NUTRITIONAL APPRAISAL AND DEVELOPMENT OF A STRATEGIC MODEL TO ENHANCE THE IMPLEMENTATION OF HOME GROWN SCHOOL FEEDING PROGRAMME IN MAKUENI COUNTY, KENYA

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NUTRITIONAL APPRAISAL AND DEVELOPMENT OF A STRATEGIC MODEL TO ENHANCE THE IMPLEMENTATION OF HOME-GROWN SCHOOL-FEEDING PROGRAMME IN MAKUENI COUNTY, KENYA

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DECLARATION

This thesis is my original work and has not been presented in any other institution for a degree award or other qualification.

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DEDICATION

This research is entirely in honour of my late father, Mr. Kimwele Matuta, and my late father-in-law, Pastor Daniel Kalii, whose passion for education laid the foundation for my academic achievements.

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ABSTRACT

The Home-Grown School Feeding Programme (HGSFP) is an initiative to provide locally purchased food to schoolchildren. There is a body of literature on HGSFP, but not much on how successfully it is being implemented or how it influences children' dietary intake. Therefore, the objectives of this study; assessed differences in consumption of vitamin A and iron-rich foods, dietary diversity score, and nutritional status, of children in and not in schools implementing HGSFP, explored stakeholders' roles and challenges in the implementation of HGSFP, then solicited their opinions on possible strategies to improve the HGSFP. A model to enhanced implementation of HGSFP in Makueni County was then developed. This study done in two phases. During phase I, cross- sectional concurrent mixed method approach was used to collect quantitative data and qualitative data. Phase II was the development of a model. A researcher-administered questionnaire to a random sample of 288 schoolchildren collected quantitative data. Responses from four Key Informant Interviews (KIIs) and six Focus Group Discussions (FGDs) with primary stakeholders of the HGSFP provided qualitative data. Quantitative data was collected using a 24-hour food frequency questionnaire with index child/caregivers on consumption of vitamin A, iron-rich foods, and individual dietary diversity. Analysis was done based on FAO (2010) guidelines and using Statistical Package for Social Science (Version 20.0). Fisher's exact tests and independent t-tests were conducted to investigate differences of variables for children in and not in schools implementing HGSFP. Qualitative data from FGDS and KIIs was coded and organised into themes using Qualitative Data Analysis (QDA) Miner Lite software. Overall, there were no significant differences in the proportion of children in and not in schools implementing HGSFP who consumed vitamin A and iron-rich foods (75.7 % vs 69.4% and 22.9% vs 16.0% $P = 0.635$, respectively). A significant percentage ($P<0.01$) and a high proportion of children (33.4%) from HGSFP-implementing schools achieved minimum dietary diversity score (consumed foods from ≥ five (5) food groups), compared to (17.3%) those in schools without the feeding programme. Children in schools implementing HGSFP had significant ($P<0.0001$) higher rates of overweight and obesity (7.6%, 0.7% vs 16.7%, 6.9% respectively) and low rates of underweight and severe underweight (7.6%, 7.6% vs 2.8%, 1.4% respectively. School head teachers served as managers, accountants, and procurement officers in the implementation of HGSFP. Parents supported the implementation of HGSFP by providing cash, water and firewood. The school meal management committee served as the accounting and procurement officers in conjunction with the head teachers. A government representative supervised the operation of the feeding programme. As identified by stakeholders, the challenges facing the implementation of HGSFP in Makueni County were insufficient funding, lack of procurement experience, inadequate and low-quality food supply, selective programme coverage, and lengthy procurement procedures. The stakeholders highlighted the need for their empowerment, increased funding and engagement of food producers and suppliers on methods to increase production and procurement of a variety of food items for the HGSFP. The aforementioned findings were organised in a model with mechanisms to improve the diversity of school meals for schoolchildren. This study suggests broadening of the school feeding initiative in all schools and taking into account the adoption of this study's developed model, which includes stakeholders' perspectives of an enhanced and sustainable feeding programme. In addition, there is need for a longitudinal study, which includes all the seasons of the year so as verify the results of this study as well as determine the sustainability of the programme for a better policy formulation.

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ABBREVIATIONS AND ACRONYMS

ASAL	Arid and Semi-Arid Lands
AU	African Union
BMI	Body Mass Index
DDS	Dietary Diversity Score
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
GOK	Government of Kenya
HGSFP	Home Grown School Feeding Programme
IDA	Iron Deficiency Anaemia
KDHS	Kenya Demographic Health Survey
KII	Key Informant Interview
MoA	Ministry of Agriculture
MoE	Ministry of Education
NACOSTI	National Council for Science, Technology and Innovation
NEPAD	New Partnership for African Development
NGO	Non -Non-Governmental Organisations
QDA	Qualitative Data Analysis
SFP	School Feeding Programme
SGDs	Sustainable Development Goals
SPSS	Statistical Package for Social Science
UK	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund
UNSSCN	United Nations Standing Committee on Nutrition
US/USA	United States/ Unites States of America
USDA	United States Department of Agriculture
VAD	Vitamin A Deficiency
WFP	World Food Programme
WHO	World Health Organisation

DEFINITION OF TERMS

Home-Grown School Feeding Programme: Home Grown School Feeding (HGSFP) constitutes a school feeding model that provides safe, diverse and nutritious food, sourced locally from smallholders, to children in schools (FAO &WFP, 2018).

Individual dietary diversity- Is the sum total of the nine (9) Dark green vegetables 2. Eggs, 3. Legumes, nuts and seeds, 4. Meat and fish, 5. Milk and milk products, 6. Organ meat 7. Other fruits and vegetables, 8. Starch staples (cereals and white roots and tubers) 9. Vitamin A-rich fruits and vegetables.

Iron intake- Consumption of organ meat, flesh meat and fish as defined by FAO (2010).

Vitamin A intake – Consumption of plant foods (vitamin A-rich fruits and vegetables, dark green leafy vegetables) or/ and animal food (eggs, organ meat, milk and milk products), as defined by FAO (2010).

OPERATIONAL DEFINITION OF TERMS

A model: A framework developed by this study detailing the challenges of implementing the Home-Grown School Feeding Programme, as well as potential strategies for enhancing dietary diversity and children's nutritional status through the feeding programme.

Appraisal: Assessing the worth or significance.

Implementation of Home-Grown School Feeding Programme: The process of setting up and running the Home-Grown School Feeding Programme.

Caregiver: A person who provides direct care to school-age children at the time of this study in their place of residence/home, whether they are biological parents or not.

Consumption of foods rich in vitamin A: Eating vitamin A-rich fruits and vegetables, dark green leafy vegetables, organ meat, eggs, milk**,** and milk products a day preceding this study interview.

Consumption of iron-rich foods: Eating food from organ meat, flesh meat and fish a day preceding this study interview.

Nutritional status: School children's health condition as influenced by dietary diversity and consumption of vitamin A and iron-rich foods.

School children: Pupils aged 6-13 years and attending the formal primary education system in Kenya.

Stakeholder: School head teachers, parents, school meal management committee members and the officer in charge of school feeding supporting the Home-Grown School Feeding Programme (HGSFP) implementation activities.

Strategy: A plan of action suggested or perceived to help improve the implementation of the Home-Grown School Feeding Programme (HGSFP)

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

School feeding programmes are interventions that regularly provide mid-day meals to school children (Food and Agriculture Organisation (FAO, 2019). Limited studies on the nutritional benefits of a well-designed feeding programme exist. Most countries in the world have some form of School Feeding Programme (SFP) in some way and at some scale (World Food Programme, (WFP), 2020). In developed countries, such as the United States of America (USA) and the United Kingdom (UK), the local governments mainly fund SFP (WFP, 2017). In the USA, there are a variety of school feeding programmes such as the National School Lunch Program (NSLP), School Breakfast Programme (SBP), After School Snack Programme (ASP) and the Fresh Fruit and Vegetable Programme (Ogachi, 2016). These programmes serve to benefit and protect the health and well-being of those participating in the SFP, especially favouring children from socio-economically poor backgrounds (WFP, 2020).

School feeding programmes (SFPs) are steadily gaining popularity in developing countries (Jomaa et al., 2011). According to the African Union (AU) Biennial Report on Home-Grown School Feeding, in 2022, 65.9 million children received school meals in Africa, a slight increase from 65.4 million in 2020 (African Union biennial report on home-grown school feeding (2021-2022, n.d). In 39 countries across the African continent, governments are financing and managing national school feeding programmes. Countries like Ghana, Malawi, Kenya, and Zimbabwe all feed over 1 million schoolchildren, while Egypt and Nigeria each feed more than 9 million children every day of the school year (African Union, 2023). School feeding programmes aim to enhance schoolchildren's concentration span and learning capacity by providing meals in schools to reduce short-term hunger that may otherwise impair children’s performance (WFP, 2017).

Available literature shows that the Kenyan government started implementing school meal programmes in 1980 in coordination with development partners (Langinger, 2011). Since that time, school meals have remained a crucial development strategy to support the nation's successes in the education sector. To date (2023), based on the National School meals and nutrition strategy 2017-2022 (Republic of Kenya, n.d[a]), the Government of Kenya runs the Home-Grown School Meals Programme. Through the programme, the Ministry of Education transfers cash to schools to purchase ingredients to provide hot meals for schools (Republic of Kenya, n.d[a] & WFP, 2018). Home Grown School Meals Programme coverage has grown from 540,000 in 2009 (Republic of Kenya/ WFP, 2018) and reached more than 1.6 million Kenyan children in arid and semi-arid regions, approximately 12% of school-age children (WFP, 2020).

Since its inception in Kenya, HGSFP has targeted schoolchildren in primary schools who are in the age of six years and above (Espejo, 2009). Some of the beneficiaries of HGSFP are school children from households in the Arid and Semi-Arid Lands (ASALs) suffering from persistent hunger brought on by food shortages and droughts (Langinger, 2011). School-age children are particularly susceptible to malnutrition, which can have a detrimental impact on their development, health, and academic performance. Micronutrient malnutrition can adversely affect children's growth and development, increasing susceptibility to infections and mortality (Stevens et al., 2015). For instance, Iron Deficiency Anaemia (IDA) can severely influence children's cognitive development, which may lead to less success in school and, in turn, harm economic development (Harika et al., 2017). The effects of Vitamin A Deficiency (VAD) on schoolchildren include increased mortality and morbidity from infectious diseases (Stevens et al., 2015). Due to rapid growth and development among schoolchildren, there is an increased need for vitamin A and iron, frequently unmet because of inadequate consumption (WHO, 2009).

School feeding programmes are excellent strategies for reducing the risk of undernutrition among schoolchildren, especially in developing countries (Mustapha Titi et al., 2020). There is no much research on how school meals can influence the micronutrient adequacy of children's diets.

The HGSFP currently encourages the purchase of various foods like sorghum, millet, and cowpeas and using horticulture and livestock products within the school feeding programs (United States Department of Agriculture Foreign Agricultural Service, (USDA), 2009). However, the Kenyan Ministry of Education (MoE) has adopted the World Food Programme-WFP's daily hot lunch ration composed of cereals, pulses, and oil, where a bean and maize mix that includes oil is encouraged and largely implemented throughout schools (Partnership for Child Development, 2012). Although the school meal management committees are free to purchase various locally available foods, the flat rate stipend from the government limits the purchase of horticulture and livestock products for use within the school feeding programme (Langinger, 2011). A better understanding of the impact of HGSFP on the consumption of a diversified diet could help fill the nutritional gap created by recurring droughts and ever-rising food costs that have threatened the viability of diverse meals in food-scarce areas.

The introduction of the HGSF strategy is built on the benefits and challenges of earlier school feeding programmes. Kenya started with the school milk programme, which was introduced in 1980 but failed due to high costs, low accountability, and poor road infrastructure (Langinger, 2011). Kenya transited to a WFP-assisted school-feeding programme in 1992 in light of the reduced coverage by WFP (from 1.2 million to 770,500 beneficiaries) due to increased commodity and transport costs as well as prevailing food insecurity. The Government of Kenya responded by launching the HGSFP in 2009. The transition to HGSFP was part of a larger plan

to hand over the ownership and implementation of the school feeding programme to the government. The programme aimed to improve access to food for deprived and vulnerable schoolchildren in the ASAL and slums (Espejo, 2009). To ensure sustainability, the responsibilities for implementing school meals initiatives are shared across various ministries and other non-governmental stakeholders. Key institutional partners included the Ministries of Agriculture; Education, Science, and Technology; and Health (WFP, 2018), smallholder farmers, school head teachers, and the parents/communities (Langinger, 2011, Republic of Kenya, n.d[a])

Since the endorsement of HGSFP by the New Partnership for Africa's Development (NEPAD) in 2003, the programme concept has continued to attract significant attention due to its potential to meet various cross-sectoral objectives. A successful Home-Grown School Feeding programme requires policymakers to consider several aspects during the planning and implementation phases (FAO and WFP, 2018). In their study, Kelly and Swensson, 2017) found that implementing HGSFP is free to change in unique situations. An operating model for the HGSF programme can be adapted to the context and take into consideration a series of factors, including the prevailing economic and market structure, the government structure, the volumes and types of food required, beneficiaries' needs, and institutional procurement capacities (Kelly and Swensson, 2017). The development of a context-specific HGSFP implementation model school may be justified by the unique issues that Arid and Semi-Arid Lands (ASAL) pose and that school feeding programmes in Kenya have continued to grow and evolve. A Large population in the ASAL are chronically food insecure and malnourishment is widespread amongst children (Langinger, 2011). A context specific HGSFP model that takes into consideration unliable rains, low agricultural production and high food prices can improve the nutritional status of children and contribute towards food security for enrolled children.

1.2 Problem Statement

The key principle of HGSF is to procure diversified foodstuffs locally from small-scale farmers and traders (Gelli et al., 2010). The HGSF procurement policy often emphasises the need to procure food from local smallholder farmers, but extreme rainfall failures (ACF-USA/Makueni County, 2011) affect farmers' productivity and, consequently, the diversity of food supplied to the programme. Despite the production issues that farmers in the ASALs face, school meal programmes continue to function in these areas, intending to improve children's nutrition by influencing dietary diversity through local procurement. This highlights the importance of comprehensively documenting the contributions of school meals on children's nutrition across the ASALs. School feeding programmes have improved children's school enrolment and attendance (United Nations System Standing Committee on Nutrition-UNSCN, 2017), but the effects on schoolchildren's nutritional status and dietary diversity remain underexplored. This is in addition to the fact that school-aged children have not been commonly included in health and nutrition surveys. An up-to-date overview of their nutritional status across the world is not available.

Despite the HGSFPs implementation principles of providing diversified food (FAO &WFP, 2018), children from households in the ASAL remain vulnerable to micronutrient deficiencies due to limited intake of micronutrient-rich foods (Lokuruka, 2020). Vitamin A and iron deficiency are among the most prevalent types of malnutrition, affecting a significant number of schoolchildren (Mwaniki & Makokha, 2013). Approximately one in four (23.6%) Kenyan children aged <15 years are anaemic (Okiro et al., 2020). Vitamin A deficiency among Kenyan schoolchildren is estimated to be 9.4% (Ministry of Health, 2011). Iron deficiency anaemia (IDA) is known to adversely affect cognitive development in children, which may result in lower

educational achievements and negatively influence economic development (Harika et al., 2017). Vitamin A deficiency (VAD) affects immune function and increases morbidity risk (Rice et al., 2004). Both vitamin A and iron deficiencies increase the risk of mortality in children (Harika et al., 2017). The diets of households from the ASAL are cereal-based diets with low intakes of micronutrient-rich vegetables, fruits, and animal-sourced food (Bamji et al., 2020). The implementation policy of HGSFP in ASAL encourages the purchase of micronutrient-rich food like sorghum, millet, and cowpeas and the use of horticulture and livestock products (USDA, 2009). The contribution of the HGSFP implementation model on children's micronutrient intakes is less studied, yet school meals are likely to complement the inadequacies in nutrients schoolchildren receive from home.

The implementation of HGSFP, like any other programme, requires continuous evaluations for sustainability. However, the majority of research evaluations on the Home-Grown School Feeding Programme have mainly focused on specific components of the programme, neglecting the valuable perspectives of key stakeholders in the implementation process. This is of concern because the stakeholders play a major role in the successful implementation of HGSFP. Understanding opinions and challenges in the implementation of HGSFP is crucial to identifying strategies for achieving the programme's main objective.

The implementation of the reference model for the Home-Grown School Feeding Programme has been well explained in the Resource Framework on Home Grown Technical Document (FAO & WFP, 2018). Despite the reference of this resource framework as a guidance tool for implementing Home-Grown School Feeding Programmes (FAO & WFP, 2018), it lacks specific strategies that would enable the programme to impact children's nutrient intakes. To fulfil the HGSFP goal of offering diverse diets to schoolchildren in specific contexts (ASALs),

policymakers urgently require a context-specific model with specific strategies to address programme challenges.

1.3 Justification of the Study

There are evidence gaps, and research needs for schoolchildren and HGSFP. The majority of the studies on the evaluation of HGSFP have mainly focused on school enrolment and retention (United Nations System Standing Committee on Nutrition-UNSCN, 2017). Little has been documented about the nutritional benefits of HGSFP. Data on the nutritional status of schoolchildren participating in school feeding programmes, particularly those aged 6 to 13, is hardly available. School-aged children in Kenya are often excluded from health and nutrition surveys and surveillance even though school years represent a critical period for physical and mental development (Jomaa et al., 2011). There have been limited studies on the implementation status of HGSFP since its inception as the main food and nutrition intervention, particularly in the ASALs. The use of school feeding programmes (SFP) as nutrition safety nets for children from the ASAL, there is a need to appraise their nutritional value and develop a school feeding model that provides mechanisms to improve the diversity of meals and their nutritional value.

1.4 Purpose of the Study

The purpose of this study was to nutritionally appraise the Home-Grown School-Feeding Programme (HGSFP) by involving schoolchildren aged 6 to 13 years and key stakeholders, with an aim of developing a strategic model to enhance the feeding programme's implementation in Makueni County, Kenya.

1.5 Specific Objectives

The study objectives were to;

1. Determine differences in consumption of vitamin A, iron-rich foods, and dietary diversity score of schoolchildren 6-13 years of age in and those not in schools implementing HGSFP in Makueni County.
2. Assess the differences in nutritional status of schoolchildren 6-13 years of age in and those not in schools implementing HGSFP in Makueni County.
3. Explore stakeholders' roles, challenges, and strategies for improving the implementation of HGSFP in Makueni County.
4. Develop a strategic implementation model for enhancing HGSFP in Makueni County.

