8), District Directors of Health Services (n=10), Other governmental agencies(Food and Drugs Authority(n=2), making a total of 80 experts eligible for the study. Participants were invited through an email invitation to participate in the Delphi process.

The Nutrition Officers, Dieticians and School Health Education Program coordinators were selected from the ten previous administrative regions of Ghana while the District Directors of Health Services were selected from 10 district across the country; 2 from Eastern Region (Yilo krobo and Nsawam), 3 from Greater Accra (Amasaman, Ga East and Dangne West), 3 from Ashanti region (Kumasi Metro,Afigya-Sekyere and Adansi North) and 2 from Brong Ahafo (Sunyani and Tano North).

3.5.1. Quality Control

A pretest of the study questionnaire was done with 20 expert panelists from selected hospitals and district health directorate in the Eastern region. After, the necessary corrections and re-arrangements of the various sections of the questionnaire were done.

3.6 Data Collection Procedure And Analysis

According to Keeney Keeney et al. (2006), one of the fundamental blocks of the Delphi techniques is to have as many rounds as needed to achieve convergence for consensus. Keeney et al. (2001) used four rounds to achieve consensus in his study.

In this study, two rounds of the Delphi method was employed to identify the research priorities for nutrition in Ghana. The two rounds were selected to reduce participant fatigue and high attrition usually associated with multiple rounds in a Delphi study (Thangaratinam & Redman, 2005).

3.6.1 Round One (1)

Procedure for Generating Nutrition research Question for Round 1

The 38 research questions for the first round survey were developed and refined through review of literature, from Ghana and other African countries. review of the Ghana Health Service research agenda (Ghana Health Service, 2014) and the Ghana Nutrition policy 2014 to 2017 (Ministry of Health, 2017).

The questionnaire (as a google form link) or digital copy in MS word document format) was sent via email to all participants who agreed to participate in the study. the email also included instructions for completing the questionnaire and information about the study and expectations of panelists. Expert panelists were informed they will not receive any incentive for their participation and were also assured of the anonymousity of the answers they will provide.

Of the 80 expert panelist who agreed to participate in the study, 11 did not respond during the first round, and 3 declined due to time constraints or adequate knowledge of the Ghanaian context. The 66 experts who responded were asked to use the link to the google form or the word document to provide responses to the 38 nutriton research questions which were grouped under 8 thematic areas by the principal investigator. Respondents were asked to rate on a 4 Likert scale (from 1=not relevant to 4=very relevant) based on priority and to propose new nutrition research questions based on the prioritization criteria sent to them.

To enhance the response rate, reminders were sent to participants one week after the initial mail and again on the 3rd week.

3.6.2 Analysis Of Round 1

All responses from the google form were exported into Microsoft excel and those received via email copy were crossed checked and entered into Microsoft excel. All statistical analyses were done using STATA version 15 and Microsoft excel 2010. Frequencies and percentages for each research question were calculated and questions that had 75% or more participants indicating it was very relevant or relevant were considered to have achieved consensus. Questions that achieved consensus in round 1 and **30 new** questions proposed by expert panelist were used to develop the second-round questionnaire.

3.6.3 Round 2:

This round marks the final round of the data collection procedure. All expert panelist that participated in the first round were invited to re-rank questions that achieved consensus in the first round. The additional questions raised by the expert panel were added to these questions and were re-grouped. In all, a total of 66 questions under 11 thematic areas were identified for the expert panelist to rate and rank.

The panelists were asked to return the completed questionnaire within one month after receiving the email. Follow-up reminders were sent to the expert panel one (1) week and also given three weeks to respond.

3.6.4 Analysis Of Round 2

Responses from the google form were exported into excel while those received through the mail were checked, coded, and entered into excel. Analysis of the second round was done using Stata version 15 and Microsoft excel to compute frequencies, percentages, standard deviation, to determine the number of research topics that have reached consensus and ranked from the most

important to least important. A total of 23 questions achieved the highest ranking and 10 of these questions were prioritized by expert panel members (using prioritization criteria) and presented as the top nutrition question for the research agenda.

3.6.5 Prioritization Of Research Question

A set of eight (8) prioritization criteria was developed using guidelines from other published work (Ball et al., 2016). These criteria include; focus on the target group, sustainability, feasibility, public health importance, contribution towards achieving national and global targets among others. The 23 submitted research questions were independently scores by each panel member using the above stated criteria with answers; (3 points) for “yes” and “no” (1 point). The total number of each points awarded to each research question was summed in order to provide an overall total score for each criterion. Finally, the appraised questions were ranked from highest to lowest score to provide the list of 10 prioritized research questions.

3.7 Data Collection Tools

3.7.1 Delphi Questionnaire

The questions were developed by the principal investigator through reviews of relevant literature, review of similar research done in Ghana and other African countries, review of journal articles, and other published work from databases such as Science direct, google scholar, review of the Ghana Health Service research agenda (Ghana Health Service, 2014) and the Ghana Nutrition policy 2014 to 2017 (Ministry of Health, 2017) using Google Forms for the online data collection and a word document which was sent to study participants through email attachments. The questionnaire required respondents to chose from a pre-determined responses such as most relevant, very relevant, relevant, less relevant and not relevant.