1.6 Hypotheses

The study tested the following hypotheses;

$H0_1$: There is no significant difference in the consumption of vitamin A and iron-rich foods among schoolchildren aged 6-13 years in and those not in schools implementing HGSFP in Makueni County

$H0_2$: There is no significant difference in dietary diversity score for children aged 6-13 years in and those not in schools implementing the Home-Grown School Feeding Programme in Makueni County

$H0_3$: There is no significant difference in nutritional status for children aged 6-13 years in and those not in schools implementing the Home-Grown School Feeding Programme in Makueni County

1.7 Significance of the Study

The findings of this research may be helpful to the Ministry of Education, the Ministry of Health, non-governmental organisations, the World Food Programme, school management committees, and parents in enhancing the County's school food programme. These research findings provided new insights into understanding the influence of HGSFP on children's nutrient intakes and nutritional status. By understanding the challenges and strategies in implementing HGSFP in Makueni County, policy makers can better engage with stakeholders and work collaboratively to improve the health and nutrition of schoolchildren. The results of this study add to the limited studies on the Home Grown School Feeding Programme since its inception in Kenya. The results of this study act as reference material for researchers on areas related to school feeding, nutrition intakes, and nutritional status of schoolchildren, specifically those age 6-13 years. This developed model in this study can serve as a guide to further research.

1.8 Study limitations

The researcher acknowledges that this study was undertaken during harvest season; it was not on purpose but coincided with the data collection time. In view of this, the results on children's dietary diversity and consumption of vitamin A and iron-rich foods, as reported in this study, should be interpreted with caution, given that they may not represent pre- and post-harvest seasons. Dietary diversity was based on a one day 24- hour period including food consumed in the HGSFP and at home or outside the programme and so results of dietary diversity score may not reflect the daily dietary variation. The study sought information that can be classified as sensitive to school head teachers, parents, members of school meal management committees, and the sub-county government representative of school feeding. However, the researcher assured the

respondents of the confidentiality of their identities. Some schools were inaccessible due to the poor road network, and the absence of adequate transport made accessibility challenging. The researcher hired a local motorcycle rider to access such sampled schools. Studies assessing the nutritional status and dietary diversity of schoolchildren exist. However, they are extremely scarce in Makueni County. In this context, the nutritional status and dietary diversity scores of children in and out of schools implementing the HGSFP were compared. This study developed a new strategic model to enhance the Home Grown School Feeding Programme implementation in Makueni County. However, the new model was not tested because, since the COVID-19 outbreak, the HGSFP has been put on hold.

1.9 Delimitation

In this study, nutrient intake was not assessed; rather, the menu composition of HGSFP, children's dietary diversity, consumption of vitamin A and iron-rich foods, and nutritional status were assessed and used as proxy indicators of the nutritional quality of meals provided through the HGSFP.

1.10 Conceptual Framework

Figure 1.1 shows the conceptual framework this study's conceptual framework which was adapted and modified from figure. 1 in the Home Grown School Feeding Resource Framework on the benefit and beneficiaries of HGSFP by FAO & WFP (2018) and as shown in appendix IXX. Home-Grown School Feeding (HGSF) is a school feeding model designed to provide children in schools with safe, diverse, and nutritious food sourced locally from smallholders (FAO & WFP, 2018). The HGSFP programme targets children in households that are food

insecure and of low socio-economic status, making school meals a vital source of nutritious food for the children. Through the HGSFP menu, schoolchildren are likely to enjoy more diversified menus rich in vitamin A and iron, and this influences their nutritional status. Different stakeholders, that is, the School Meals Management Committee (SMMC), parents, the school head teachers, and the government, are involved in the overall management and implementation of the HGSFP. Their roles and perceived solutions to the programme's challenges can be used to improve the menu composition provided through the HGSFP to influence schoolchildren's dietary intake and nutritional status

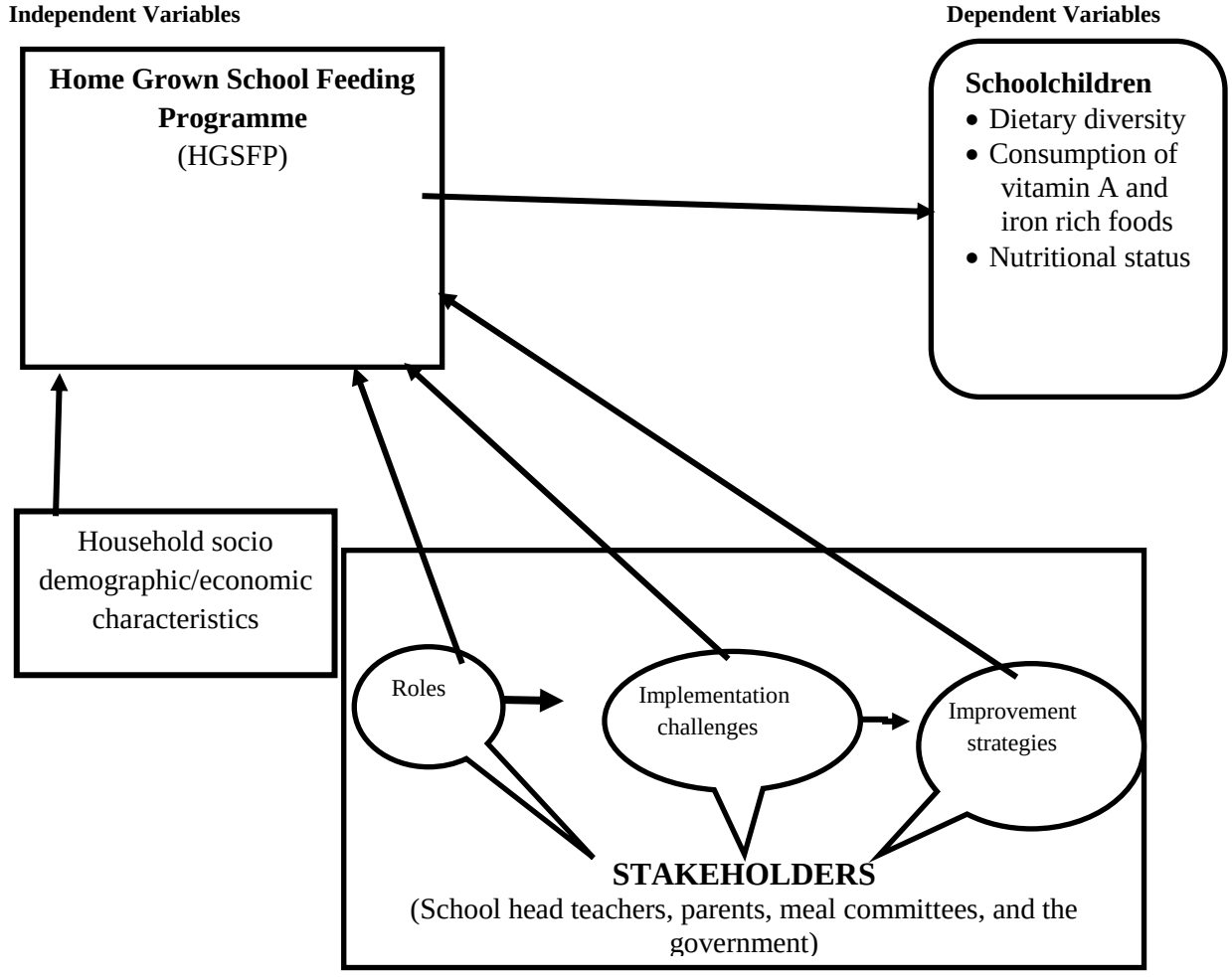

Fig. 1.1. Implementation and nutritional appraisal of HGSFP
Adapted and modified from The Home Grown School Feeding Resource Framework on the benefit and beneficiaries of HGSFP by FAO & WFP (2018)

CHAPTER TWO: LITERATURE REVIEW

A collection of relevant literature for this study was done electronically. The search was conducted on Google search engine using different key words, among them were; implementation of Homegrown School Feeding Programme, benefits and beneficiaries of Homegrown School Feeding Programme,' School feeding programmes in Kenya among others. Further electronic search for school feeding programme literature was conducted in Google Scholar and research gate. This helped in identifying major sources of data that encompassed studies from other scholars all over the world on Home Grown School Feeding Programmes, the World Food Programme (WFP) Reports, online websites of the WFP and Food and Agricultural Organization (FAO) Reports/Guidelines/Conference/Discussion/working papers. Relevant literature that was duplicate or older than 20 years were excluded.

2.1 Home-Grown School Feeding Programme

As early as the 1930s, the United States (US) and the United Kingdom (UK) had school feeding programmes that utilised Food for Education (FFE) to improve children's health (Gokah, 2008). Since then, school feeding broadened and become a practice in many other countries. As a social safety net, school-feeding programs (SFP) gained popularity among political leaders and policy makers in developing countries. In Brazil, school feeding was added to the constitution (Bundy et al., 2009), while in India, the Supreme Court mandated that all state governments must provide cooked meals in targeted schools (Afridi, 2011). In Africa, one of the few documented literatures indicates that school feeding was first implemented in South Africa in the early 1940s as a programme to provide schoolchildren with free milk (Kallman, 2005).

Using school feeding programmes as a vehicle for agricultural development has gained momentum (New partnership for African Development (NEPAD), 2003). This is the concept behind Home Grown School Feeding (HGSF), identified by the Millennium Hunger Task Force as a quick win in the fight against poverty and hunger among school-aged children. NEPAD's vision drives home grown school feeding programme as a nationally owned, sustainable health and nutrition programme for school-age children aiming to improve smallholder farmer income and food security (NEPAD, 2003). At least twenty sub-Saharan African countries are interested in or are already implementing HGSF (Rae, 2010). Countries implementing HGSFP have all become less dependent on external food sources by linking school feeding with agricultural and community development (Bundy et al., 2009). The school feeding programmes haves been in existence in Kenya for almost 40 years (MoA, 2011). The initiative began with a school milk programme and then transited to providing pre-primary and primary school children with a midday meal (Langinger, 2011). The objective was to increase school enrolment and retention of children while at the same time reducing their vulnerability to food insecurity (MoA, 2011). It is evident that school feeding programmes have contributed to providing meals to schoolchildren. However, documented information is scarce on the extent to which these school meals have influenced the dietary intakes of schoolchildren and household food security.

2.2 School Feeding Programmes in Kenya

Available literature shows that Kenya started school food programmes in 1980 with the school milk programme under former President Moi in order to increase primary school enrolment and ensure a stable market for Kenyan dairy producers (Langinger, 2011). The school milk programme did not last for long and was succeeded by a WFP–assisted programme whose

objective was to increase enrolment and retain children in school (Langinger, 2011& Reche et al., 2012). The programme relied on foreign aid; WFP provided 71% of programme costs, 15% was local communities' obligation, and only 14 % came from the Kenyan government (Galloway et al., 2009). This limited the Kenyan government's role in the direction and stewardship of the programme. In an effort to transition to a more sustainable school feeding programme, the Ministry of Education (MoE) launched the Home-Grown School Feeding Programme (HGSFP) in July 2009 (Langinger, 2011). Funds were to be transferred from the National Treasury to the Ministry of Education and then to school accounts. Each school constitutes a meals programme committee, composed of four teachers and four parents, who issue a call for tenders and buy food from local suppliers (traders or farmers) from the school meals bank account. Parents were required to provide the cooks with firewood, salt, water, and salaries (United States Department of Agriculture Foreign Agricultural Service (USDA), 2009; Aliyar et al., 2015; Espejo, 2009). The HGSFP started with a beneficiary level of 38,000 children in 1,777 schools in 66 semi-arid districts (Langinger, 2011), and by 2011, the programme was being implemented in sixteen (16) counties in Kenya: Elgeyo, Marakwet, Embu, Kajiado, Kilifi, Kitui, Kwale, Laikipia, Lamu, Machakos, Makueni, Narok, Nyeri, Taita Taveta, Tharaka Nithi, West Pokot were covered by the government-funded Home-Grown School Feeding Programme (Partnership for Child Development, 2012 & Langinger, 2011).

2.3 Status of HGSFP in Makueni County

Little information is available regarding the Homegrown School Feeding Programme's developments since it was introduced in Kenya in 2009. Makueni County is classified as Arid and Semi-Arid Land (ASAL) and a beneficiary of the school feeding programmes in Kenya

(ACF-USA / Makueni County, 2012). Makueni County experiences recurrent drought because of poor rainfall, causing massive crop failure and depletion of pasture/browse for livestock. This has caused livelihood uncertainty, with the majority opting for unskilled wage labor (Republic of Kenya; Government of Makueni, n.d.). Nearly 219,000 people, mostly children, are in desperate need of food, according to the National Drought Management Authority Makueni County (n.d) report. This report further shows that families have depleted food reserves since the last rains in 2020 (three years ago). Children rely on one meal provided by the HGSFP (Republic of Kenya; Government of Makueni, n.d.), the County's sole structured school feeding programme implemented in some schools (Republic of Kenya, n.d.).

2.4 Menu Composition of the HGSFP

While providing a balanced diet at home is important, it is equally crucial to encourage diet diversity in school meals (Unilever Health, 2023). School meals have the potential to vary with inclusions from fruit, vegetables, whole grains, and legumes such as beans, iodised salts, and fortified oils (UNSCN, 2017). When linked to local smallholder farming and agricultural development, school meals have the potential to promote dietary diversification from local sources and local dietary habits (Bundy et al. 2009; Gelli et al. 2010; Espejo et al. 2009). There is insufficient global information on the composition of meals offered through the HGSFP. The only available information is provided in the 2021 Global Survey of School Meal Programmes. This survey found out that in any school meal programme menu, grains/ cereals were the most common food category (served in 87% of programs), followed by oil (78%) and legumes (75%). Fruits and vegetables (63-65%) were less common, and animal-source foods were served least often. In high-income settings, children received an average of 8.3 different food categories,

while this value dropped to 7.1, 6.5, and 5.2 in upper-middle-income, lower-middle-income, and low-income counties, respectively (Global Child Nutrition Foundation (GCNF), 2022).

Available data show that the Kenyan school feeding programme menu, a mix of maize and bean, is mainly served through the Home-Grown school feeding programme (the Republic of Kenya, (n.da.). This is a positive factor for school-feeding beneficiaries from extremely poor families and largely unable to provide adequate food for their children (Langinger, 2011). Schoolchildren depend largely on school meals in the Arid and Semi-Arid areas (ASAL) (WFP, 2010). Inadequate food intake may irreversibly stunt young children's mental and physical development, resulting in wasted potential and lifelong difficulties (Galal, 2005). Different foods offer a range of nutrients, allowing children to meet their dietary needs more comprehensively (Unilever Health, 2023). The HGSFP implementation strategy aims to address nutrition objectives by ensuring that school menus contain a variety of nutritious foods (Aliyar et al. 2015; Drake et al. 2016; Sumberg and Sabates-Wheeler 2011). However, research literature supporting this objective is limited.

2.5 Models of Implementing School Feeding Programme

Even though most countries in the world have some type of school feeding programme in place for their children at various levels of education (FAO, 2020), there are no reference models in place. The reasons could be that various school feeding programmes are largely diverse in relation to their history, institutional mechanisms, coverage, supply modalities, costs, and management system, among others (FAO & WFP, 2018). Depending on the region and country, school feeding programmes operate in many distinct forms with different objectives, whether to meet social needs and provide a social safety net for the students or to

support adequate child development through improved education, health, and nutrition (WFP, 2017). As a result, in many countries over the past years, school feeding programmes have undergone significant changes in their initial conception, objectives, coverage, and purchasing modalities and in their institutional, social participation, and monitoring and evaluation mechanisms (FAO, 2020). Other countries have incorporated other elements besides food provision, such as food and nutrition education, educational school gardens, and regulations for school vendors to provide better food and promote healthy eating habits (WFP, 2017).

In the context of collective efforts to achieve the Sustainable Development Goals (SDGs) in food security, nutrition, education, health, and agriculture under the 2030 Agenda, the HGSF initiative was launched (FAO & WFP, 2018). World Food Programme (WFP), in partnership with the FAO and other organisations, developed a Resource Framework for the implementation of government-led Home-Grown School Feeding programmes (FAO & WFP, 2018). The framework was to provide a structure within which to consider and address various aspects of the planning, design, and implementation of HGSF programmes (FAO & WFP, 2018). However, many countries have developed their models based on their specific contexts and objectives (Kelly and Swensson, 2017). One documented model for implementing HGSFP is the conceptual framework on policies, multi-stakeholder approaches, and Home-Grown School Feeding Programmes for improving the quality, equity, and sustainability of school meals in Tanzania (Roothaert et al., 2021).

A country context-operating model in the implementation of HGSFP takes into consideration the prevailing economic and market structure, the government structure, the volumes and types of food required, beneficiaries' needs, and institutional procurement capacities (Kelly and Swensson, 2017). The primary message is that there is no "one size fits all" approach to

school feeding programmes, context is crucial, and many school feedings are appropriate for various contexts. Depending on the context, implementing school feeding programmes may require a systematic approach to allow scaling-up and sustainability.

2.6 Food Policies, Strategies and Action Plan for School Meals

It is worth noting that the provision of school meals in Kenya is backed by several national policies, action plans, and strategies to guide the implementation process. Some of these documents are relevant to the school nutrition and meals programme. The National Food Nutrition Security Policy (2011) aims to strengthen efforts for improved nutrition and nutrition education in schools (Republic of Kenya, 2011). The sixth strategic objective of the National Nutrition Action Plan (2012- 2017) is to improve nutrition in schools and other institutions (Republic of Kenya, n.d[b]). The National School Health Strategy Implementation Plan 2011-2015, its eight thematic areas, has the objective of constituting a sustainable and standard homegrown school meal programme (Republic of Kenya, n.d[c]). National school meals and nutrition strategy (2017–2022) aims to ensure that all children in pre-primary and primary schools receive at least one nutritious meal per school day (Republic of Kenya, n.d[a]). Despite these national policies, action plans, and strategies, there is a lack of a context-specific action plan primarily on implementing HGSFP, especially in the ASAL.

2.7 Benefits of HGSFP to School Children

2.7.1 School Feeding Programmes on School Enrolment and Attendance

Available studies show that school feeding can facilitate access to education by increasing school enrolment, attendance, and completion (Langinger, 2011). The provision of food acts as a strong

incentive for children to attend school on a regular basis (WFP, 2017). Several studies have supported this; a study by the Agency Française de Development (AFD) and the World Bank in Sub-Saharan Africa found school feeding to be an impactful intervention for boosting student learning, particularly in Burkina Faso, Kenya, and Senegal. (Bashir et al., 2018). School feeding programmes can help get children into school and help them stay there; Fortified biscuits given to school children improved school enrollment by 14.2% and reduced the probability of drop-outs by 7.5%. (Bundy et al., 2018). Similarly, in Madagascar, attendance rates increased from 88% to 98% over two years after the introduction of take-home rations in schools (Gelli, 2015). According to research from 45 countries worldwide, children who receive school meals throughout the academic year attend classes for 4–7 days (Kristiansson et al., 2016). A systematic review by Snilstveit et al. (2016) of 216 school programmes in 52 low- and middle-income countries found that school feeding programmes are one of the few education interventions that positively impact enrolment, attendance, and completion.