The questionnaire was in 3 sections. Section A asked about demographic characteristics of respondents, section B asked respondent to identify which list of the nutrition research question was relevant for Ghana, section C asked panelist to identify which other research question was important for Ghana and to identify the opportunities and barriers to nutrition research in Ghana.

3.8 Ethical Issues

Ethical clearance was obtained from the Ghana Health Service Ethics Review Board. (GHS-ERC040/11/19). Questionnaires were sent to expert panelists who agreed to participate in the Delphi process. Consent was also sought from participants before the data was collected. Voluntary participation was indicated on the google form and participants were asked to check to indicate their participation. The purpose of the study and the processes involved were explained to all the expert panelists. Data collected was kept confidential and securely under lock. The soft copy is stored on a computer and password protected.

CHAPTER FOUR

RESULTS

4.1 Demographic Characteristics Of Panel Members

Of the 80 expert panelists invited to participate in the Delphi study, 66 completed the first round survey (83% response rate). Thereafter, 56 out of 66 completed the second round (85% response rate). Thus 70% of the original 80 panelists completed the second round of the opinion survey.

The mean age ± standard deviation of respondents was 41.9 ± 6.5 years with a minimum age of 33 years and a maximum of 60 years. Majority (52%) of respondents were between the ages of 30 and 40 years. About half of the expert panelists (51.5%) were females (Table 4.1). About a third had a master's degree and have been involved in policy, planning, and management as part of their roles. Another third (31.8%) were service providers working in health-related institutions.

Table 4. 1: Demographic characteristics of expert panel members

Variable	Frequency	Percentage (%)
Age Group (completed Years)		
30-40	34	51.5
41-50	20	30.3
51-60	12	18.2
Sex		
Male	32	48.5
Female	34	51.5
Highest Education Qualification		
Bachelor's Degree	10	15.2
Masters/MPhilequivalent degree	53	80.2
Ph.D/Doctorate or equivalent degree	3	4.5
Current role		
Policy/planning/management	25	37.9
Health care Provider	21	31.8
Advocacy	9	13.6
Research	6	9.1
Monitoring and Evaluation	5	7.6
Respondent Institution		
Academia/Research	11	16.7

International/Local NGO	2	3.0
Donor/Technical Agency	19	28.8
Government Health System	31	47.0
Other*	3	4.5
# of Years Worked in Current Institution		
Less than 3 years	1	1.5
More than 3 years	65	98.5

*Other: Food industry, Food and Drugs Authority

4.2 Delphi First Round

4.2.1 Relevant Nutrition Research Questions Identified by Expert Panelist

Of the 38 questions presented to expert panelists in the first round, 36 (95%) were frequently (>75% responses) selected by panel members as relevant nutrition research questions. These questions were presented across 8 pre-selected thematic areas: maternity protection and breastfeeding, infant and young child feeding, food safety, agriculture, food security and food system, obesity and non-communicable diseases, and maternal nutrition. Table 4.2 summarizes the number of questions expert panelists considered to be relevant, across the thematic areas.

Table 4. 2: Summary of grouped research questions considered relevant by expert panelists

Thematic Area	**Number of research Questions Presented to panel**	**%(*n*) of questions prioritized by at least 75% of the panel**
Maternity Protection and Breastfeeding	13	92 (12)
Food safety	2	50 (1)
Complementary feeding	6	100 (6)
Agriculture, food security, and food systems	6	100 (6)
Maternal nutrition	4	100 (4)
Obesity and nutrition-related NCDs	2	100 (2)
Nutrition among the Elderly	2	100 (2)
Food Quality in public Space (e.g school, hospital)	1	100 (1)
Other Questions	2	100 (2)
Total	38	95 (36)

Almost all (12 out of 13) maternity protection and breastfeeding-related research questions were considered relevant by the expert panelists. The questions rated relevant most frequently (83% of respondents) were: “Are the workplace policies on breastfeeding being implemented” and “What duration of maternity leave in Ghana is most cost-effective”.

All the six (100%) questions related to complementary feeding were considered relevant by the expert panel. There was unanimous consensus for all questions related to agriculture, food security, and food systems; obesity and related NCDs; elderly nutrition; and Food Quality in the public space such as schools, and hospitals. Of the two questions raised under food safety, only one achieved consensus with 43 responses (77%).

Additionally, 33 new questions were proposed by expert panelists during this round.

4.3 Delphi Second Round

In the second round, consensus over research questions was achieved for 61 (88.4%) out of the 69 questions presented to panel members. Although there were variations in the proportion of questions achieving consensus across thematic areas, thirteen (13) questions achieved a consentient agreement among the expert panelist. Table 4.4 below shows a summary of questions achieving consensus in the second round.

All the 38 questions from the first round were retained as relevant in the second round. Most (76%) of the new questions were also retained as relevant.