In Kenya, the average enrollment in schools that offer meals is 28% higher than schools that do not in the same Arid and Semi-Arid lands (ASAL) regions (Finan et al., 2010). In 2009, the Home-Grown School Meals Programme (HGSFP) was launched, with a beneficiary of 540,000 children; in 2013, the beneficiary level had increased to 762,715 schoolchildren in 2,118 primary schools in 55 semi-arid sub-counties (Republic of Kenya, n.d[c]). By 2020, more than 1.6 million Kenyan children benefited from the HGSFP, up from 900,000 beneficiaries in 2016 (WFP, 2020). Evidently, school feeding goes far beyond the plate of food, producing high returns in education outcomes; the impacts on nutritional outcomes have been rather unclear or less documented.

2.7.2 School Feeding Programmes on Dietary Diversity of School Children

Dietary diversity is a qualitative measure of food consumption that reflects an individual's access to a variety of foods and is a proxy for nutrient adequacy of individual diet (FAO, 2010). Dietary diversity scores consist of a simple count of food groups consumed by a household or an individual over the preceding 24 hours (Swindale & Bilinsky, 2006). An individual's dietary diversity score translates to energy consumption and other nutrients (Torheim et al., 2004). Most school-age children have little access to a varied diet. A study among schoolchildren in Bahrain, Asia, showed that intake of milk and dairy products was less than 50% (Gharib &Rasheed, 2011). In Taiwan, Wu et al. (2007) found that cereals and snacks were the most consumed foods among schoolchildren of 6–12 years, while the daily fruit intake was below one serving. In Benin elementary school-aged children, daily animal product consumption was 7%, while legumes and cereals were 34% and 50% (Mitchekpe et al., 2009). School-aged children in developing countries mainly consume plant-based diets predominantly from cereals, roots, and tubers, with limited animal-source foods (Ochola & Masibo, 2014). In Ethiopia, a study with children aged 6–9 years in Wukro showed that milk was completely missing from their diets (Kassaye et al., 2001).

In Kenya, a study by Ogachi (2016) revealed that schoolchildren hardly consumed foods rich in Vitamin A, such as fruits, vegetables, and animal sources. This is similar to study findings by Ndungu & Chege (2019), where 99.7% of school-aged children in Nairobi City consumed grains, roots, and tubers with low intakes from other food groups. There is a need to evaluate the dietary diversity of schoolchildren, especially in the marginalised areas benefiting from school feeding programmes. This is because the HGSFP initiative encourages the purchase of various foods like sorghum, millet, and cowpeas and using horticulture and livestock products (USDA, 2009).

2.7.3 School Feeding Programme and Students' Micronutrient Intake

There is ample evidence that school meals can reduce micronutrient deficiencies. A study undertaken in Uganda established that schoolchildren benefiting from school meals had significant declines in anaemia prevalence compared to a control group (Adelman et al., 2008). In a systematic analysis of 12 research on school meal fortification, Best et al. (2011) found that fortified school snacks or meals increased students' micronutrient status, particularly their iron, vitamin A, iodine, and folate intake. In the Himalayan villages of India, multiple micronutrient fortification of meals cooked and fortified at school using a premixed powder effectively improved iron, vitamin A, and folate status in schoolchildren (Osei et al. 2010).

As noted from the above literature, none of the research is Kenya-based, and the majority are randomised studies using micronutrient fortification on school meals. The available information study for Kenya was an impact evaluation of WFP School Feeding Programmes (1999-2008), which revealed that school meals, maize, beans mix, and added oil contributed to 91-100% of the iron and vitamin A intakes of the children (WFP, 2010). Therefore, there is a need to assess the contributions of school meals to micronutrient intakes of schoolchildren.

2.7.4 School Feeding Programme and Nutritional Status of Schoolchildren

One of the main goals of school feeding programmes is to improve children's nutrition (Wang & Fawzi, 2021). Despite the scarcity of literature, school feeding programmes influence children's nutritional outcomes. For instance, A randomised controlled study comparing the BMIs of 395 rural Jamaican children in grades 2–5 who received daily school breakfast for a year to 396 control children showed a 0.16 kg/m2 gain in the breakfast group (Partnership for Child Development, 2013). In a supplementation study, 544 Kenyan pupils in class 1 gained around

10% more weight and 1.3 cm (15%) more height than the control group after receiving a meat, milk, and energy supplement (Grillenberger et al. 2003). In a school milk intervention trial in Beijing with 757 girls (average age ten years) in nine primary schools, the results showed increases of 0.6% in height and 2.9% in weight above the control group (Du et al. 2004).

Other studies have found no relationship between school feeding programmes and children's nutritional status. The impact of school feeding programme on anthropometric outcomes in 6–13-year-old children in Internally Displaced Persons (IDP) camps in northern Uganda (Adelman et al., 2008) found no significant effects on body mass index z-scores (BMIZ) or height-for-age z-scores. Similarly, a randomised trial on educational and health impacts of two school feeding schemes in Rural Burkina Faso showed no significant effects of school feeding and the take-home rations on BMI or weight-for-age in schoolchildren 6–15 years of age (Kazianga et al., 2010).

It is important to note the complexity of establishing direct associations between food provision and achieved nutritional status in schoolchildren (measured through anthropometry), as many factors are not accounted for (Ahmed, 2004; Adelman et al., 2008). There is a call for more studies that not only follow a high-quality methodological design but also take into consideration some factors like the location of the programme (arid and semi-arid areas) as it can affect the impact of school feeding on nutrition outcomes. This strengthens the case for this study, where the beneficiaries of school meals were children from Makueni County, an Arid and Semi-Arid area. Children may only eat at school for a specific day or eat less at home because some parents choose to use the school feeding programme (SFP) as a substitute for home meals. (Aliyar et al., 2015).

2.8 Stakeholders and the Implementation of HGSFP

2.8.1 Government's Role in the Implementation of HGSFP

Although there is a scarcity of literature, the Home-Grown School Feeding initiative (HGSFP) is a government-led, economical school feeding initiative (Partnership for Child Development, 2013). Almost every country in the world is implementing a school feeding programme, with approximately 368 million children being beneficiaries (WFP, 2020). In Africa, at least 20 countries are implementing HGSFP, ranging from government partially supported to fully government-funded programmes (Partnership for Child Development, 2013).

Various reviews are available on the role of different governments in designing and implementing HGSFP. The government fully implements the Namibian School Feeding Programme (NSFP) to the Ministry of Education (Republic of Namibia, Ministry of Education, 2012). As for Cote d'Ivoire, the national government, through the Ministry of Agriculture (MoA), provides agricultural inputs and land to groups of female farmers. From their produce, one-third is supplied to the school feeding programme ("Home-grown: The school feeding revolution in developing countries," 2013). In Nigeria, the government transfers funds to the bank accounts of cooks, who use the money to purchase food from local markets. Each cook prepares food for 50 children (Falade et al., 2012).

In Kenya, through the Ministry of Education, the government transfers cash directly into schools' bank accounts. A management committee in each school uses the money to purchase produce directly from farmers within a 50-kilometer radius of the school (Finan et al., 2010; USDA, 2009; Langinger, 2011). The government's support in designing and implementing the Home-Grown School Feeding Programme process is key. It is imperative to evaluate the role of the government in the implementation process of HGSFP.

2.8.2 Role of Parents and Meal Management Committees' in Implementing of HGSFP

According to Drake et al. (2016), parents contribute to implementing the Home-Grown School Feeding Programme (HGSFP) in associations, committees, or an individual's capacity. The summaries follow as described by Drake et al. (2016). In Botswana, parents participate in managing and implementing HGSFP through Parent-Teacher Associations (PTAs). In South Africa, it is through School Governing Boards (SGBs). In Brazil, they have a School Feeding Committee/council (SFC), while in Ghana, they have the School Implementing Committee (SIC). In Nigeria, there is the School-Based Monitoring Committee (SBMC) and School Management Committee (SMCs) for Kenya. The associations and committees have specific roles in the implementation of HGSFP. They organise food supplies and preparation (Brazil), liaise with other authorities to develop local menus (SICs in Ghana), monitor food preparation, procurement from local sources, and employment of cooks (PTAs of Botswana). For Kenya, the SMCs administer and manage all the facets of HGSF at the school level, including procurement, food preparation, and reporting (Drake et al., 2016).

Parents have also contributed to the implementation of HGSF in an individual capacity. In Botswana, they provide school kitchen utensils and detergents (Moepeng, 2016). In Namibia, parents provide firewood, water, plates, cooking utensils, shelters, and storerooms (Republic of Namibia, Ministry of Education, 2012). In Kenya, parents are required to provide firewood, salt, water, and salaries for the cooks (USDA, 2009). According to the scenarios mentioned above from many countries, parents are responsible for supporting the implementation of Home Grown School feeding programmes. It is, therefore, crucial to assess the roles given to parents and how they influence the implementation of HGSFP.

2.8.3 Head teachers' Role in the Implementation of HGSFP

The Kenya School Nutrition and Meals Strategy (2017–2022) states that, although the Ministry of Education's Schools' Meals and Health unit, the school head teachers run the HGSFP are responsible for overseeing its execution (Republic of Kenya, n.d[a)]. According to Mawela & Van den Berg (2018), the head teachers are in charge of the school nutrition programme. A study by Iddrusi (2018) emphasised that teachers, being at the tail end of the implementation process of school feeding, are a vital part of the programme because they help in its efficient and effective execution. However, most head teachers feel overwhelmed by other duties that are mainly administrative in nature (Claartje and Onex, 2020) and, therefore, fail to adequately perform their role as stated in National School Meals and Nutrition Strategy, 2017-2022 (Republic of Kenya, n.d[a]). The strategy mandates the head teachers to, amongst other things, play an oversight role in implementing HGSFP at the school level (Republic of Kenya, n.d[a]). This makes it important to assess how the role of school head teachers influences the HGSFP implementation process.

2.9 Challenges Facing Implementation of HGSFP in Kenya

There are a number of challenges that affect the ability to plan and provide wholesome meals in schools. Some studies have identified challenges facing HGSFP. A study conducted by Olubayo (2015) in Emuhaya identified managerial incompetency, funding, accountability, lack of adequate planning, lack of community participation, and monitoring and evaluation systems as the main challenges. Munuhe (2014), in her study on challenges facing the School Feeding Programme (SFP in Kajiado County), found that poor management, funding, lack of political will, and harsh climatic conditions influenced the implementation of school feeding programmes. Awour (2016), in her study in Machakos County, reported that funding, monitoring and

evaluation, and utilisation of funds inhibited the successful implementation of school feeding programmes. The above studies focused on managerial issues; none focused on the challenges associated with specific roles assigned to different stakeholders involved in the implementation of HGSFP. Stakeholder involvement in identifying and comprehending HGSFP implementation challenges can result in well-tailored solutions and a successful HGSFP.

2.10. Summary of Literature Review

There is literature on the many aspects of the Home-Grown School Feeding Programme (HGSFP). However, most of the studies are outdated and are for other countries, with very little information on Kenya. There are limited research appraising Home Grown School Feeding Programme influences on schoolchildren and food consumption patterns, especially on micronutrient intakes, dietary diversity, and nutritional status. There is also limited literature on the roles of various stakeholders and their recommendations for ways to enhance school feeding programmes. Moreover, there is a lack of context-specific models with strategies to help improve the implementation of HSGP in Makueni County. Therefore, it is clear that there is an information gap that this study intended to fill.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Study Design

The research was in two phases. In the first phase of this study, concurrent mixed methods and a cross-sectional design were employed. A concurrent research design was chosen as an approach of collecting and analysing both quantitative and qualitative data at the same time during research process. Cross-sectional study design was used to for this study to help describe the prevailing characteristics of HGSFP at that time of the study. The concurrent mixed methods allowed investigation from inductive and deductive perspectives in a single study. Collecting both quantitative and qualitative at one point in time provided data that was helpful in understanding the holistic picture of HGSFP which added depth and breadth to the study. The quantitative methods used in this study pprovided information about core components adopted in the HGSFP while the qualitative methods were helpful in developing the model in this study adapted to the context. Quantitative data on the consumption of vitamin A and iron-rich foods and dietary diversity was collected with schoolchildren. Qualitative data on HGSFP menu composition, stakeholders roles, challenges, and strategies to use in the implementation of HGSFP in Makueni County was collected. The findings of phase one were used in phase two of the study to develop a strategic model to enhance implementation of HGSFP in Makueni County.

3.2 Study Location

Makueni County (as shown in appendix XXI) covers an area of 8,034.7 Km^2 and lies between Latitude 1º 35´ and 30 00 South and Longitude 37º10´ and 38º 30´East. The County borders several counties, which include Kajiado to the West, Taita Taveta to the South, Kitui to the East,

and Machakos to the North. Makueni County has six constituencies and nine Sub-Counties. Among the Sub Counties is Makindu, situated in the low-potential areas of the County.

Within Makueni County, as revealed by the government representative of school feeding, the HGSFP was being implemented in schools with low net enrolment rates, low attendance rates, and low completion rates or criteria established at the County Education Office. Makindu Sub County, out of the nine sub-counties in Makueni County, had the most cases of low school enrolments and attendance. In addition to other reasons not revealed to the researcher, the Makindu sub-county was the only sub-county in Makueni with a running feeding programme at the time of this study; however, not all schools were implementing the feeding programme.

3.3 Study Variables

This study's variables were summarised as follows in Table 3.1

Table 3.1. Study variables

Dependent Variables	**Indicators for dependent Variables**
• Children dietary diversity	≥5 food groups
• Children's consumption of vitamin A-rich foods	Vitamin A-rich vegetables or tubers and fruits, dark green leafy vegetables, organ meat, eggs, milk, and milk products.
• Children's consumption of Iron-rich foods	• Organ meat, meats, and fish/sea foods
• Children nutritional status	• BMI – for-age, Height for age
Independent Variable	**Indicators for independent Variables**
• Demographic and economic characteristics	• Age, sex of school children, marital status, Education level, and occupation of the parents • Household Wealth Index
• Home Grown School Feeding Programme	• School implementing HGSFP • Schools not implementing HGSFP

3.4 Target and Study Population

The target population for this study were entire schools and stakeholders in the Kenyan Arid and Semi-Arid Lands (ASAL) involved in implementing HGSFP. The study population is a subset of the target population was schoolchildren aged 6-13 years, school head teachers, school meal management committees, parents with children in schools implementing HGSFP, and the Officer in charge of the school feeding programme all from Makueni County, Makindu Sub County, one of the ASALs implementing HGSFP. Table 3.2 provides the details of the target population in terms of numbers and characteristics. Out of 56 public primary schools in Makindu Sub-County, 27 schools were implementing (HGSFP, while 29 schools were not implementing the programme. All schools implementing HGSFP had constituted a school meal management committee, making 27 committees (Personal Interview with Sub County Education Officer, 17th March 2018). The Sub County Education officer did not have the exact number of parents in the whole sub-county, but from the number of school and pupil enrolments (36,786), it was estimated to be above 5,000.

Table 3.2. The target population for the study

Category	Targets	Population
School children	6-13 years	36,786
Schools	With HGSFP	27
	Without HGSFP	29
School head teachers	In schools with HGSFP	27
School Meal Management Committee	In schools with HGSFP	27
Parents	In school with HGSFP	>5,000
Government officer in charge of school feeding	In Makindu Sub-County	1

3.4.1 Inclusion Criteria

The study included all schoolchildren 6-13 years old from public primary schools (class 1-8) in Makindu sub- County. Parents, school head teachers, and members of the school meal management committee from schools implementing HGSFP in the Makindu sub-county were included in the study. Makindu government representative in charge of school food programmes participated in this study.

3.4.2 Exclusion Criteria

Children with signs of infectious or systemic diseases such as tuberculosis, sickle cell anaemia, malaria, and acute inflammation on the day of the survey (based on teachers'/child medical reports) were excluded from the study. They were referred to manage conditions and treatments in Makindu Level 4 hospital. These illnesses can negatively influence food intake, dietary diversity, and, as a result, the consumption of foods rich in vitamin A and iron. Schoolchildren aged 6-13 years whose parents and school management did not give informed consent were excluded from the study. Schoolchildren aged 6-13 years who did not assent to participate in this study even if their parents gave informed consent were excluded from this study. School head teachers, school management committees, and parents who declined the request to participate voluntarily in the study were excluded from the study.

3.5 Sample Size Determination and Sampling Procedures

3.5.1 Quantitative Sample Size Calculations

The study sample size was determined using the Kelsey formula (Kelsey et al. 1996).

$$N_{Kelsey} = \frac{(Z\alpha + Z\beta)^2 \; p(1-p)\,(r+1)}{r(po - p1)^2}$$

Variable Notations:

- α-The probability of type I error (significance level-95%)
- β-The probability of type II error (1 - power of the test-80%) is the probability of failing to reject the false null hypothesis-0.842 (from tables)
- P_1 -The proportion of population 1 (children in the HGSFP)-35% (0.35) (Makueni County, 2013).
- Po The proportion of population 2 (children not in the HGSFP) - 65% (0.65) (Makueni County, 2013).
- P -power (probability that the study will detect a difference in measurement between two groups = $\frac{Po+rP1}{r+1}$
- r The ratio of population 2 to population 1 =1
- K_{elsey} Required sample size for population 1 and 2 groups using the Kelsey formula.

$$n = \frac{(1.96 + 0.842)^2 0.5 * 0.5 * 2}{1(0.65 - 0.35)^2}$$

Using the $\mathbf{K_{elsey}}$ n=43.5 =44

Using Kelsey's formula and with an anticipated nonresponse of 10%, 48 children were sampled per school in six (6) schools, making a total sample of 288 pupils.

3.5.2 Sampling Procedure for the Collection of Quantitative Data

Data was collected during the entire second term, within the May–August period of the Kenyan school calendar. Makueni County was purposefully and conveniently selected from a list of 16 counties implementing HGSFP. Then, Makindu Sub-County in Makueni County was also purposively and conveniently selected.

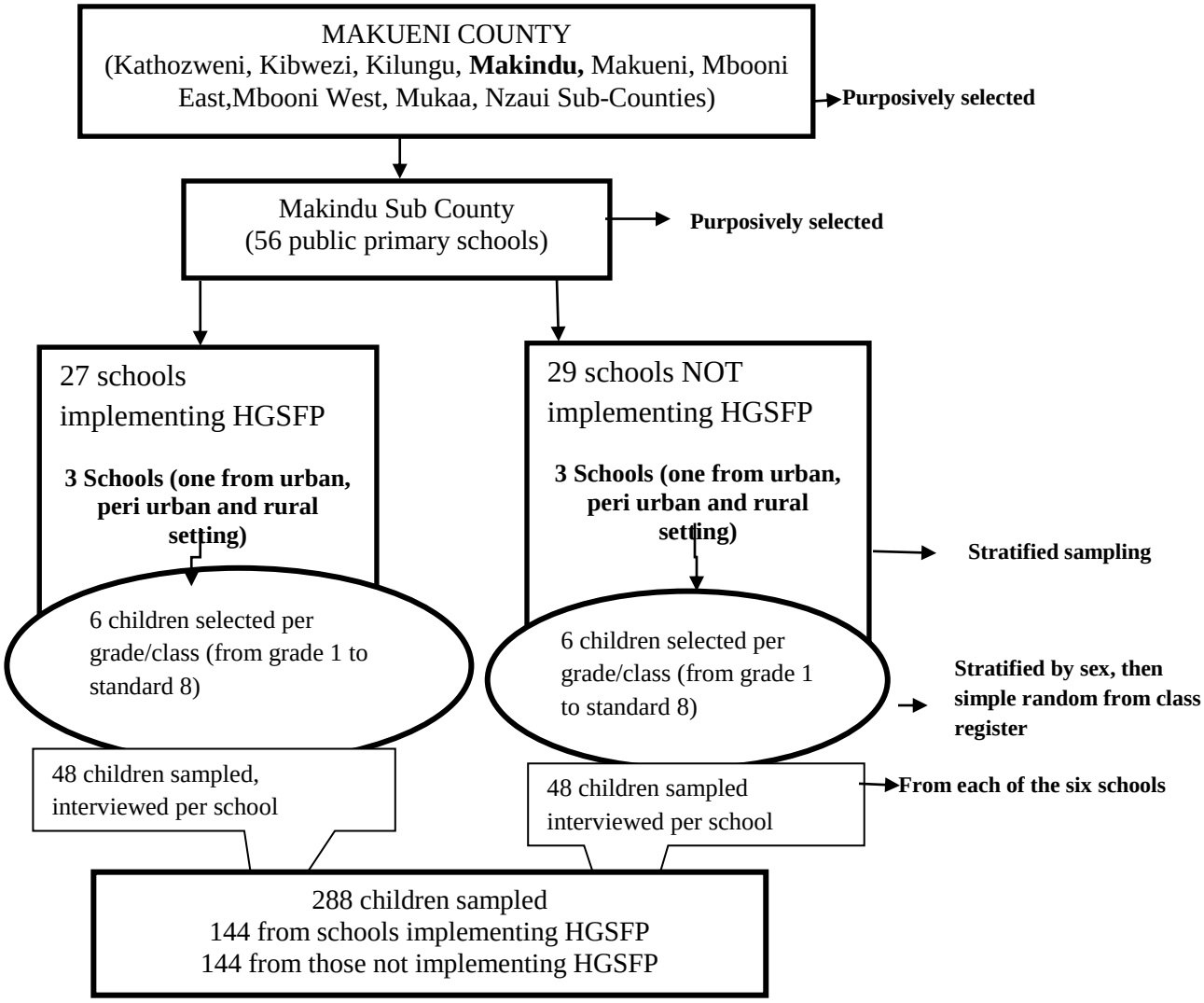

Fig. 3.1. Flowchart on the quantitative data sampling procedure

It was the only Sub-County that had a running HGSFP at the time of this study and the easiest for the researcher to access. Then, a list of all 56 public primary schools in Makindu Sub County was obtained from the officer in charge of the school feeding programme. The schools were already in two strata, 27 schools were implementing HGSFP, and 29 schools were not implementing the programme. Six schools were randomly selected using a table of random numbers. Three schools were chosen, one from each of the following peri-urban, urban, and rural areas for the schools implementing the HGSFP. Another three schools were sampled from similar locations but did not implement the HGSFP. Forty-eight (48) children were then selected

in each school. Using the corresponding class registers provided by the individual class teachers, the researcher used a simple random sample and selected three male and three female children from each grade/class (on average, there were 40 children in each grade/ class). A total sample of forty-eight (48) schoolchildren per school, translating into two hundred and eighty-eight (288) children from six schools, were included in this study. The sampling procedure is illustrated in Figure 3.1.

3.5.3 Sample Size and Sampling Procedures for Qualitative Data

The qualitative data collection was conducted simultaneously in the three HGSFP-implementing schools sampled for the quantitative data collection. In consultation with the sub-county officer, stakeholders with significant roles in the HGSFP were identified and purposefully selected for this study. These included parents, school head teachers, school meal management committees, and sub-county officers in charge of school feeding. All three school head teachers and respective school meal management committees were sampled. A total of 18 parents (6 per school), three school meal management committees (comprised of 8 members each), and the sub- county government representative of school feeding in Makindu were sampled for qualitative data.

3.6 Selection and Training of Research Assistants

The principal researcher recruited three research assistants with minimum secondary school education and experience in carrying out health and nutrition surveys. The principal researcher trained the three research assistants for two (2) days on the study objectives, the purpose of the study, and questionnaire administration techniques. They were provided with guidelines for

professional codes of conduct during the study. The training was conducted through demonstrations, question and answer, role-plays on interviewing techniques, and data collection techniques, especially on conducting focus group discussions and key informant interviews. Research assistants were also trained on the ethical issues in research. They observed confidentiality and respect when collecting data from the respondents.

3.7 Data Collection Instruments

3.7.1 Structured Questionnaire

A researcher-administered questionnaire (Appendix VIII) was used to collect data on children's (those in and not in schools implementing HGSGP) characteristics, that is, their demographic status (age and sex), their parents' socio-demographic (marital status, level of education, among others); household wealth status; dietary diversity, consumption of vitamin A and iron-rich foods and nutritional status.

The questionnaire was divided into three (3) sections. Section A of the questionnaire contained questions on children and their parents' demographic characteristics and household wealth status. A demographic survey questionnaire was used to collect information on children's gender and sex, parents' education level, occupation, and marital status. The socioeconomic questionnaire by Mendez-Castellano and Mendez (1994) was modified and used to collect data on household wealth status. Section B of the questionnaire had questions on the consumption of vitamin A, iron-rich foods, and individual dietary diversity. The FANTA Household Dietary Diversity Score Indicator Guide (Swindale & Bilinsky, 2006), as indicated in FAO (2010) Guidelines for Measuring Household and Individual Dietary Diversity, was used with index child/caregiver's pair. Section C of the questionnaire was a table with columns to record the age, height, and

weight measurements of individual children. This provided anthropometric measurements for the assessment of children's nutritional status.

3.7.2 Key Informant Interview Guide and Focus Group Discussion Guide

Different semi-structured interview guides were designed to interview school head teachers and the sub-county government representative of school feeding. Focus group discussion (FGD) guides for parents and school food management committees were also developed. They were designed to gather information on the HGSFP menu composition, stakeholder roles, challenges in implementing the HGSFP, and suggestions for strategies to improve the programme in the study area (Appendix IX and X)

3.8 Pretesting of the Data Collection Tools

The data collection tools were pre-tested before being used. Pre-testing was done to enhance the clarity and validity of questions and to trouble-shoot potential technological issues. The research questionnaires were pretested on thirty (30) schoolchildren from one public primary school drawn from neighbouring Kibwezi Sub County. This is approximately ten percent (10%) of 288 schoolchildren, the total sample size in the study. Pretesting was done for five (5) days. The sample used for pre-testing and location were not part of the main study. During pretesting, the researcher established the validity and reliability of the research instruments questionnaire. After the pre-test, the research instruments were revised based on comments and suggestions from the participants.

3.8.1 Validity and Reliability of Research Questionnaire

The validity of the research questionnaire was done to establish the extent to which the information collected by the researcher reflects what was being studied. The study adopted standard validated questionnaires to collect data on consumption of vitamin A and iron-rich foods and individual child dietary diversity. Minor changes were made, such as increasing printing font sizes and re-ordering the questions (numbering of questions). Before the data collection exercise, the principal researcher changed the questionnaires with help from study supervisors.

To establish questionnaire reliability, the questionnaire was administered twice to the same group of children/caregiver pairs from a school in the neighbouring Kibwezi Sub County, with a duration gap of two weeks. Test-retest reliability of the questionnaire was measured by correlating the two sets of data, and a Cronbach alpha coefficient of 0.89 was obtained. According to Creswell (2012), a reliability coefficient of 0.7 and above is satisfactory for any research instrument in social sciences. Thus, the questionnaire was found to be appropriate for this study.

3.8.2 Validity and Reliability of Qualitative Data

The validity of qualitative data was established using the following strategies. Being a well-trained and skilled moderator, the principal researcher facilitated the discussions and interviews that were free from personal bias. The participants were primary stakeholders in the implementation of HGSFP and were considered to possess valid information. The other technique used was to restrict the amount of information shared with the respondents to make sure that preconceived notions of the respondents did not bias the research. The validity of the

discussions and interview guides was established using a panel of experts who reviewed the questions. The statements that did not go well with the subject of the study were removed. After the researcher had interpreted and condensed them, initial results were shared with the participants to see if they still rang true and whether they still recognised the results as authentic.

The reliability of qualitative data was established based on the stability of participants' responses. Research assistants took direct notes during the discussions and interviews with research participants. After the fieldwork was complete, expanded typed notes were prepared. This included comments and quotes arising from the discussions and interviews and was enhanced by the use of the recording equipment and transcription software.

3.9 Data Collection Techniques and Procedures

3.9.1 Children's Demographic Status their Parents' Socio-demographic Characteristics

The researcher and assistants administered a questionnaire to a caregiver /index child in face-to-face interviews during a one-time visit to the school. Specific questions on children's demographic status (age and sex), their parents' socio-demographics (marital status, level of education, among others), and household wealth status (ownership of household assets, housing status, and quality of water) were administered. They responded to questions with predetermined responses in the form of yes/no or numbered from one (1) to five (5). The reply frequencies were utilised to describe the demographics of the parents and the children. Household wealth status was calculated by the summation of the "YES" score in each item in the household asset ownership, quality of water, and housing status as defined in the questionnaire.

3.9.2 Consumptions of Vitamin A and Iron-Rich Foods and Children's Dietary Diversity

Consumption of vitamin A, iron-rich foods, and individual dietary diversity were assessed using FAO (2010) Guidelines. A single 24-hour recall of each child was done. The principal researcher (A licensed nutritionist and dietitian) administered the qualitative 24-hour recall. The recalls included different food types that were categorised into nine (9) different standardised food groups as follows;

1) Starch staples (bread, noodles, porridge, *githeri*, spaghetti, rice, chapatti, white potatoes, white yam, white cassava, among others)
2) Vitamin A-rich fruits and vegetables (ripe mango, ripe pawpaw, tomatoes, water melon, grape fruit, pumpkin, carrots, sweet potatoes);
3) Dark green leafy vegetables (amaranths, cassava leaves, *kunde*, spinach, *Sukuma wiki)*;
4) Other fruits and vegetables (onion, *dhani*a, wild fruit/juices)
5) Meat and fish (beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects, fresh and dried fish);
6) Legumes, nuts and seeds (dried beans, dried peas, lentils, Groundnuts, pumpkin seed)
7) Organ meat (liver, kidney, heart, other organs, and blood-based foods),
8) Eggs (from chicken, duck, guinea fowl, or any other egg), and
9) Milk and milk products: milk, cheese, yogurt, fermented milk

In the school context, caregivers' index child pairs were asked to recall all the foods (meals and snacks) the child ate the previous day (during the day and night). They were to start with the first food/drink consumed the previous morning. The researcher probed for snacks eaten, special foods given as well as added foods such as sugar in tea, oil in mixed dishes or fried foods, and in

cases where a mixed dish was eaten, a list of ingredients of the dish was probed (See Appendix VIII, Section B).

3.9.3 Anthropometric Measurements

The researcher assessed children's age, weight, and height in the classrooms, assisted by two trained research assistants. The age of each child was determined by reviewing the birth dates in the class registers and/or as told by the caregiver. One of the research assistants took the height and weight measurements to avoid inter-observer variation. Weight was measured to the nearest 100 g, with minimal clothing and without shoes, using a calibrated portable Seca bathroom Scale.

Each child's height was measured in the Frankfurt position (head, shoulder, buttocks, knee, and heal-touch vertical board) to the nearest 0.1 cm using a calibrated Seca 213 portable stadiometer. The height and weight measurements were taken twice, and the average value was recorded if it was within the acceptable margin of error.

3.9.4 Focus Group Discussion and Key Informant Guides

Face-to-face, Focus Groups Discussions (FGDs) and individual Key Informant Interviews (KIIs) were conducted. The principal researcher liaised with the school administration to obtain rooms, particular dates, and specific times for the interviews and discussions. Invitation calls were made to the sampled participants, communicating the meetings' date, time, venue, and purpose. They all consented verbally. The discussions and interviews commenced with welcome remarks and a brief introduction of the principal researcher, assistants, and participants. After this, the principal researcher gave a brief overview of the topics for discussion and the objectives. The participants gave informed consent. The principal researcher created a thoughtful, permissive atmosphere,

provided ground rules, and set the tone of the discussion/interviews. During the discussion/interviews, attempts were put in place to minimise differences in the data collection processes. As the interview/discussion guides outlined, the principal researcher used the same order to ask open-ended questions. The research assistants recorded the deliberate direct responses, took handwritten notes, and noted non-verbal responses. The discussions and interviews were tape-recorded as they lasted for 60 minutes. The technical connection requirements were also kept consistent during each discussion and interview session. As with any qualitative inquiry, the principal researcher asked inductive follow-up questions based on participant responses but did not introduce ideas from any previous data collection event. At the end of the interview/discussion, the principal researcher reviewed the objectives by posing summary questions to the participants. This was followed by shaking hands and giving parting remarks of appreciation.

In total, six Focus Group Discussions (FGDs) were conducted, comprising three separate sessions with parents from each of the three schools and another three separate discussions with school committee members from each of the three schools. The researcher conducted four (4) Key Informant Interviews (KIIs), three different sessions with the school head teachers of each of the schools implementing HGSFP, and one session with the Makindu Sub-County government representative of school feeding. The qualitative data was collected from 64 participants: 60 participants from the FGDs and 4 from the KIIs.

3.10 Data Analysis and Presentation

3.10.1 Quantitative Data

Data was cleaned and entered into a Statistical Package for Social Science- SPSS (Version, V.22 Chicago, Illinois, USA) software. The explore command of the SPSS was used to test for the normality of the data. Median, interquartile ranges, frequencies, and percentages were performed using the computer application SPSS (version 22) to summarise and characterise the differences between children in and those not in schools implementing HGSGP.

To test for significant differences between children in and those not in schools implementing HGSGP, a Chi-square, Fisher exact test, and an independent t-test were used. A Chi-square was used when the frequency or cell value was more than 5, and Fisher's exact test was used when the frequency or cell value was less than 5 to test significant differences in children's age, sex, household wealth status, vitamin A intakes, consumptions of iron-rich foods and nutritional. The independent t-test was used to determine whether there was a statistically significant difference between the dietary diversity score of children in and those not in schools implementing HGSGP. Statistical significance was at a P value of < 0.05

Descriptive statistics (median, interquartile ranges, frequency, and percentage) were used to summarise the demographic characteristics of children (by age and sex) and parents (by marital status, education level, and occupation status). Using the Mendez-Castellano and Mendez (1994) wealth status strata classification, summation of the household economic "yes" scores were categorised into five (5). The richest (score 13-15), rich (score 10-12), middle (score 7-9), poor (score 4-6) and the poorest (score 1-3). A chi-square/Fisher exact test was used to establish the statistical difference in the demographic characteristics of children, their parents' socio-demographic characteristics, and wealth status.

Consumption of vitamin A and iron-rich foods was analysed based on FAO (2010) Guidelines. Children's consumption of vitamin A and iron-rich foods were placed in the categories of;

Vitamin A-rich food (plant-based and animal-based).

- Vitamin A Plant-based food groups were:

    1) Vitamin A-rich vegetables or tubers and fruits

    2) Dark green leafy vegetables

- Vitamin A animal-based foods were;

  3) Organ meat

  4) Eggs

  5) Milk and milk products.

- The iron-rich foods (FAO, 2010) were;

  1) Organ meat

  2) Flesh meat and Fish/seafood.

A chi-square test/ Fischer's exact test was used to establish the statistical difference in the consumption of vitamin A and iron-rich food for children in and those not in schools implementing HGSGP.

Dietary diversity score was analysed based on the FAO (2010) Guidelines for Measuring Household and Individual Dietary Diversity. Dietary diversity score (the number of food groups the child consumed during the 24 hours preceding the survey) was used as a proxy for dietary diversity. A score of "1" was awarded if a food group was consumed, and a score of "0" was awarded if no foods in that particular group were consumed. The total scores, or Dietary

Diversity Scores (DDS), were computed by summing the consumption from the nine different food groups for a possible maximum score of nine (9). Then, frequencies and percentage consumptions for each of the nine (9) food groups were computed for all the children in and those not in schools implementing HGSFP. A chi-square test/Fischer's exact test was used to establish the statistical difference in the dietary diversity (sum totals and total percentages) for the various nine (9) food groups for children in and those not in schools implementing HGSGP.

With no internationally agreed-upon indicators of dietary diversity for children between the ages of 6 and 13 in use, the minimum dietary diversity score in this study was established at consumptions of ≥5 food groups. Earlier studies (Arimond et al., 2011; Ruel et al., 2004) and recommendations from the FAO (2016) served as the basis for this minimum dietary diversity score. An independent t-test was used to establish the statistical difference in the minimum dietary diversity score for children in and those not in schools implementing HGSGP.

The z-score values for BMI-for-age and height-for-age were calculated using WHO AnthroPlus® software (v1.0.4 World Health Organisation, WHO 2006). Calculated z-scores of BMI-for-age and height for age were used to classify thinness and stunting using the new WHO (2006) reference value, respectively. BMI-for-age Z score was categorised as follows:>2 were "obese,">1 to <2 were "Overweight," <-2 to <1 were "normal,">-2 to <-3 were "underweight" and >-3 were "severely underweight." Children were classified as stunted if the child's height for age Z-score was > -2 SD from the median WHO reference values. A chi-square/Fisher exact t-test was used to establish the statistical difference in the BMI for Age and Height for Age for children in and those not in schools implementing HGSGP.

3.10.2 Qualitative Data

Qualitative data obtained was transcribed, analysed thematically, and presented descriptively with verbatim quotes. Responses from key informant interviews and Focus group discussions were transcribed into a text using Google Docs Voice Typing. Upon cleaning, the datasets were exported to the Qualitative Data Analysis (QDA) Miner Lite software (v. 4.0) for thematic analysis. Following Braun and Clark's (2021) recommendations, six steps were used for the thematic analysis of qualitative data.