Table 4. 3: Number of Research Questions Achieving Consensus in Delphi Second Round

Thematic Area	Number of research Questions Presented to Panel	percent of questions achieving 75% consensus (n)
Maternal Protection and Breastfeeding	13	100 (13)
Food safety	8	88 (7)
Complementary feeding	10	70 (8)
Maternal Nutrition	4	100 (4)
Obesity and nutrition-related NCDs	4	100 (4)
Elderly nutrition	2	100 (2)
Food Quality in public space	2[a]	100 (2)
Adolescent nutrition	4[b]	75(3)
School Health and Nutrition	4[b]	100 (4)
Nutrition and mental health	1[b]	100 (1)
General Question	6[a]	50 (3)
Total	**69**	**88.4 (61)**

a includes new research question(s) raised by expert panelists in the round I

b new thematic area based on research questions raised in the round I

Two new thematic areas were considered a priority by the panel: school health and nutrition, and nutrition and mental health. Regarding the food safety thematic area, perception, and experiences of using food additives failed to reach the 75% threshold for consensus across panelists (71% in the first round, and 64% in the second round). Research questions proposed by the panel in the first round that did not achieve consensus include the linkages between nutrition and WASH in institutions (48% of panelists) and the link between open defecation and nutrition in Ghana (45% of panelists).

4.4 Consensus between the Delphi Rounds

The table below shows the level of consensus or agreement between the Delphi rounds, the standard deviation, and the top-ranked questions.

Table 4. 4: Summary statistics between the Delphi rounds

Summary Statistics	Round I	Round II
Number of research Questions	38	69
Number Achieving consensus	36	61
Top Ranked Questions		23
% achieving consensus	95%	88%
Standard deviation	12.3	14.8
Inter Quartile range (IQR)	12	20

Consensus for questions raised in round one was high (95%) compared to round II where consensus was achieved for 88% of questions raised.

4.5 Top-Ranked Nutrition Research Questions

A total of 23 questions were ranked by panel members as the top nutrition research question with more than 75% of expert panelists endorsing the same direction of importance. Among these questions, about half were questions listed under maternity protection and breastfeeding protection, agriculture food security and food systems, and nutrition and school health thematic areas. Table 4.5 below shows the top-ranked nutrition research question based on scores attained for each question in the first and second rounds of the survey.

Table 4. 5: Top Ranked Nutrition Questions

No.	Nutrition Research Question	Consensus Achieved		Highest Ranked
		Round 1	Round 2	
	Maternal Protection and Exclusive Breastfeeding Practices			
1	What is the Impact of baby-friendly initiative on exclusive breastfeeding practices and infant mortality?	97%	100%	1
2	What are the factors that influence exclusive breastfeeding practices among working women in Ghana?	95%	100%	1
3	What policies are available at the workplace that promotes breastfeeding practices	98%	100%	1
4	Are the workplace policies on breastfeeding being implemented?	97%	100%	1

	Complementary Feeding Practices			
5	What are the drivers of poor diet adequacy among young children in Ghana?	77%	86%	1
6	What are the child feeding experiences and coping mechanisms among working mothers?	94%	84%	1
	Food Safety			
7	What is the impact of food regulatory bodies on the availability of substandard food on the market?		100%	1
8	What is the infectiveness of nutritional supplements in the nutritional status and health of children under five years?		100%	1
	Agriculture, Food Security, and Food systems			
9	What is the effect of government policies (PFJ, 1V1D, etc.) on food production, trade, and consumption?	100%	100%	1
10	What is the association between consumer knowledge and awareness of healthy diet on nutritional status?	98%	100%	1
11	Does seasonal food availability influence the nutritional status of the community?		100%	1
12	What is the link between agriculture production diversity and dietary quality?	100%	85%	1
13	What proportion of pregnant women receive full anemia preventing package during pregnancy?	85%	100%	1
	What is the effect of a girl's iron-folic acid implementation on school performance outcomes?	89%	100%	1
	Obesity and NCDs			
14	What is the linkage between urban living and the nutritional status of adults in Ghana?	97%	100%	1
15	What are the drivers of Childhood obesity in urban settings?	92%	100%	1
16	What is the prevalence of dietary supplement and nutraceuticals use among Ghanaian adults?	89%	100%	1
	Adolescent Nutrition			
17	What are the determinants of adolescent nutrition behaviors?		100%	1
	School Health and Nutrition			
18	What is the level of collaboration between school health collaborators and the development of nutrition policies for school-aged children?		100%	1

19	Does the school feeding program at the SHS impact on academic performance?	100%	1
20	What are the opportunities and challenges in the implementation of school feeding program at the Senior High school level?	100%	1
21	What factors influence the adoption and implementation of nutrition policies in the educational sector?	100%	1
	Nutrition and Mental Health		
22	What factors influence the nutritional status of persons with mental disorders?	78%	1
	Food Quality in Public space (e.g schools, hospitals, etc)		
23	What factors influence the preference for roadside foods in urban areas?	85%	1

4.6 Top Priority Nutrition Research Question Identified by Expert Panel

Of the 23 top-ranked questions, 10 questions were identified using a prioritization criteria as the priority nutrition research question for the country (Table 4.7).

Table 4. 6: Top 10 Prioritizef Nutrition Questions

Research Questions	Prioritization Criteria and score								Total Score	% Score	Rank
	Focus on key targets group	Sustainability	Feasibility	Public Health Importance	Contribution towards achieving targets	Address unmet needs	Level of evidence	Effectiveness			
What are the factors that influence exclusive breastfeeding practices among working women in Ghana? (Workplace Policies and implementation)	168	159	156	165	144	159	165	165	1281	95.3	**1**
What is the effect of government policies (PFJ, 1V1D, etc.) on food production, trade, and consumption?	165	165	162	168	165	141	150	153	1269	94.4	**2**
What factors influence the adoption and implementation of nutrition policies in the educational sector?	168	156	153	162	165	150	153	153	1260	93.8	**3**
What are the determinants of adolescent nutrition behaviors?	165	156	168	147	162	156	153	150	1257	93.5	**4**
What is the Impact of a baby-friendly initiative on exclusive breastfeeding practices and infant mortality?	168	165	159	168	168	162	156	108	1254	93.3	**5**
What factors influence the nutritional status of persons with mental disorders?	150	165	168	165	150	141	144	150	1233	91.7	**6**
What is the effect of girl's iron-folic acid implementation on school performance outcomes?	165	156	144	159	156	162	147	144	1233	91.7	**6**

What is the impact of food regulatory bodies on the availability of substandard food on the market?	168	165	156	144	156	141	147	138	1215	90.4	**8**
What are the drivers of poor diet adequacy among young children in Ghana?	153	132	159	162	165	156	138	132	1197	89.1	**9**
What is the prevalence of dietary supplement and nutraceuticals use among Ghanaian adults?	144	129	138	135	147	153	156	105	1107	82.4	**10**

4.7 Barriers To The Implementation Of Prioritized Nutrition Research In Ghana

The graph below provides the details on what the expert panelist say are the barriers to the implementation of prioritized nutrition research in Ghana.