In the first step, the researcher familiarised with the data by reading through the transcribed data already exported in the Qualitative Data Analysis (QDA) Miner Lite software. Using a deductive approach (with a set of expected themes) in thematic analysis in step two (2), the researcher coded data by highlighting sections that had interesting features and information (in reference to the study objective). In the third step, with the fact that themes are generally broader than codes (Caulfield, 2023), several codes, as highlighted in step two (2), were combined into common themes and identified as stakeholders' roles, challenges and strategies to improve HGSFP (study objective). In step four (4), which involves reviewing themes, the researcher checked the themes to ensure they were in reference to the study. The researcher bypassed step five (5), which involved redefining and renaming the themes. This was based on the fact the theme names were predetermined to match those in the study objective. In step six (6), a coherent narrative that included participant quotes was created for each theme.

3.11 A Model for Implementing HGSFP in Makueni County

A new model for the implementation of HGSFP in Makueni was developed using the findings from phase one of the study and additional information gathered from the literature review. The

model development approach was based on response to the identified challenges related to food supply to schools implementing the HGSFP, financial structures, and stakeholder participation in the HGSFP. The model proposed strategies to address the challenges food suppliers, funders, and other HGSFP stakeholders face. The model depicted the desired nutritional outcomes of an improved HGSFP.

3.12 Ethical and Logistical Considerations

The School of Graduate and Advanced Studies at the Technical University of Kenya approved this research (Appendix XI). The Pwani University Ethics Review Committee then provided the ethical approval (Appendix XII). The National Council for Science, Technology and Innovation (NACOSTI) gave a research permit to conduct the study (Appendix XIII & XIV). Additionally, authorisation letters for the study were obtained from the Makueni County Commissioner, Makueni County Director of Education, Makueni County Director of Health Services, and Makindu Sub County Director of Education (Appendix XV-XIII respectively). All of these were made available to head teachers in the schools included in the sample for their review and to assure them that the essential steps had been taken.

This study ensured data protection and confidentiality by adhering to specific procedures and practices. The participants' written or verbal voluntary informed consent /assent was obtained before recruitment into the study (Appendices 1-7). School head teachers, parents, school meal management committee members, and the sub-county government representative of school feeding were made aware of their right to consent to or decline participation, and they had the option to do so at any time. In addition, they were free to decline to respond to any questions they preferred not to. Participants in the interviews and group discussion were made aware of

tape recording and given an option of whether or not to consent to the use of their audio recording. For the study, sampled children's assent and their respective parents' consent were sought. Participants' names and the names of their respective schools were kept anonymous by the use of code numbers. Research participants were assigned code numbers to protect their privacy and the confidentiality of the information they provided. The measure was disclosed to research participants. The study findings were reported generally without naming any specific schools, i.e., schools were classified as either implementing the Home-Grown School Feeding Programme or not. This was to safeguard the privacy of the schools and their head teachers. The principal researcher kept hard copies of notebooks (used during interviews and group discussions, questionnaires, assent, consent, and other paper documentation in looked cabinets. Raw data for statistical analysis was stored in a password-protected principal researcher's personal computer. Further, when the computer was left unattended, files containing raw data were always closed. Only the principal researcher and the biostatistician had access to the research and participant data at any one time.

3.13 Funding for the Study

This study did not receive any specific grant from public, commercial, or profit funding agencies. The itemised budget for this research is as attached in Appendix XXII.

CHAPTER FOUR: RESULTS AND FINDINGS

4.1 Demographic and Socio-Economic Characteristics

4.1.1 Demographic Characteristics of School Children

As shown in Table 4.1, 144 schoolchildren in schools implementing the Home-Grown School Feeding Programme (HGSFP) and a similar number (144) in schools not implementing the programme participated in the study. There were no statistically significant (P-value=0.999) gender disparities between children in and those not in schools implementing HGSFP. Male and female participants were equally represented. Children's ages were not normally distributed (skewed to the right, the majority being ten years and above) as assessed by the Shapiro-Wilk test of normality. Therefore, the median with an interquartile range was calculated to compare the average age of children across the groups. Children in schools implementing HGSFP had a median age of eleven (11) years with an Interquartile Range (IQR) of five (5) years. The median age of children in schools not implementing HGSFP was ten (10) years old, with an Interquartile Range (IQR) of five (5) years. When assessed by the Mann-Whitney U test, the differences in average age observed were not statistically significant, P – value = 0.322.

Table 4.1. Demographic characteristics of schoolchildren

Variables	Children in schools with HGSFP (N=144)		Children in schools without HGSFP (N=144)		Chi-square value	P – value
	n	%	N	%		
Sex of the child						
Male	72	50	72	50	0.0001	0.999
Female	72	50	72	50		

	Median	IQR	Median	IQR	Mann-Whitney U value	P – value
Average children's age	11	5	10	5	9678.5	0.322

*Significant difference at p-value <0.05

4.1.2 Demographic Characteristics of Parents

Table 4.2. Demographic characteristics of the parents

Demographic characteristics	Children in schools with HGSFP (N=144)		Children in schools without HGSFP (N=144)		Chi-square/ Fisher's exact value	P-value
	n	%	n	%		
Parents Marital status	**n=144**		**n=144**			
Married	114	79.2	115	79.9	5.071	0.28
Single	19	13.2	11	7.6		
Divorced	3	2.1	7	4.9		
Separated	2	1.4	1	0.7		
Widowed	6	4.1	10	6.9		
Mothers' education level	**n=143**		**n=143**			
None	4	2.8	19	13.3	24.7056	0.002*
Completed Primary	57	39.9	40	28.0		
Primary dropout	9	6.3	15	10.5		
Completed Secondary	25	17.5	38	26.6		
Secondary dropout	11	7.7	5	3.5		
Diploma/Certificate /college	17	11.9	14	9.8		
University	20	14.0	12	8.0		
Main occupation of the mother	**n=143**		**n=143**			
Waged labour (Casual)	35	24.5	45	31.5	36.8006	<0.01*
Waged labour (Salaried)	20	14.0	12	8.4		
Petty trade	34	23.8	31	21.7		
Housewife	29	20.3	35	24.5		
Farmer	24	16.8	20	14.0		
Student	1	0.7	0	0.0		
Father education level	**n=120**		**n=118**			
None	1	0.8	17	14.4	33.642	<0.01*
Completed Primary	42	35.0	23	19.5		
Primary dropout	6	5.0	10	8.5		
Completed Secondary	31	25.8	37	31.4		
Secondary dropout	9	7.5	3	2.5		
Diploma/certificate/technical college	15	12.5	11	9.2		
University	16	13.3	17	14.4		
Main occupation of the father	**n=120**		**n=118**			
Waged labour (Casual)	52	43.3	48	41.0	3.4506	0.84
Waged labour (Salaried)	27	22.5	23	19.7		
Petty trade	27	22.5	27	23.1		
Unemployed	6	5	7	6		
Farmer	8	6.7	10	8.6		
Student	0	0	2	1.7		

*Significant difference at p-value <0.05

As shown in Table 4.2, nearly all of the parents of the index children in and not in schools implementing HGSFP were married (79.2% and 79.9%, respectively). More mothers of children attending schools with HGSFP had completed primary education (39.9%) compared to those in schools without HGSFP at 28.0%. A higher proportion of the fathers with children in schools implementing HGSFP had completed primary education (35.0%) compared to those in schools without the programme (19.5%). Both mothers (24.5% and 31.5%) and fathers (43.3% and 41.0%) of index children enrolled in and not enrolled in schools implementing HGSFP were predominantly casual laborers. As assessed by the chi-square test or Fisher exact test, only proportions of mothers' education level, mothers' occupation, and fathers' education level across the group were statistically significant, P-value < 0.05.

4.1.3 Household Wealth Status

Table 4.3. Household wealth status

Household wealth index	Children in schools with HGSFP N=144		Children in schools without HGSFP N=144		Chi-square test –Value	P-value
	n	%	n	%		
Quintiles						
Richest	9	6.3	10	6.9		
Rich	15	10.4	17	11.8		
Middle	23	15.9	20	13.9	0.2245	0.894
Poor	60	41.7	63	43.8		
Poorest	37	25.7	34	23.6		

*Significant difference at p-value <0.05

There was no significant difference (P=0.894) in the wealth status of households with children in and not in schools implementing HGSFP (Table 4.3). Very few households were categorised as wealthy (richest), both those with (6.3%) and those without (6.9%) children in schools implementing HGSFP. The highest proportions of the households with children in and not in

HGSFP-implemented schools were in the categories of poor (41.7% and 43.8%, respectively) and poorest (25.7% and 23.6%, respectively) wealth-wise.

4.2 Consumption of Vitamin A and Iron-Rich Foods

4.2.1 Differences in Children's Consumption of Various Vitamin A and Iron-rich Foods

As indicated in Table 4.4, a small percentage of children in and not in schools implementing HGSFP consumed organ meats (1.4% vs. 4.9%), food that is rich in vitamin A and iron.

Table 4.4. Children's consumption of various Vitamin A and iron-rich foods

Consumptions of various Vitamin A and Iron rich foods (FAO, 2010)	Children in schools with HGSFP		Children in schools without HGSFP		Chi-square/Fishers exact test value
	N = 144		N = 144		
	n	%	n	%	P – value
Vitamin A rich foods					
Vitamin A-rich fruits, tubers and vegetables	20	13.9	17	11.8	0.597
Dark green leafy vegetable	52	36.1	74	51.4	0.009*
Eggs	4	2.8	3	2.1	0.985
Organ meat	2	1.4	7	4.9	0.173
Milk and milk products	60	41.7	32	22.2	<0.01*
Totals	**138**	**100**	**133**	**100**	
Iron-rich foods					
Organ meat	2	1.4	7	4.9	0.173
Meats and Fish/seafood	33	22.9	17	11.8	0.013*
Totals	**35**	**100**	**24**	**100**	

*Significant difference at p-value <0.05

* Multiple responses included in the consumption of various vitamin A and iron-rich foods

Another significant difference was in the proportions of children in schools implementing A significant percentage of children (51.4%) in schools without the HGSFP had consumed dark green vegetables, a vitamin A-rich food, compared to those (36.1%) in schools with the feeding programme (P=0.009).

HGSFP that consumed milk and milk products, another rich source of vitamin A, as compared to those in schools without the feeding programme (41.7%, 22.2% respectively; (P=<0.01).

A significant proportion of the children in schools implementing HGSFP consumed flesh products and/or fish compared to those in schools without the programme (22.9%, 11.8%; P= 0.013). Children's consumptions of organ meat (1.4% vs. 4.9%; P= 0.173), source of iron did not significantly differ for those enrolled in HGSFP-implementing schools and those schools without the feeding programme;

Multiple responses on children's consumption of vitamin A and iron-rich foods mentioned in Table 4.4 were excluded, and an analysis was done to identify those who had consumed vitamin A and iron-rich foods (only one response was included, whether one had consumed one or many of the vitamin A or iron-rich food). As indicated in Figure 4.1, a high proportion (75.7 % and 69.4 %, respectively) of children both in and not in schools implementing HGSFP had consumed vitamin A-rich foods. Lower proportions (20.8% and 16.0%, respectively) of children in schools with and without HGSFP consumed iron-rich foods, respectively.

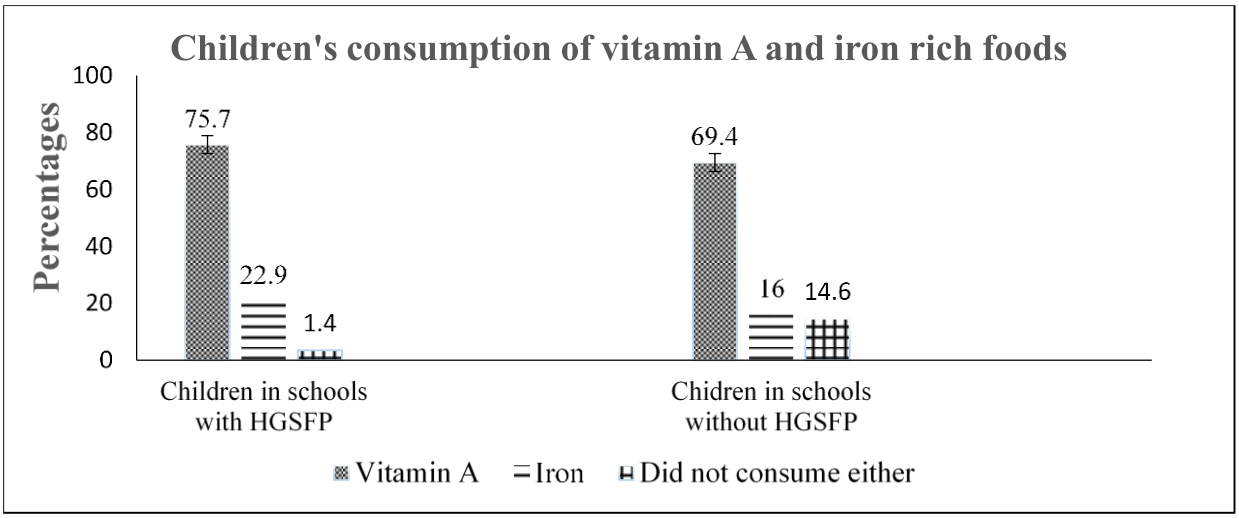

Fig. 4.1. Children's consumption of vitamin A and iron-rich foods

Considering children's consumption of vitamin-A and iron-rich foods (as explained above and displayed in Fig 4.1), further analysis was done on the differences. A Chi-square test showed no significant differences in the proportions of children who had consumed vitamin A and iron-rich foods (P=0.635).

Table 4.5. Children's differences in the consumption of vitamin A and iron-rich foods

Consumptions of Vitamin A and Iron rich foods	Children in schools with HGSFP (N=144)		Children in school without HGSFP (N=144)		Chi-square/Fishers exact test value	P-value
	n	%	n	%		
Vitamin A	109	75.7	100	69.4		
Iron	33	22.9	23	16.0	0.2253	0.635
Did not consume either	2	1.4	21	14.6		
Totals	**144**	**100**	**144**	**100**		

*Significant difference at p-value <0.05

4.3 Children's Dietary Diversity Score

4.3.1 Children's Differences in Consumption of Various Food Groups

Food consumption from various individual food groups in the last 24 hours, as presented in Table 4.6, shows that starchy staples were consumed by all (100%) of the index children.

Table 4.6. Children's consumption of various food groups

Food groups	Children in schools with HGSFP N=144		Children in schools without HGSFP N=144		Chi-Square/Fishers exact test value	P-value
	n	%	n	%		
1. Starch staples	144	100	144	100	-	-
2. Vitamin A-rich fruits, tubers and vegetables	20	13.9	17	11.8	0.2791	0.597
3. Dark green leafy vegetable	52	36.1	74	51.4	6.8289	0.009*
4. Other fruits and vegetable	128	88.9	101	70.1	15.539	<0.001*
5. Organ meat	2	1.4	7	4.9	2.867	0.173
6. Meat and fish/seafood	33	22.9	17	11.8	6.195	0.013*
7. Eggs	4	2.8	3	2.1	0.1c46	0.987
8. Legume nuts and seeds	144	100.0	109	75.7	33.77	<0.001*
9. Milk and milk products	60	41.7	32	22.2	12.522	<0.001*

*Significant difference at p-value <0.05

* Multiple responses included in the consumption of various food groups

When compared to children in schools without the feeding programme, children in HGSFP-implemented schools consumed significantly more of the following dietary groups; other fruits and vegetables (88.9% versus 70.1%; P= <0.001), meat and fish (22.9% versus 11.8%; P= 0.013), legume nuts and seeds (100% versus 75.7%; P= < 0.001) and milk and milk products (41.7% versus 22.2%; P= 0.001). One noticeable food consumption pattern was that more children in schools without the HGSFP consumed more dark green leafy vegetables than children in HGSF-implementing schools (51.4% versus 36.1%; P=0.009).

Children's different scores in consumption for foods from various food groups were highlighted using Fig. 4.2. Among the noticeable findings was the higher proportion of schoolchildren (36.1%) in schools implementing the HGSFP who consumed food from four food groups as opposed to (31.9%) of schoolchildren in schools without the feeding programme. A small proportion (0.7%) of schoolchildren in schools that were not implementing HGSFP consumed

food from one group. None of the schoolchildren had consumed foods from all of the nine food groups.

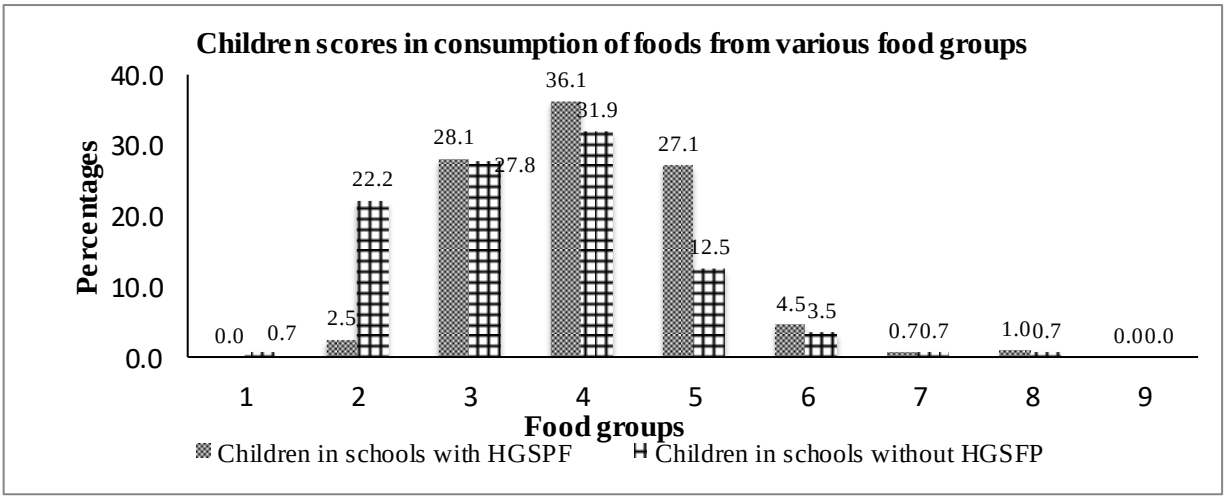

Fig. 4.2. Children consumption of foods from various food groups

Further analysis was done on the Home-Grown School Meal Programme menu composition.

As indicated in Table 4.7, children from all the sampled schools received lunch, which wasng served as a mixture of boiled maize and beans with added oils, and iodised salt (See appendix XX). All of the school head teachers withheld information about the ratio in the menu composition. The researcher observed that a 250-gram plastic cup was being used to serve children (See Appendix XX).

Table 4.7. Home Grown School Meal Programme menu composition

Meal	Serving portion	Menu composition
Lunch only	250-gram cup	A mixture of boiled Maize, Legumes (Beans), Vegetable oils and Salt (iodised)

Nine food groups identified in the FAO (2010) guideline on measuring individual dietary diversity were used to analyse the HGSFP menu composition ingredients for diversity. This study found that only two of the nine food groups in children's diets were represented in the

school meals provided through the HGSFP. The maize content was under the starchy staples, while beans contributed to the legume food group (Fig. 4.3)

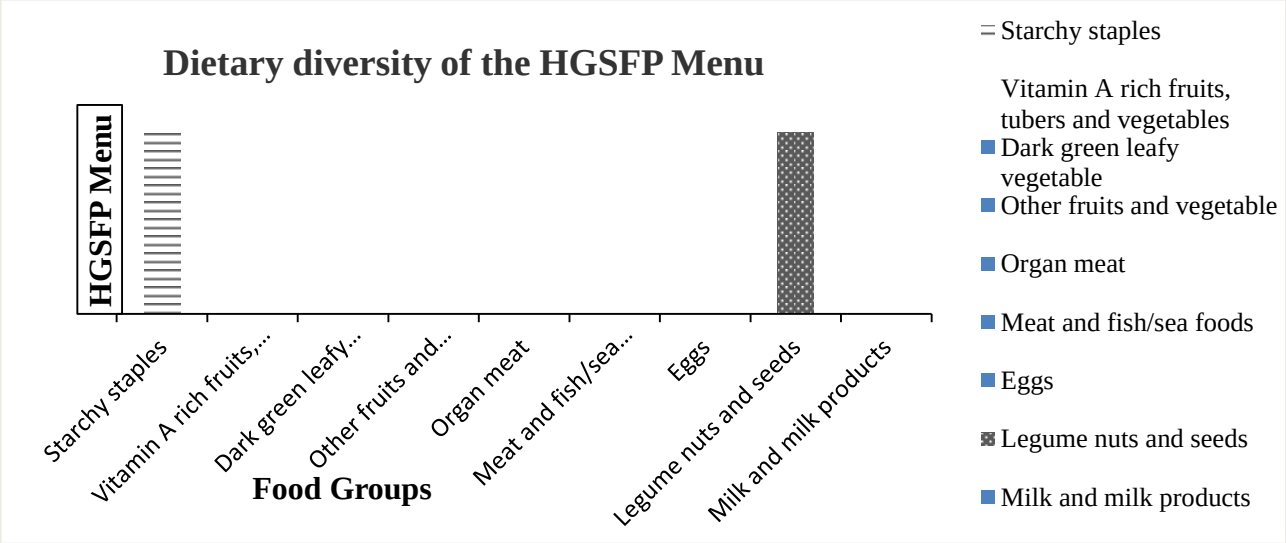

Fig. 4.3 Dietary diversity of the HGSFP Menu composition

Additional analysis followed to determine the percentage of children who attained the minimum dietary diversity (consumed foods from ≥ five (5) food groups). Only one-third (33.4%) and one-fifth (17.3%) of children in and not in schools that were implementing HGSFP, respectively, had attained the minimum dietary diversity (Fig. 4.4).

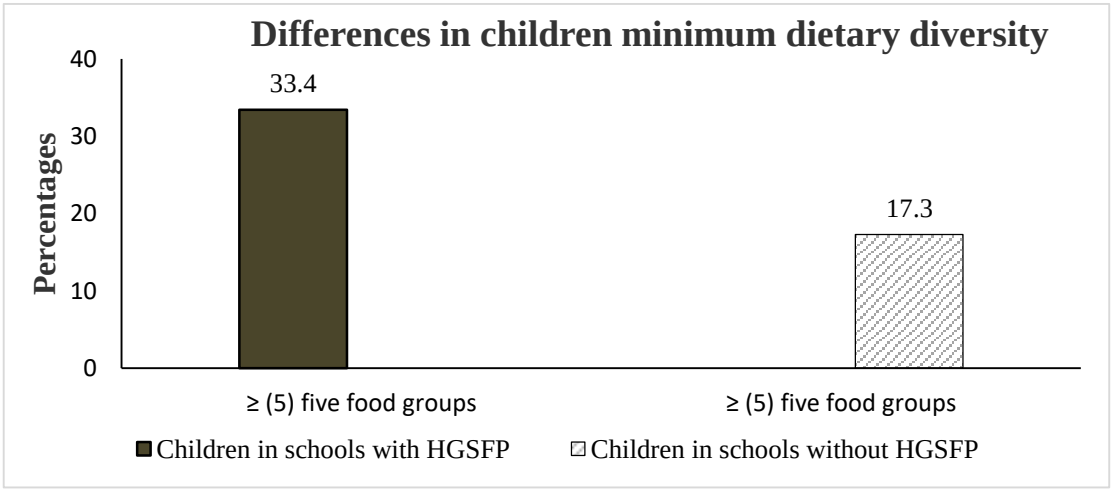

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Fig. 4.4. Differences in children's minimum dietary diversity

As shown in Table 4.8, an independent t-test showed a significant difference in the attainment of minimum dietary diversity between children in a school implementing HGSFP (M = 5.1, SD = 0.98) and children in schools without the feeding programme (M = 4.1, SD = 1.43), t (286) = 6.78, P= 0.01.

Table 4.8. Differences in children's minimum dietary diversity

	Children in schools with HGSFP		**Children in schools without HGSFP**				
	n = 144		**n = 144**		**T-value**	**T-test**	**P-value**
Minimum Dietary Diversity	M	SD	M	SD		Df	
	5.1	0.98	4.1	1.43	6.78	286	0.01*

*Significant difference at p-value <0.05

4.4 Nutritional Status of Schoolchildren

Table 4.9 shows that the majority of the index children in and not in school implementing HGSFP were of normal nutritional status based on BMI for age and height for age (72.2% vs.76.4%; 97.2% vs. 95.8%, respectively). A statistically significant proportion of the children in schools with HGSFP as compared to those in schools without the feeding programme were overweight and obese (16.7% vs. 7.6%, 6.9% vs. 0.7%; P= <0.001, respectively). A significant number of the children in schools without the feeding programme as compared to their counterparts were underweight (7.6% vs. 2.8%) and severely underweight (7.6 % vs. 1.4%; P= <0.001), respectively. The overall picture here is that children from schools with the programme were significantly overweight, a finding which needs further investigation, and children from schools with no feeding programme were more likely to be underweight and severely underweight.

In this study, the prevalence of stunting had no significant difference (2.8 % versus 4.2%; P= 0.478) among children in and not in school implementing HGSFP. Worth noting were the low proportions of stunted children in the study area.

Table 4.9. Nutritional status of the children

BMI for age category		**Children in schools with HGSFP N=144**		**Children in schools Not in HGSFP N=144**		**Chi-square /Fisher's Exact Test Value**	**P-value**
	Z score (SD)	**n**	**(%)**	**n**	**(%)**		
Overweight	>2	24	16.7	11	7.6		
Obesity	>1 to <2	10	6.9	1	0.7	21.8579	<0.001*
Normal	<-2 to <1	104	72.2	110	76.4		
Underweight	>-2 to <-3	4	2.8	11	7.6		
Severe Underweight	>-3	2	1.4	11	7.6		
Height for age category							
Normal	< 2	140	97.2	138	95.8	1.4773	0.478
Stunted	> -2	4	2.8	6	4.2		

*Significant difference at p-value <0.05

BMI: Body Mass Index

4.5 Stakeholders in the Implementation of HGSFP

4.5.1 School Head Teachers

4.5.1.1 Roles of School Head Teachers in the Implementation of HGSFP

The researcher identified three major roles of the school head teacher in the implementation of HGSFP: accounting officers, managers, and procurement officers.

Accounting officers of the HGSFP: The head teachers reported they were involved in keeping track of the number of children receiving meals at their schools and the amount of government

funding the institution received. They had the responsibility to account for the number of school days in a school term the meals programme was in effect, the amount of food purchased, and the price at which the foodstuffs were procured. They completed return forms and submitted them on a weekly basis to the Ministry of Education, along with copies to the county and sub-county offices. Given their office obligations, the head teachers found this to be taxing, although they embraced the responsibility and were equal to the task.

Managers of the HGSFP: The school head teachers reported that they were signatories of school feeding programme bank accounts and secretaries of their respective school meal management committees. School head teachers approved and monitored the preparation of the daily rations of food within the school. Although parents provided for water and firewood, heads of schools were responsible for monitoring food preparation as well as serving.

Procurement officers and school head teachers were involved in approving budgets, requesting bids, and paying suppliers. They arranged for the storage of the food they had purchased.

4.5.1.2 Head teachers' Perceived Challenges in the Implementation of HGSFP

The school head teachers experienced a number of challenges, such as payment delays and unpaid bills for food supplies, having to consult the procurement office from the Ministry of Education based at the County offices. They had challenges of lengthy bureaucratic procurement procedures, insufficient funding, and inadequate food supplies**.** They were overwhelmed with responsibilities and a high cost of living. The following are some of the quotes from head teachers highlighting various challenges in the implementation of HGSFPs.

Need for consultation on procurement procedures: "*Despite having money in the school bank account, I did not buy food throughout the first month of this term because I wanted to consult the County procurement officer on the procurement process" (*KII 1, participant 1, Male)

Payment delays and unpaid bills.

The head teachers reported that delays in payment on non-payment were a major challenge in the implementation of the HGSFP. This opinion was expressed in one of the statements:

"Quality service cannot be assured due to payment delays that might occasionally extend up to five months or longer, even though all service providers sign contracts guaranteeing them to deliver food on a daily basis" (KII 2, participant 1, Male*),* stated by one of the head teachers

"*The issue of unpaid payments raises the likelihood that suppliers stop delivery of foodstuffs" (KII 3, participant 1, Male), a*nother head teacher commented.

Lengthy bureaucratic procurement procedures. The researcher concluded that the main reason for the delayed payment was the bureaucratic procedure that had to be followed before payment was made. All the head teachers agreed that the "*Process is too long*" (KII 1, 2 and 3, participant 1, 2 and 3, Female, Male, and Male)

Inadequate finances. As explained by the majority of the head teachers, the feeding programme was operating on a tight budget of Kshs. 11 per child per day. As a result, food ran out before the end of the term, or they had to ration the little food they procured. This affected how successfully the programme ran and achieved its objectives. This was evident when one head teacher stated, "*In my school, food is served twice a week using the smallest 250g cup because the food is not enough" (*KII 3, participant I, Male)

Inadequate food. The majority of the head teachers claimed that the school feeding programme had increased enrolment and attendance in the schools, making the food not enough for every

child. According to the head teachers, the blame was on the widespread poverty and hunger in the study area (Makueni County). This was confirmed in a statement made by one of the school head teachers, "*Many households prepare only one meal in a day, mainly supper, and many children attend school to receive free lunches"* (KII 2, participant 1, Male)

School head teachers were overwhelmed with responsibilities. In their capacity as managers of HGSFP, school head teachers approved and monitored the preparation of the daily rations of food. The children asked their parents for water and firewood as well. In most cases, school head teachers were responsible for monitoring food preparation as well as serving. This posed extra work for the school's head teachers, who were also in charge of the school's academic activities. Following are quotes from school head teachers expressing how they felt overwhelmed by their workload. "*The coordination of the school feeding programme is labor-intensive, which interferes with my administrative responsibilities at the school"* (KII 1, participant 1, Female*). "I feel physically drained by my work in this school"* (KII 1, participant 1, Female).

"I feel used up at the end of the day work "(KII 2, participant 1, Male).

"I feel fatigued when I get up in the morning to face another day on the job" (KII 3, participant 1, Male).

The low economic status of the parents. The head teachers claimed that significant portions of their parents were unemployed, with a small number engaging in sporadic work and small-scale business, and that expecting them to contribute money to the programme was unrealistic. One of the head teachers remarked, "*Many parents lack permanent jobs and rely on agriculture, which is seasonal."* (KII 1, participant 1, Female).

"You send the children home to collect Kshs. 50, but most parents send them back to school the next day without the money" (KII 3, participant 1, Male), *one* head teacher said

"There are many parents with very high outstanding balances in this school, "Another teacher added (KII 2, participant 1, Male).

4.5.1.3 Suggestions from School Head teachers on Strategies to Implement HGSFP

School head teachers made suggestions for improving the implementation of the Homegrown School Feeding Programme in Makueni County. The researcher summarised them as follows: the need for professional training, increased funding, faster transfer of funds, as well as the hiring of experts or professionals.

Professional training: The head teachers suggested that the government should train teachers on the procurement process or hire experts. As one of the head teachers stated, "*I am overwhelmed with accounts of the school, so I have employed the school's bursar"* (KII 1, participant 1, Female). The head teachers proposed the need to engage support staff to relieve them of their responsibilities for the feeding programme,

Increased funding: School head teachers requested the national government to allocate more money towards funding HGSFP. In addition to the purchase of the foodstuff, the funds will be used to pay for cooking fuel, clean water, kitchen construction, and the hiring of cooks. The majority of head teachers stated that the school feeding programme had increased enrolment and attendance in many schools, making the food not enough for every child. According to the head teachers, the blame was on the widespread poverty and hunger in Makueni County, where many families enjoyed one meal in a day and therefore sought the benefit of school meals for their children.

Faster transfer of funds: The school head teachers appealed for prompt payments to vendors in order to guarantee the quality, quantity, and timely delivery of food supplies.

Engagement of professionals or expertise: All of the head teachers concurred that the engagement of professionals with experience in managing and directing the implementation of school feeding programmes was important. This view was expressed in one of the statements.

A head teacher admitted and said, *"I don't have any basic information on government policy documents related to school nutrition and meals programme*." (KII 3, participant 1, Female).

4.5.2 Parents

4.5.2.1 Parents' Role in the Implementation of HGSFP

As part of their in-kind donations, parents provided firewood and water to their children. Parents contributed money to pay school cooks and security guards. The following statements demonstrate parental involvement in the HGSFP.

"*In this school, our monthly contribution is Kshs. 50*" (FGD1, participant 4, Female), one parent said

"*The payments are Ksh. 300 per parent for this term*," another parent said (FGD 2, participant 2, Female).

Another reported, "*Every day, my children each carry a 5-liter water container and one piece of firewood to school."* (FGD 3, participant 1, Male).

4.5.2.2 Parents Perceived challenges in the Implementation of the HGSFP

Parents faced challenges related to the high cost of living, a mix-up between free primary education and free school meals, and shortages of water and firewood supply.

High cost of living: The challenges of increased living expenditures had a negative impact on parents' financial contributions to the programme. Even as they made the following statement, parents' faces showed displeasure.

A frustrated mother lamented, "*We pay 50 shillings a month to this school for meals. As a casual employee who has not worked for a month, where am I supposed to get this money from?"* (FGD 3, participant 6, Female).

Another parent stated, *"It's getting harder to get Kshs. 50 and pay for my child's school lunches"* (FGD 2, participant 3, Male*)*

"My child was sent to collect Kshs. 50, which I did not have. The whole of last week my child was home" (FGD 3, participant 5, Male), a parent said with teary eyes.

A mix-up between free primary education and free school meals challenge was on how parents understood the free basic education system. Parents believed that free school lunches were part of the free education system. During the Focus Group Discussions (FGDs), the researcher noted loud whispers from the majority of the parents that "*Education is free." (FGD1,2 3, participants 1-18, 9 Female and 9 Males)*

Shortages of water and firewood supplies: Parents highlighted the challenges in supplying water and firewood for the programme. This challenge of firewood provision was expressed through a number of comments from parents.

*"*There *are no longer trees in this place; where can I get firewood? The type of firewood available cannot even bring water to a boil. They are of poor quality"* (FGD 1, participant 6, Female), a parent commented.

"Even as parents, we no longer use firewood in our residences. I stay in town. Where can I get enough firewood so that I can give my three daughters to take to school? (FGD 2, participant 1, Male), Comment from one parent.

Parents expressed their struggle with water through various sentiments.

"There is a water crisis; this area is extremely arid and devoid of permanent rivers" (FGD 2, participant 2, Female); one of the parents stated

"Water is expensive when I buy it for my home. It's impossible to share with the school" (FGD 3, participant 4, Female) was a response from another parent.

4.5.2.3 Parents' Suggestions on Strategies to Improve the Implementation of HGSFP

Parents supported the government's assumption of full financial responsibility for the programme. The Kenyan government was paying teachers' wages, covering the fundamental costs of competency-based education, and allocating money for new textbooks, and therefore, had the capacity to meet all the implementation costs of HGSFP.

Increased funding by the government: When the researcher requested parents for suggestions on solutions to the firewood and water difficulties, in unison, all the parents shouted "*free education*"(FGD 1, 2, 3, participants1-18, 9 males and 9 female), in a loud voice. It was suggested that the government should be in charge of providing the funds needed to cover the cost of the water and fuel used to prepare meals for the school feeding programme.

4.5.3 School Meal Management Committees

4.5.3.1 School Meal Management Committees' Roles in the Implementation of HGSFP

The committee's primary job was that of an accounting and procurement officer. Together with the head teachers, they served as signatories on the school's food bank account, created and approved budgets for school meals, released bids, and paid food suppliers. Additionally, they received and checked the quality of the food they had purchased.

4.5.3.2 Challenges by Meal Management Committees in the Implementation HGSFP

The researcher identified the inability to procure adequate quantities of nutritive food, lack of professional training, and lengthy bureaucratic procurement procedures as the main challenges facing meal committees. This was confirmed in the list of comments from the committee members.

"*The choice of quality food is dictated by the amount of money from the government. If each child only receives Ksh. 11, it will be challenging to buy enough and nutritious meals for them to eat at school*" (FGD 4, participant 6, Male), a participant stated.

"*The programme recommends we procure food locally but we have a limited number of productive farmers to buy from*," (FGD 4, participant 4, Male), a member added.

"*At the moment, due to the programme issues, maize and beans still make up the food purchased for the school feeding programme*" (FGD 6, participant 6, Male), another participant stated.

The committee member continued and said, "*Farmers are unable to produce and supply a variety of food products to schools because of low production capacity brought on by insufficient rains, expensive fertiliser, and pesticides, inability to access loan facilities"* (FGD 6, participant 2, Female).

"*Pupils complained about the little quantity of food served, but we have to make sure that all pupils get something, however small,"* a member commented. (FGD 5, participant 1, Female).

"Another problem is that food prices are rising, and by the time we go to buy food, the money we budgeted for is insufficient," another member said (FGD 4, participant 3, Male).

A member commented, *"This school had stopped the feeding programme in last term due to insufficient funding from both parents and government*. (FGD 4, participant 3, Female).

The government money we got was to buy food only, for we had to buy firewood, pay cooks and buy utensils which were actually not enough...we had no option but to wait for the next funding from the government to resume the programme this term," (FGD 5, participant 6, Male), another member added.