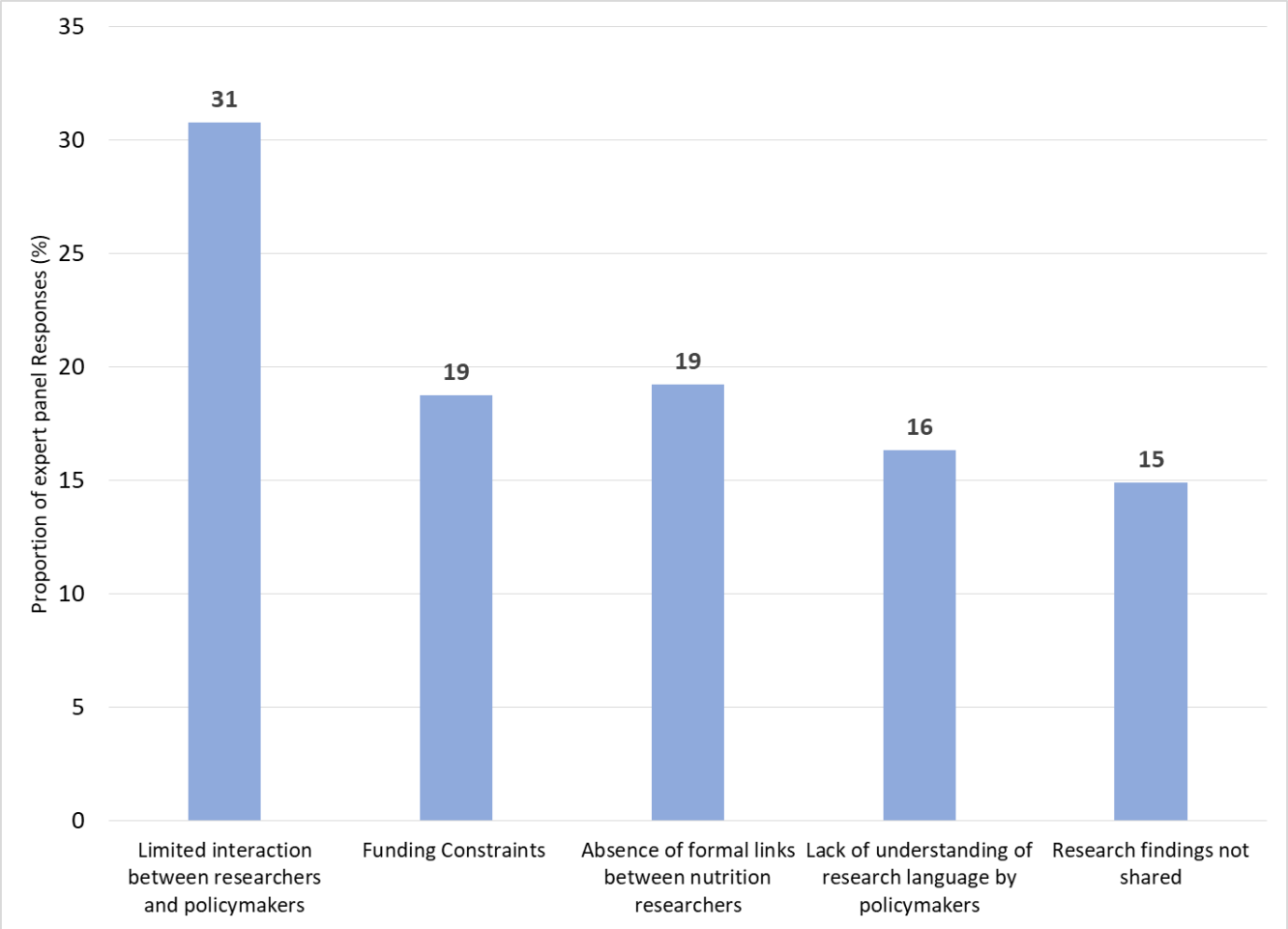

Figure 4. 1: What are the Barriers to the implementation of prioritized nutrition research in Ghana

The most frequently reported barrier to the implementation of nutrition research priorities was the lack of interaction between researchers and policymakers (31%). The frequency of responses regarding funding constraints and the absence of formal links between nutrition researches was

19%. The least frequently reported barriers were lack of understanding of research language by policymakers (16%) and research findings not shared (15%).

4.8 Opportunities Available For Nutrition Research Implementation In Ghana

Availability of nutrition policy (34.3%) was perceived by expert panelists as an opportunity for prioritized nutrition research implementation in Ghana. The second most frequently mentioned opportunity was political will (26.9%).

Table 4. 7: Opportunities available for nutrition research implementation in Ghana

Responses	Frequency	Percentage (%)
Availability of nutrition Policy	60	34.3
Political will	47	26.9
Availability of Funding	29	16.6
Popular event	22	12.6
Presence of Nutrition Champions	17	9.7
Total	**175**	**100.0**

CHAPTER FIVE

DISCUSSIONS

5.1 Relevant Nutrition Questions Identified By Expert Panelist

This study, through consensus, has generated nutrition research priorities relevant to Ghana based on expert panelists surveys. By expert agreement (with ≥ 75 consensus level) a total of 10 questions were identified and ranked as the top priority nutrition question for Ghana. These questions span across 10 pre-determined thematic areas; maternity protection, and breastfeeding, Agriculture, food security, and food systems, food safety, complementary feeding, adolescent nutrition, obesity, and diet-related NCDs, school health and nutrition, mental health, and nutrition, and adolescent nutrition.

It is recommended by WHO and UNICEF (2018) that the best food for the infant for the first six months of life is breast milk. Evidence from several countries in both low and middle-income countries has underscored labor-related issues as major reasons why most working mothers are not able to initiate breastfeeding early, not able to breastfeed at all, or stop breastfeeding early. The enforcement of the implementation of labor protection laws and the expansion of paid maternity leave has a strong influence on women's practice of exclusive breastfeeding and their participation in the labor market (Vilar-compte, et al. 2020). Although the International Labour Organization (ILO) recommends a minimum of 14 weeks of paid maternity leave, many countries including Ghana do not meet this recommendation (Vilar-compte et al. 2020). This, therefore, means only a few employed women can achieve their breastfeeding goals due to inadequate maternity protection. Expert panelists might have selected this question to allow further studies into what works best in terms of maternity protection and breastfeeding in Ghana so that the country may reap the many benefits that come with its practice.

Improving agriculture development and food security is important for food diversity and improved nutrition (HLPE, 2016). By expert agreement, agriculture food security and food systems research was considered important for nutrition research with a focus on the effect of government policies on food production, trade, and consumption.

Questions prioritized undernutrition and school health were centered on policies relating to school health and nutrition policy development, opportunities, and challenges relating to the adoption of nutrition policies in education. These research questions were prioritized by expert panelists probably because they are areas that have been under-studied since the implementation of the school feeding program in the country (Ministry of Health, 2017; Ghartey, 2010).

Although the questions under maternal nutrition have long been documented in the country expert panel members ranked them as top questions. The panel might have ranked this as a priority research questions because of its importance for anemia in pregnancy. Girls' iron-folic acid implementation on school performance also needs to be continuously explored (Ghana Health Service, 2014; USAID, 2018).

A statement by Hippocrates about 2 millennia ago “let food be thy medicine and medicine thy food” has gained more attention in recent time mainly because both food scientists and food consumers have realized the critical role food play in the health and wellbeing of the individual. Many products in recent years are being advertised to have the ‘Magic” of providing the body with good health and vitality and providing the ideal body image we so desire (Nasri et al. 2014). These products range from traditional nutraceuticals (that is products in the natural state without additives) to non-traditional neutraceuticals (from the agricultural breed and added nutrients such as vitamins and minerals) (Yaa & Mante, 2019). Expert panel members might have prioritized this, the prevalence of dietary supplement and nutraceuticals use among Ghanaian adults is

probably a new area that needs further studies to guide policies and programs in the prevention of obesity and diet-related NCDs.