"We became members of this committee by default because of the fact that we are also members of the school development committee; none of us has professional training in procurement" (FGD 4, participant 1, Female), the committee chair reported.

The school head teacher, who serves as the group's secretary, revealed, "*I was not aggressive about selecting the committee members because I could not distinguish its duty from that of the development committee"* (FGD 6, participant 1, Male*).*

"The procurement process is long, and it should be shortened so that feeding can start at the beginning of a school term with all food items being available" (FGD 5, participant 2, Female), a committee member commented.

"There were days when learners would go without a meal, the suppliers were not paid, and consequently, they could not afford to supply food for the school," another committee member reported (FGD 6, participant 3, Female).

"The suppliers often say, 'You haven't paid me. I can't keep accruing more debts" (FGD 4, participant 6, female). The chair of one of the committees stated.

4.5.3.3 Meal Management Committee Suggestions on Strategies to Improve HGSFP

Members of the various school meal management committees recommended engaging professionals to work on the programme, timely transfer of funds to school bank accounts, increasing financing for the programme, and buying a variety of food items.

Engaging professionals: According to the committee members, improvements were required in the operation and recruitment of its members. They suggested that school meal management committees should include members with experience in accounts and procurement procedures and who are highly motivated to work without pay.

The following comments were suggestions on the need for recruiting professional members of the school meal management committee:

"Professional membership can expose the programme to efficiency and effectiveness," a committee member said (FGD 6, participant 6, Male).

Another committee member stated, *"I think the HGSFP has a high chance of achieving set goals with sufficient training on procurement process"* (FGD 4, participant 6, Male).

Timely transfer of funds: Members of the committee agreed on the need by the national government to improve on the issues of delayed timelines for releasing funding for school feeding as they were affecting the procurement of adequate and nutritious food. According to the following excerpts from the focus group discussion with members of the school meal management committee, prompt payments to local vendors can impact the quality and quantity of meals provided to children.

"*Prompt payments can strengthen the committees' ability to buy diversified foodstuff from multiple suppliers, thus providing nutritious meals for our children to improve their nutritional and healthy status"* (FGD 4, participant 3, Female), a committee member stated

"If prior supplies are paid in time, they are able to deliver foodstuff every start of the term without delays," a committee member remarked. (FGD 6, participant 4, Male).

Increased funding: The focus group discussions made it clear to the researcher that the HGSFP relied on government money and that parental involvement was minimal. Committee statements clearly indicated the need for the government to upscale its budget allocation for the programme. The following verbal quotes support the need for increased funding of school feeding programmes.

"*The government has always supported and increased teachers' salaries and other educational costs; it should now take on more responsibility for school meals"* (FGD 5, participant 4, Male), one committee member stated.

*"Although as parents we are expected to supplement for the inadequacy of funds to pay the cooks, we are not able to" (FGD 5, participant 6, Male), o*ne member reported.

"Crop farming is not possible in the area, and therefore parents do not have resources to contribute; instead, they also depend on the assistance offered by the government" (FGD 4, participant 4, Male), another member said.

Diversified foodstuffs: From the statements made by the committee members, it was evident that school meals can be used to improve the dietary diversity of schoolchildren. The following statements were made in Favor of the need for the committee to take into account buying a variety of food products.

"*The programme utilises maize and beans because those are the main crops produced locally*." (FGD 4, participant 2, Male). To address this, a member requested that the programme procedure permit the purchase of food from other counties with a wider range.

'Incorporating meat and other livestock products in the school meals programme would go a long way in benefiting the children who are from extremely poor families that are largely unable to provide for nutritious meals" (FGD 6, participant 6, Male), *a* committee member commented.

"Droughts and rising food costs have threatened the availability of nutritious meals in our homes, and school meals are supporting our children" (FGD 5, participant 1, Female), another member stated

A participant said, "*Irrigation systems, farming technology, and indigenous plant knowledge need to be improved in order to boost the agricultural capacities of local farmers*" (FGD 5, participant 5, Male).

A committee member made the following statement regarding cross-sector collaboration for diversified food production by farmers: "*To improve agricultural production, the Ministries of Agriculture should use their extension workers to teach local farmers about irrigation systems and modern farming techniques. To assist farmers in the ASALs with the cost of farm inputs, the Ministry of Finance should enhance grants given to them" (FGD 1, participant 1, Female).* The member argued

A Member pointed out the importance of purchasing fortified foods from the market, saying, "*We can enrich meals served to our children by adding margarine.*" (FGD 5, participant 2, Female).

4.5.4 Government Representative

4.5.4.1 Roles of Government Representative in the Implementation of HGSFP

The government representative in charge of the school feeding programme was a supervisor who kept track of the food supplies to each participating school. The officer guided schools on the processes of implementing the Home-Grown School Feeding Programme and oversaw how monies intended for Home Grown School Feeding (HGSFP) were spend.

4.5.4.2 Government Representative on Challenges in the Implementation of HGSFP

Increasing School Enrolments

The quantities of food served to schoolchildren were always a challenge because more pupils were enrolled in schools than those approved and budgeted for by the school food programme. The following sentiment from the officer portrayed this challenge:

"*The food is not enough for all the students enrolled in the programme for all the days"* the officer posed, then went on to say, *any students who enrol in the school after the first ten days of a term are not taken into account when determining the HGSFP school budget allocations"* (KII4, participant 1, Male), The officer explained.

Selection of Beneficiary Schools

The government representative stated that making a decision on eligible schools for HGSFP funding to the satisfaction of the community was a major challenge. "*I can attest that just a small number of schools were selected to participate in the food programme, but it was done at random,"* the officer said. "*All schools qualify, but there were financial constraints*" (KII4, participant 1, Male), the officer explained.

4.5.4.3 Government Representative Views on Challenges Facing HGSFP Implementation

Broader Programme Coverage and Increased Funding

The government representative in charge of school meals made the comments below, which demonstrated that the Kenyan government could successfully fund and manage school food programmes in vulnerable Counties.

"The Ministry of Education has promised to take full responsibility for providing hot lunches to almost two million pupils in the arid and semi-arid areas of the country," the officer disclosed.

"*If the Kenyan government is to ensure the success of Free Primary Education, there must be a considerable and consistent investment in programmes that increase educational access, participation, and quality, especially among the most vulnerable and historically marginalised social groups"* (KII4, participant 1, Male). The officer expressed his sentiment on the achievement of Universal Primary School Education in Kenya. The officer went to state, *"When the Ministry took over from WFP, it was aware of the importance of this programme (HGSFP), conscious of the challenges that need to be addressed to ensure the continued success of the programme…,"* (KII4, participant 1, Male), The officer said.

"The government's commitment to ensuring the programme's success has been proved in several ways, one of which is funding. The government has promised to increase money allocated for school meals in the current fiscal year" (KII4, participant 1, Male), *the* officer reported.

4.6 A Model to Improve Implementation of HGSFP in Makueni County

A new model was developed (Fig. 4.5) using this study's findings in phase 1 and some concepts borrowed from the Homegrown School Feeding Resource Framework Figure 1 by FAO & WFP (2018). Home Grown School Feeding Programme seeks to feed children in slums and arid and

semi-arid land (ASALs) who are food insecure. Aridity, as it is in Makueni County, is linked to low socioeconomic status and food insecurity among households. The objective of school meals delivered through the HGSF in the ASALs is to help schoolchildren access a diversified diet, thus reducing their vulnerability to malnutrition and food insecurity brought on by food crises (FAO & WFP 2018). As confirmed in this study's quantitative result, a significant number, although not large enough, of children in Makueni County attending schools that were implementing HGSFP had attained minimum dietary diversity. A high proportion of children in and not in schools implementing HGSFP consumed foods rich in vitamin A and iron-rich foods. The difference was not significant. Children from schools not implementing HGSFP were significantly underweight and severely underweight when compared to their counterparts. Using the aforementioned quantitative results in this study model, school children are more likely to get access to a varied diet through the HGSFP, which is more likely to deliver the micronutrients that are frequently absent from their meals and, as a result, enhance nutritional status.

This study developed a model that recognises funding from the government, stakeholders (parents, school head teachers, and sub-county government representative of school feeding), and food suppliers' roles in the HGSGP goal of delivering diversified diets to schoolchildren. This was as per the qualitative analysis of this study. The government is the only source of funding for the HGSFP to send cash at the beginning of each three-month term, with amounts determined by net student enrolment in schools. The government funding levels are at Kshs. 11 per child per day. These are the funds to purchase diversified food from local suppliers (farmers and traders). Many parties are involved in the purchases of food from local farmers and in the operation of the Homegrown School Feeding Programme. A local school meal management committee (made up

of parents and school head teachers) is constituted to purchase food from local farmers and traders. Parents make contributions of firewood, water, and cash for cooks' salaries.

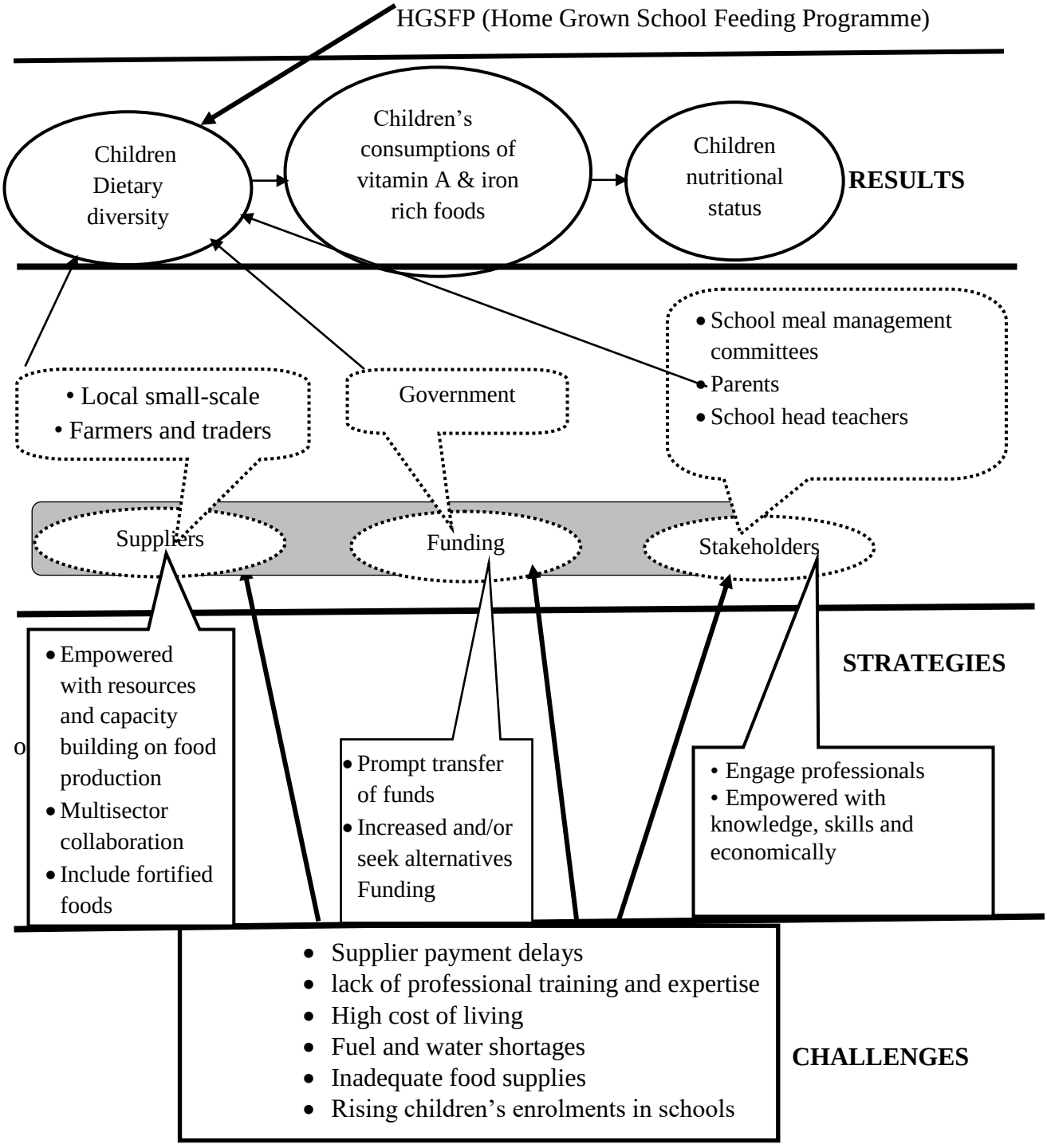

Fig. 4.5. A model to improve the implementation of HGSFP in Makueni County

The school head teachers are managers and coordinators of the programme at the school level. The county government representative of the school feeding programme offers coordination and oversight roles to schools implementing HGSFP in liaison with the county education office.

Using qualitative analysis, and as highlighted in this study development model, a number of challenges were faced by the government, stakeholders, and food suppliers in the implementation of HGSFP. Food suppliers to the HGSFP (local farmers) had challenges with payment delays and resource constraints. Due to the location in the rural districts of the ASAL, the HGSFP's food suppliers lacked the capacity to provide enough food to satisfy a potentially large demand. Farmers lacked key agricultural inputs such as water, fertiliser, pesticides, and seed, lacked adequate large-scale storage facilities, had little access to affordable bank credit, and therefore unable to produce and supply diversified food products to schools. There were reports on a lack of professional training and expertise, especially on matters of management, accounting, and procurement among school heads, teachers, and the meal management committee. This could have had a detrimental effect on the effectiveness and efficiency of the programme. High cost of living was affecting parents' ability to support the programme, in addition to fuel and water shortages affecting Makueni County at large. According to the study's findings, the government, as the sole financier of the HGSFP, had challenges and was unable to cover all schools in the ASALs. The complex and burdensome bid procedures influenced the purchase of foodstuff in time. Rising children's enrolment in schools implementing feeding programmes affected the ability to purchase quality and quantity foodstuffs.

Using qualitative data analysis, as shown in this study-developed model, there were specific suggestions to counter the challenges. To help the local farmers who supply the HGSFP with food, it is necessary to empower them with resources and increase their capacity to produce a

variety of foods. The government needs a multisector collaboration between the Ministries of Agriculture and Finance to provide more support in the form of farming grants and education on irrigation systems and modern farming technologies. Based on the summaries of the qualitative findings of this study, the government, as the sole financier of HGSFP, ought to implement a scaled funding system that adjusts for regional food scarcity and price disparities rather than the current flat allowance. Other funding sources, such as development partners, faith-based organisations, and the private sector, can supplement the national budget or budgets of vulnerable schools that do not have parent support. Funds for the HGSFP should be released on time to aid the effective administration of the programme.

Since local farming is designated as the primary source of food suppliers for the HGSFP and is an economic activity for Arid and Semi-Arid dwellers (as in the case of Makueni County), the government should support parents who are mostly small-scale food producers. These may include the provision of farming grants, technical advice on agriculture, and supplies of inputs to support their agricultural production. The implementation of the Home-Grown School Feeding Programme is different from that of school academic activities. In this respect, the programme calls for the engagement of professionals or empowerment of school head teachers and school meal committee members on the management and co-ordination of HGSFP. Areas of concern, as mentioned in this study, were matters of accounting and procurement modalities.

CHAPTER FIVE: DISCUSSION OF RESULTS AND FINDINGS

5.1 Characteristics of the Study Population

5.1.1 Demographic Characteristics of the Schoolchildren

This study comprised children aged 6 to 13, with no significant differences in number of boys and girls and average age, both those in and not in schools implementing HGSFP. The inclusion of the sex/gender dimension means that differences, whether biological or social, were taken into account in this research. This study's sex ratio was close to Makueni County's 49% female and 51% male school enrolment statistics (Makueni County, 2013). The sex ratio is seemingly okay, given that Kenya has a population of 47.6 million people, where 23,548 (49.5%) million are men and 24,014 (50.5%) million are women (Kenya National Bureau of Statistics, 2019). The children in this study ranged in age from 6 to 13 years old, with a median age of 11 and 10 years for students in and not in HGSFP-implementing schools. These ages are in line with Kenya's primary school enrolment age, which is 6-13 years (Dubeniberg et al., 2017). This can also be confirmed using reports in the Kenya Demographic Health Survey-KDHS, 2014 (Kenya National Bureau of Statistics, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population and Development and ICF, 2014), where the attendance age of primary school children is at the age of 6-13 years.

The school years are a dynamic period of growth and development, where children experience key physical, mental, emotional, and social changes (Saavedra & Prentice, 2022). The foundations of good health and a sound mind are laid during the school-age period (Srivastava et al., 2012). Schoolchildren are vulnerable to malnutrition due to diverse factors, including inadequate availability and access to a nutritious and varied diet (Mwaniki and Makokha, 2013;

Degarege at al., 2015). In this context, strategies that focus on nutrition intervention during the school years should undergo continuous improvements to support children's development.

5.1.2 Demographic and Economic Characteristics of Parents and Households

Socio economic characteristics are useful factors in the implementation of HGSFP. Counties in arid and semi-arid regions are the main targets of the HGSFP since the children therein are more vulnerable and likely to suffer from inadequate food intake and malnutrition (Langinger, 2011). In this study, the highest proportion of parents, mothers, and fathers, both with children in and not in HGSFP-implementing schools, had primary education and were mostly working in petty trade or casual jobs. It is possible that parents' education level dictated their employment status. This study further shows that the majority of the households with children in and not in HGSFP-implemented schools were poor/poorest wealth-wise. Parents' education level and employment status are in line with the Kenya National Bureau of Statistics (KNBS) and Society for International Development (SID) report of 2013, where 62% of Makueni County residents have a primary level of education and only 23.2% work for pay. The poor wealth status among households in Makueni is linked to the poverty level in Makueni County, which stands at 60.6%, higher than the national average of 45.2% (KNBS &SID, 2013). The county ranks 38 out of 47 counties in terms of poverty levels. School feeding, according to Espejo et al. (2009), has been an effective safety net that can prevent those affected by economic shocks (increased food prices or during protracted crises) from adopting negative coping strategies. In many low-income countries, school feeding programmes have been a critical part of the response to the global economic crisis ("Home-grown: The school feeding revolution in developing countries," 2013). The immediate benefit of the school feeding programme is that it draws parents who are

struggling to sustain their children on low incomes, as is the case in Makueni County, to take advantage of the free lunches offered at the schools.

5.2 Consumption of Vitamin A and Iron-Rich Foods

Children in or not in schools implementing HGSFP did not show a significant difference in the consumption of vitamin A and iron-rich foods. The consumption of vitamin A-rich foods from animal sources was very low for both schoolchildren in and out of the HGSFP-implementing schools. Considering all meals originated from home for children in schools that did not implement the HGSFP, the low consumption of animal-source vitamin A is mostly a reflection of poor diet quality at the household level. The insufficient intake of foods containing vitamin A from animals further shows that meals provided to children enrolled in schools implementing HGSFP were deficient in animal source foods. To fully understand why children in schools implementing the HGSFP consumed significantly more milk and milk products than children in schools not implementing the HGSFP, more research is necessary.