Food safety has been found to be an important element in promoting healthy eating and adequate nutrition among the population (Odonkor, 2020). The role of food regulatory bodies plays in ensuring food safety cannot be overemphasized. Expert panel members, therefore, prioritized the impact of food regulatory bodies on the availability of standard food on the market (Ababio & Lovatt, 2015).

Several studies have been conducted in the area of infant and young child feeding with a special focus on complementary feeding. However, there is a limited number of intervention studies that look at the link between nutrition-specific and nutrition-sensitive approaches in dealing with problems associated with infant feeding practices (Marquis et al., 2018). A review of studies conducted by Berti et al. (2004) and Christian et al. (2012) shows that intervention studies that focus on the linkage between agricultural practices, socio-economic indicators such as women empowerment, education, and microcredit or financing have a better effect on children's nutritional outcomes. Panel members identifying complementary feeding practices may be as a result of the need to focus more studies that establish the causal relationship between nutrition-specific and nutrition-sensitive approaches such as the impact of family economic empowerment programs on child's nutritional status, and the influence of caregiver's income on the intake of nutritionally adequate food.

Other research areas prioritized by expert panel members were nutrition and mental health and adolescent nutrition.

Although limited literature exists in Ghana and Sub Sahara Africa on setting nutrition research agenda, a study conducted by SUNRAY project (2014) on Developing a Sustainable Nutrition Research Agenda in Sub-Saharan Africa and a similar study conducted by the Sackler Institute for Nutrition in collaboration with WHO (2008) on A Global research agenda for Nutrition Science identified interventions to improve nutrition and behavioral strategies of population groups, agriculture, food systems, and food security, nutrition and diet-related NCDs, and Nutrition and normal growth during early life as the top prioritized nutrition research question in their nutrition research agenda-setting.

A recent research priority setting exercise for Africa conducted by the African Academy of Sciences and the AU Development Agency (AUDA) identified research priorities that focus on food security, protection against malnutrition especially in early life, and the diet-related NCDs as the top research areas needed (African Academy of Sciences, 2020).

5.3 Barriers To Nutrition Research Implementation In Ghana

The study also examined barriers to the implementation of nutrition research in Ghana. Expert panel members indicated the lack of interaction between researchers and policymakers, funding constraints, absence of formal links between nutrition researches, lack of understanding of research language, and research findings not shared. These findings were consistent with other research findings which stated poor funding and lack of engagement between researchers and policymakers as barriers to nutrition research implementation (Lachat et al., 2014).

Although large volumes of nutrition research exist, the findings are not translated into policy largely due to the disconnect between policymakers and researchers which often happens as a result of low stakeholder engagement and lack of a framework for integrating nutrition evidence into policy (Lachat et al., 2014). Again, the absence of formal links between nutrition research

often leads to either duplication of nutrition research or evidence which are not context-specific therefore may not address both local and national priorities (Aryeetey et al., 2017).

Though governmental commitment (in promises and actions) to addressing the issue of malnutrition has been high on the agenda because of the quest to meet the international targets of achieving SDGs, this commitment has not seen much translation into funding support for nutrition research in Ghana. (Van Royen et al. 2013). This affirms a report by Laar et al. (2015) in a Scaling Up Nutrition (SUN) Academy assessment of budgetary allocation for nutrition in Ghana for the year 2014. Since the nutrition budget for both nutrition-sensitive and nutrition-specific activities are en routed through ministries and agencies such as Ghana health service, local Government and Rural Development, and ministry of Agriculture, spending on nutrition programs by these sectors are nugatory. Inadequate funding as mentioned by panel members continues to slow the progress in advancing nutrition research in Ghana.

Other important barriers identified were a lack of understanding of research language and research findings not shared. Although there exist several nutrition research findings most of these findings are in journals and databases which are inaccessible to policymakers (Aryeetey et al., 2017). Again, most researchers often share their findings with those in academia, leaving out other key stakeholders who need such findings for decision making. In instances where policymakers and stakeholders participate in the dissemination process, the use of scientific language, coupled with the lack of nutrition knowledge, prevents the practical use of evidence by stakeholders for societal benefit. Some of the ways through which nutrition research findings can be shared with program institutions are to translate the findings into policy briefs, developing technical reports that are coincise and easily understood, through presentions at symposia and the

use of knowledge brokers; these are organization or individuals who support researchers by translating and adapting findings to the local context.

5.4 Opportunities Available For Nutrition Research In Ghana

Several opportunities have been cited to facilitate the implementation of nutrition research in Ghana. In this study, expert panel members identified the availability of nutrition policy as the biggest opportunity that exists for implementing nutrition research in Ghana. Nutrition policy and the policy environment is key in determining the overall nutrition outcomes. When the policy environment is enabling, it accelerates nutrition security and creates the right environment that promotes research, and policies that are based on sound research are context-specific and are pivotal to drive local actions to tackle nutrition problems.

Other opportunities identified by expert panelists were political will and availability of funding (internally generated) for research and popular events such as world breastfeeding day and so on. Tackling the twin burden of malnutrition - undernutrition, and obesity requires a strong commitment from the government and policymakers. A recent international call for the government to commit to addressing nutrition problems which is key in achieving sustainable development goals has seen some level of governmental/political will towards nutrition research implementation. These, expert panel members, saw it as a springboard for accelerating nutrition research implementation in Ghana.

Another opportunity that expert panel members identified to facilitate nutrition research in Ghana is the availability of funding. This finding is consistent with other studies that identified inadequate resource and funding allocation for nutrition research implementation in sub-Saharan Africa (Aryeetey et al., 2017). This suggests that, with governmental commitment and political will, some amount of funding can be allocated to support nutrition research in Ghana.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

The study aimed to identify the priority nutrition questions for Ghana, identify the barriers to the implementation of nutrition research in Ghana, and identify opportunities that exist for nutrition research in Ghana. This chapter highlights the conclusion and recommendations drawn from the study.

6.1 Conclusions

This study identified 10 questions as the top prioritized nutrition research question for Ghana;

What are the factors that influence exclusive breastfeeding practices among working women in Ghana? (Workplace Policies and implementation), What is the effect of government policies (PFJ, 1V1D, etc.) on food production, trade, and consumption?, What factors influence the adoption and implementation of nutrition policies in the educational sector? What are the determinants of adolescent nutrition behaviors?, What is the Impact of baby-friendly initiative on exclusive breastfeeding practices and infant mortality?, What factors influence the nutritional status of persons with mental disorders? What is the effect of a girl's iron-folic acid implementation on school performance outcomes? What is the impact of food regulatory bodies on the availability of substandard food on the market? What are the drivers of poor diet adequacy among young children in Ghana?, What is the prevalence of dietary supplement and nutraceuticals use among Ghanaian adults?

The barriers identified to mitigate the implementations of nutrition research in Ghana were lack of interaction between researchers and policymakers, lack of funding, and lack of formal links between nutrition researchers.

Availability of nutrition policy and political will were seen as the greatest opportunity that exists for nutrition research in Ghana.

6.2 Recommendations

1. The top 10 priority research questions should be used by policymakers in the Ghana Health Service and other relevant decision-making institutions (such as the Ministry of Health, National Development Commission, Ministry of Education, Ministry Food and Agriculture, Ministry of Finance, UNICEF) for nutrition Ghana.
2. There is a need for a national framework to ensure that decision-makers/policymakers make input regarding nutrition research agenda-setting to enhance the increased linkage between policymakers and researchers. This could be done through a National nutrition research forum spear headed by the Ghana health service in collaboration with stakeholders from the academia and the representation of nutrition researchers at the governmental level.
3. There is a need for government to prioritize nutrition in its budgetary allocation; this can be done by establishing a funding mechanism to support nutrition research in the country.
4. Researchers can leverage the political will which was seen as conducive for nutrition research to draw attention to the government on prioritizing nutrition research as part of the national priority setting.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

PART A: Respondent characteristics

Kindly circle your response with the corresponding code on the right.

PART B: Nutrition research Issues

Below is the list of research questions on key nutrition issues. Please take time and reach each question carefully and provide the response appropriately. For each research question, place an X to indicate your response or rating by checking one (either most relevant, Very relevant, less relevant, and not relevant)

PART C: For each question, kindly circle your response with the corresponding code on the right.

PART A : Background information on Expert Panelist			
	Question	**Response**	**Code**
A	Sex	Male	1
		Female	2
B	Age (in years)	……..	---
C	Highest Educational Qualification	PHD/doctorate/equivalent	1
		Masters/Mphil/equivant	2
		Bachelors/equivalent	3
		Diploma/certificate/equivalent	4
		Other(specify)	5
D	Current institution of work	Academia/Training institution/Research	1
		MOH /GHS	2
		Health Facility (hospital, pharmacy, laboratory)	3
		International donor/technical Agency	4
		International and local NGO	5
		Other(specify)	6
E	Number of years working in the current institution	Less than three(3) years	1
		More than three(3) year	2
F	Role in the current job	Health care provider (clinical and public)	1
		Policy/ planning/management	2

		Research and development	3
		Advocacy and promotion	4
		Monitoring and evaluation	5

PART B NUTRITION RESEARCH TOPICS							
Nutrition issue		**Research Question**	**Response**				
Infant and young child feeding	Maternity protection and breastfeeding	**Breastfeeding research issue**	**Most Relevant**	**Very Relevant**	**Relevant**	**Less Relevant**	**Not Relevant**
		Which sub-groups of women are most vulnerable to sub-optimal breastfeeding in Ghana?					
		Which CSO/NGO's have been actively involved in breastfeeding programs/activities in Ghana in the past 5-10 years					
		What duration of maternity leave in Ghana is most cost-effective?					
		Why are only a small percent of working women in Ghana able to access maternity leave?					
		Which categories of working women are not able to access maternity leave?					
		What is the awareness and perceived role of trade unions in maternity protection?					
		What can Civil society do to address gaps in maternity protection?					
		What is the Impact of baby-friendly initiative on exclusive breastfeeding practices and infant mortality					
	Maternity protection and breastfeeding	What are the factors that influence exclusive breastfeeding practices among working women in Ghana					
		What level of awareness do employers have on workplace policies that promote breastfeeding practices					

		What policies are available at the workplace that promotes breastfeeding practices					
		Are the workplace policies on breastfeeding being implemented?					
			Most Relevant	**Very Relevant**	**Relevant**	**Less Relevant**	**Not Relevant**
		What factors influence mothers' preference of formula feeding to breastfeeding?					
		Complementary feeding					
	Child diet quality	What are the drivers of low diet diversity among young children in Ghana?					
		what are the drivers of poor diet adequacy among young children in Ghana?					
		What are the effects of maternal depression on child feeding?					
	Socio-cultural aspects of child feeding	What are the factors associated with underweight, stunting, and wasting reduction in Ghana in the past decade?					
		what are the child feeding experiences and coping mechanisms among working mothers?					
		What is the perception of parents that drive how children are fed?					
	Food Safety	What is consumer Knowledge and practices regarding food adulteration?					
		What are perceptions and experiences of using food additives?					
	Agriculture, food security, and food system	what is the effect of government policies (PFJ, 1V1D, etc) on food production, trade, and consumption?					
		What is the level of food security among migrant households in Ghana?					

		what is the link between agriculture production diversity and dietary quality?					
			Most Relevant	**Very Relevant**	**Relevant**	**Less Relevant**	**Not Relevant**
		What is the association between consumer knowledge and awareness of healthy diet on nutritional status?					
		What are the predictors of Intra-household food distribution among women and children under-five?					
		What is the impact of women's economic empowerment on their nutritional status and that of their children?					
	Maternal nutrition	What proportion of pregnant women receive full anemia preventing package during pregnancy?					
		What are the factors that influence the intake of IFA among pregnant women?					
		What is the effect of girl's iron-folic acid implementation on school performance outcomes?					
		What factors influence Food security in households affected by HIV and AIDS?					
	Obesity and nutrition-related NCDs	What is the prevalence of dietary supplement and Nutraceuticals use among Ghanaian adults?					
		What are the drivers of Childhood obesity in urban settings?					
	Elderly nutrition	What is the dietary behavior of the elderly in Ghana?					
		What are the nutrition problems of the elderly in Ghana?					
	Nutrition in Health care setting	What is the quality of food service in public spaces (eg hospitals, schools, workplaces, etc)?					

	General Questions	What are the determinants of the nutritional status of school-aged children?					
		what is the linkage between urban living nutrition status of adults in Ghana					
2.5. Please indicate by writing which other research question you think is relevant for Nutrition research in Ghana		1.					
		2.					
		3.					
		4.					
		5.					

Part C		
Question	**Response**	**Code**
What are barriers to the implementation of prioritized nutrition research in Ghana (Please circle as many as are applicable)	a. No interaction between researchers and policymakers	1
	b. Funding constraints for implementing prioritized nutrition research	2
	c. Lack of understanding of research language by policymakers	3
	d. Absence of formal links between nutrition researches	4
	e. Research findings not shared	5
	f. Other (specify)……	4
what opportunities are available for nutrition research implementation in Ghana (Please circle as many as are applicable)	a. Policy	1
	b. Funding	2
	c. Champions	3
	d. Political will	4
	e. Popular event	5
	f. Others (please specify)……	6

APPENDIX 2: ETHICS CLEARANCE FORM

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Mob + 233- 050-3539896
Email: ethics.research@ghsmail.org

My Ref: GHS/RDD/ERC/Admin/App/19/635
Your Ref. No.

22nd November, 2019

Angela Quaye
P. O. Box 175
Koforidua
Eastern Region

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC 040/11/19**
Project Title	A Delphi Study to Identify and Prioritize Nutrition Research in Ghana
Approval Date	22nd November, 2019
Expiry Date	21st November, 2020
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months.
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. Cynthia Bannerman
(GHS-ERC Chairperson)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

APPENDIX 3: INTRODUCTORY LETTER

UNIVERSITY OF GHANA
DEPARTMENT OF POPULATION, FAMILY AND REPRODUCTIVE HEALTH
SCHOOL OF PUBLIC HEALTH

Ref. No.: .....

31st October, 2019

The Director
Family Health Division
Ghana Health Service Headquarters
Accra

Dear Sir/Madam,

LETTER OF INTRODUCTION
ANGELA QUAYE

I write to introduce to you **Angela Quaye**, an MPH Student with the Department of Population, Family and Reproductive Health, School of Public Health, University of Ghana, Legon.

As part of her academic requirement, she is undertaking a research on the topic **"A Delphi Study to Identify and Prioritize Nutrition Research for Ghana"**

She would need assistance on pertinent information in your facility to enable her carry out her research work successfully.

Your cooperation would be very much appreciated.

Thank you.

Yours faithfully,

Prof Kwasi Torpey
(Head of Department)

COLLEGE OF HEALTH SCIENCES