Iron intake, as measured by consumption of organ meats and flesh meats, was low both for children in and those not in schools implementing HGSFP. The low consumption of iron-rich foods can be linked to Kenyan diets, which are primarily composed of maize flour (for porridge/ugali), maize grains, and beans (githeri) (Houghton et al., 2019).

The low consumption of animal-source vitamin A and iron-rich foods is consistent with those of earlier studies. Research findings by Ochola and Masibo (2014) showed that school-age children in developing nations eat a diet primarily composed of plants, primarily consisting of grains, roots, and tubers, with a small number of foods derived from animals. In Nairobi City, a research study by Ndungu and Chege (2019) found that school-age children reported high (99.7%)

consumption of grains, roots, and tubers with modest intakes of animal products. The results of low consumption of animal-source vitamin A and iron-rich foods among the study children contrast Ene-Obong & Ekweagwu's (2013) research on school-aged children (ages 5 to 14) in rural Nigeria, which found that nearly all (99%) of them had consumed food from an animal source in the previous 48 hours.

The consumption of dark green vegetables as the most preferred source of vitamin A by children in schools not implementing HGSFP was found in this research study and may need to be researched further. Past studies have shown that vegetables and, more specifically, wild species accompany the diet of many people residing in rural areas (Chacha & Laswai, 2020). At the time of this research study, traditional vegetables (locally called *kunde*) were in season and readily available, and this may explain the high prevalence of dark green vegetable intake among the study children. Given that the study area experiences low rain, poor soil fertility, and resource-poor farmers (Makueni County, 2013), there is a possibility that the majority of the children consumed micronutrient-deficient diets.

5.3 Children's Dietary Diversity

For school-aged children who have significant nutrient needs for growth, dietary diversity is a crucial sign of a high-quality diet (Liu et al., 2022). Low dietary diversity, characterised by inadequate quantities and unbalanced distribution of food groups, often results in nutritional deficiencies, especially in micronutrients (Verger et al. 2021). In this research finding, a significant number of children in the schools implementing HGSFP attained the minimum dietary diversity by consuming ≥ 5 out of 9 food groups. Despite the significant difference, dietary diversity was relatively low for all the children, supporting the need for additional

interventions to improve the overall diet of children in Makueni County. This study's finding that the majority of children in the schools implementing HGSFP attained the minimum dietary score is closely related to previous findings. Research study findings by Zenebe et al. (2018) revealed that the school feeding programme had resulted in improved dietary diversity for Ethiopian children. A similar study done in Ghana on primary school children aged 7–16 years showed that the Ghana school-feeding programme significantly improved the Dietary Diversity Score (DDS) of schoolchildren (Martens, 2007).

The results of this research on better dietary diversity scores for school-aged children in implementing schools join a small body of literature assessing dietary patterns in Makueni County. The results of this study show that school feeding programmes appear to improve the dietary diversity of schoolchildren by adding different food groups into their diet. Taken together, these findings emphasise the need to improve the implementation of school feeding programmes, especially in the Kenyan Arid and Semi-Arid Lands (ASALs), areas of food deficit (Langinger, 2011). On a given day, school meals are the only meal for many Kenyan schoolchildren (Walingo and Musamali, 2008).

In the implementation of the home-grown school meal programme, the menu was designed to be composed of 40 grams(g) of beans to represent legumes, 150g of maize was taken to be the cereal, 5g vegetable oil, and 3g iodised salt, an optional banana was taken to be the fruit and spinach to represent vegetables (the Republic of Kenya, n.d). This represents a diet rich in carbohydrates, protein, fat, vitamin A, and iron (Drakes et al., 2016). However, small portions (250g cup serving) of a bean and maize mix that includes vegetable oil were being implemented in the three (3) sampled schools for this study. The Agriculture Organisation (FAO) strongly encourages the use of maize and beans in school meals (FAO, 2016) because of their

contributions to the energy, protein, and micronutrient intakes of individuals. In all three (3) schools, the portion sizes consumed were the smallest, as described by the school head teachers. This was anticipated because the amount of food the school purchased was insufficient to accommodate the growing enrolment. Although portion sizes are crucial for schoolchildren, there should be more emphasis placed on serving nutrient-dense portions.

5.4 Nutritional Status of School Children

The majority of the children in and not in HGSFP-implementing schools were of normal nutritional status, as shown by their BMI for age (thinness) and height for age (stunting). These findings can be explained by the fact that school-aged children can recovery and enjoy catch-up growth in the early years of their lives in response to changes in dietary intake (Bundy et al., 2018). These study findings, where the majority of children were of normal nutritional status, may be attributed to the timing of this study. Data was collected during harvest seasons, and it is possible that children consumed adequate food to considerably improve their nutritional status. There is a knowledge gap about the nutritional status of the age group (6–13 years); however, more research is still needed to determine why the majority of children exhibited normal nutritional status.

Children from schools implementing the HGSFP were significantly overweight and obese. More research is required since it is difficult to understand the reason behind the overweight and obese cases among children in HGSFP-implementing schools. Children in schools with no feeding programme were significantly underweight and severely underweight. The high levels of underweight (thinness) among the children in school without a school feeding programme, as

reported in this study, may be linked to food shortages in the area of study. A report by ACC/SCN (2001) indicates that thinness rates change rapidly in situations of acute food crisis.

Several other studies have shown unexpected results in children's nutritional status in relation to school feeding programmes. A study by Danquah et al. (2012) on the prevalence of nutritional status of participating and non-participating pupils in the Ghana School Feeding Programme found that the school lunch provided to the participants did not make any significant difference in their nutritional status. A study finding by Kwabla et al. (2018) in Denkyembour District, eastern region, Ghana, comparing schools with feeding and non-school feeding policies found that overweight and thinness were higher among children on School Feeding Programme (SFP) than in children in schools without SFP. A study by Agbozo and colleagues (2017) in Hohoe Municipality, Ghana, found no statistically significant differences in the nutritional status of students in schools with and without feeding programmes.

The findings of this study show that significantly underweight children in schools without HGSFP open a window for implementing targeted interventions like the school-feeding programme. For school-aged children, school-feeding programmes can be crucial nutrition interventions to support attempts to lower the prevalence of underweight children.

5.5 Stakeholders in the Implementation Of HGSFP

5.5.1 School Head Teachers

5.5.1.1 Roles of School Head Teachers in the Implementation of HGSFP

In the implementation of HGSFP, the head teachers were the accounting officers and signatories to the bank accounts for the school feeding programmes, and they served as procurement officers and coordinators. The results of this study on the roles of school head teachers are consistent

with what is specified in the implementation of HGSFP (United States Department of Agriculture Foreign Agricultural Service, 2009; Aliyar et al., 2015; Espejo, 2009). Similar findings from two studies, one in Kenya (Wakhungu and Opati, 2020) and another in South Africa (Mawela & Van den Berg, 2018), indicate that school head teachers are active in the management of the school meals programme. Head teachers' involvement in the programme could earn trust from the Ministry of Education, parents, and pupils in schools and therefore contribute to the programme's success. School head teachers are trained as administrators and managers of the school system, and therefore getting involved in the school meals programme may make the best out of it.

5.5.1.2 Challenges of School Head Teachers in the Implementation of HGSFP

School head teachers decried a number of challenges in the implementation of HGSFP. Challenges of unpaid invoices for food supplies, complex procurement procedures, insufficient funding, and overwhelming responsibilities. Late payment of service providers, as was revealed in this study, can compromise the quality and quantity of the food (Drake et al., 2016). Complex procurement procedures can result in delays in purchasing foodstuffs, as were the findings of this study and affirmed in a South African study (Dei, 2014). In other research (Quila &Tyilo, 2014) and this study's finding, inadequate funding can lead to irregular food supplies and a lack of diversity in school meals. Due to their extensive workloads as managers and administrators of the educational system, it is conceivable that school heads may not actively participate in the feeding programme. A more effective and efficient way to achieve the programme's objectives may be to minimise school head teachers' control of the daily operations of the school feeding programme.

5.5.1.3 School Head Teachers perceived Improvement Strategies in the HGSFP

School head teachers stated that the feeding programmes could be improved by investing in professional development opportunities or hiring experts in the fields of accounting, procurement, and general HGSF implementation. They also proposed that finances for the feeding programme should be increased and done immediately to school accounts. Empowering school head teachers with programme implementation knowledge and skills can help improve their focus on child nutrition and professionalise the school meal provision (Shrestha et al., 2020). Previous studies in the United States have pointed to the importance of training and capacity building to programme stakeholders as a means to improve sustainability in school-based health programmes (Hoyle et al., 2008; Saito et al., 2015). Another study from Guyana revealed teachers' relevant knowledge and skills in matters of school feeding programme was a driver in improving the quality of the programme (Masset & Gelli, 2013). The availability of adequate funds may influence the decision to purchase a variety of food items. Scaled-up financing may be used to achieve HGSFP objectives in the ASAL without parent involvement. School head teachers who are well supported in terms of knowledge and resources can approach their role in implementing the HGSFP with a feeling of ownership and purpose.

5.5.2 Parents

5.5.2.1 Role of Parents in the Implementation of HGSFP

To establish a functional School Feeding Programme (SFP), parents should be involved in all procedures to ensure the sustainability of the programme (Chepkwony et al., 2013). This study revealed that parents contributed some money, water, and fuel for the implementation of HGSFP. This was in line with parents' responsibilities in the implementation of the HGSFP (United States

Department of Agriculture Foreign Agricultural Service, 2009; Aliyar et al., 2015; Espejo, 2009). Similar findings on parents' roles in the implementation of school feeding programmes in Kenya are available; Githuku (2015) in Karaba Zone, Embu County, and Gervas et al. (2021) in Suna East Sub-County, Homabay County. By encouraging parents to participate in the HGSFP, the Kenyan government may reduce administration overhead costs and more evenly distribute the expenditures connected with the feeding programme.

5.5.2.2 Parents' Challenges in the Implementation of HGSFP

Parents had financial constraints due to the high cost of living, challenging the smooth running of HGSFP. Inadequate finances from parents affected the ability to hire cooks, among other inputs required in the implementation of HGSFP in Makueni County. In Southern Ethiopia, financial constraints interrupted the supply of grains and other inputs required for the programme (Zenebe et al., 2018). Parents were less vigilant in meeting their financial obligations supporting the HGSFP because they believed that free primary education, as is the case in Kenya public schools, also included free school lunches. A similar Kenyan study in the Kanduyi zone, Bugoma County, showed that parents were uncooperative and reluctant to contribute to the finances needed for the promotion of SFPs (Omukubi, 2017). Parents in this study were unable to provide firewood for the programme due to limits not being mentioned to the researcher.

Due to the location of arid and semi-arid land, Makueni County residents could not have had enough water to share with schools. Similar studies have shown that schools with food programmes face water issues. A study conducted in Jigjiga zone, Ethiopia, showed that problems related to water are the most serious ones (Kidane, 2012). Two other studies conducted in Ghana showed that schools implementing a feeding programme did not have regular supplies

of water (Atta & Manu, 2015; Sulemana et al., 2013). It is possible that implementing the HGSFP in Makueni County was hampered by parents' challenges in supplying water, firewood, and money for the programme.

5.5.2.3 Parents' Suggestions on Strategies to Improve the Implementation of HGSFP

Parents suggested that the government should fully finance the HGSFP. Full government funding of the HGSFP contradicts the coordination framework of shared and specific responsibilities in the implementation of the school feeding programme in Kenya (Langinger, 2011; Republic of Kenya, n.d[a]). In other countries implementing the HGSFP, parents contribute to or support the feeding programme. In Botswana, parents provide school kitchen utensils and detergents (Moepeng, 2016). In Namibia, parents provide firewood, water, plates, cooking utensils, shelters, and storerooms (Republic of Namibia, Ministry of Education, 2012). Poverty is a main problem affecting communities in Kenya's semi-arid regions, particularly in the lower Eastern province (KNBS, 2015). Family economic efforts cannot support the HGSGP or even meet basic needs. Home-Grown School Meals Programme is a nationally owned and Government-led initiative; historically, the Kenyan government has always provided adequate funding for teachers' salaries, new textbooks, and school development projects (Bwonda & Njeru, 2005). Consequently, the government can provide sufficient and stable funding.

5.5.3 School Meal Management Committee

5.5.3.1 Role of School Meal Management Committee in the Implementation of HGSFP

In this study school, meal management committees were established and collaborated with the head teachers on accounting of funds made for the HGSFP and purchasing foodstuffs for the

school meals. The study's findings regarding the membership and responsibilities of school meal management committees were comparable to those described in the Kenya HGSFP implementation strategy (Langinger, 2011; Republic of Kenya, n.d[a]). Different countries have developed a National Committee to ensure coordination of the HGSFP. There are Parent-Teacher Associations (PTAs) in Botswana, School Governing Boards (SGBs) in South Africa, School Feeding Committees/Councils (SFCs) in Brazil, School Implementing Committees (SICs) in Ghana, and School-Based Monitoring Committees (SBMCs) in Nigeria (Drake et al., 2016). The school meal management committee's roles, as revealed in this study, were crucial in the implementation of the HGSFP and can be viewed as a government means to share administrative expenditures and implementation-related costs.

5.5.3.2 Meal Management Committee Challenges in the Implementation of HGSFP

Meal committees encountered challenges with food quality, procurement processes, and procedures. Contrary to the HGSFP's principal objective, school meal management committees were unable to procure quality foods that met the criteria for a diverse and nutritious diet as outlined in the homegrown school feeding resource framework (FAO & WFP, 2018). This may be so because most rural communities in ASAL have limited capacity to produce enough amounts of food due to harsh climatic conditions and insufficient farm inputs (Espejo et al., 2009; USDA, 2009). According to this study, members of the school meal management committee had difficulties carrying out the procurement procedures necessary for the HGSFP. This could have been because they lacked relevant professional knowledge or experience. When procurement processes and procedures are complicated, they might cause challenges for non-professionals attempting to complete the process (NEPAD, 2022). Professional engagement is

important for HGSF procurement as it is subject to the same regulations as other complex public procurement processes (Global Child Nutrition Foundation, 2022). Most members of school meal management committees held positions on school management boards, which had demands simpler than the procurement procedures and processes of the HGSFP.

5.5.3.3 Meal Management Committees' Suggested Strategies to Improve HGSFP

Members of the various school meal management committees advocated for the engagement of professionals, increasing programme funding, expediting financial transfers to school accounts, and purchase of diversified foodstuffs. Engaging professionals to manage the Home-Grown School Feeding Programme would professionalise the school meal provision (Shrestha et al., 2020). The HGSFP's procurement procedures and processes, if overseen by civilian committees, would probably subject the programme to many types of inefficiencies. The HGSFP's ability to procure a variety of foodstuffs would probably improve the quality of food provided to schoolchildren. Quick money transfers to school accounts could possibly enable quick payments to food suppliers, promoting regular supplies of a variety of nutritious foods.

The meal management committee suggested the need to include a range of food items in the school meals. A bean and maize mix that includes vegetable oil was implemented in all of the schools. This menu deviates from HGSFP specifications, which call for the use of maize, beans, vegetable oil, salt, fruit and vegetables (banana and spinach), and animal products (Langinger, 2011; Partnership for Child Development, 2013). According to Kristjansson et al. (2007), well-designed school meal plans should include enough energy, protein, fat, and micronutrients. The school meal provided to children in the ASALs tends to be the biggest, or even the only meal, for

many schoolchildren on a given day due to poverty. Research may be required to enhance the understanding of the provision of nutritious foods in schools and children's nutritional status.

5.5.4 The Government

5.5.4.1 The Role of Government in the Implementation of HGSFP

The national government of Kenya has mandated that the Ministry of Education coordinate the implementation of HGSFP (Republic of Kenya, n.d[a]). With support from the national government, County governments and sub-counties have shared responsibilities and roles in the implementation of HGSFP. In this study, a designated officer at the sub-county level was in charge of overseeing the HGSFP's execution, which is similar to the specification of the Kenya HGSFP implementation strategy (Republic of Kenya, n.d[a]). Government participation in the implementation of HGSFP in Kenya, as was revealed by this study (case of Makueni County), is similar to that of Namibia, where the provision of school meals implementation is a shared responsibility between national government, state governments, and local communities (Republic of Namibia, Ministry of Education, 2012). The Cote d'Ivoire government has a different implementation strategy, where women's agricultural groups are established to implement the HGSFP at the school level ("Home-grown: The school feeding revolution in developing countries," 2013).

Commitment by the national government is key to strengthening the National HGSFP; any support at National and county levels is crucial for the success of the Programme. The deployment of a government officer to be in charge of school feeding at the Sub-County level can be one of several initiatives for a successful implementation of HGSFP.

5.5.4.2 Government challenges in the Implementation of HGSFP

The findings of this study show challenges in deciding which schools to receive the HGSFP as well as how to handle the growing enrolment in the HGSFP-implementing schools. Selecting only some schools for the HGSFP was a challenge based on the fact that Makueni County is classified as Arid and Semi-Arid Land (ASALs) (ACF-USA / Makueni County, 2011). All schoolchildren in the ASALs qualify for the HGSFP as specified in the implementation strategy (Republic of Kenya, n d[a)]. School meals programme have been considered to have the "magnet effect" that has greatly increased school enrolment, especially in the ASALs (Espejo, 2009; Langinger, 2011)

It is conceivable that the increasing number of children enrolled in HGSFP-implemented schools exceeded the budget's capability, causing a detrimental effect on the quantity and quality of food procured for the children. Similar conclusions have been made in other studies: Research conducted in Uganda by Hadijah (2022) found that children were served small amounts of poor-quality food because of the large enrolments in schools with a running feeding programme. Kenyan-based study findings on challenges facing school feeding programme in Kajiado showed that increased enrolment in schools constrained the capacity of schools to serve nutritious school meals (Muhune, 2014). Similarly, research by De Carvalho et al. (2011) in Ghana discovered that the food budgets did not accurately reflect the number of children served because school enrolment tended to rise throughout the school year, leading to reduced portion sizes or altered food quality.

School feeding programmes can provide a platform to scale-up nutrition interventions for children in ASALs. Given the recurring droughts and increased enrolment in schools

implementing HGSFP, a research study may be necessary to substantiate the relationship between funding and the quality of school meals.

5.5.4.3 Strategies by the Government to Improve the Implementation of HGSFP

This study's findings were that the government ought to ensure all schools in the ASALs are benefiting from the HGSFP; this goes hand in hand with allocating extra funds for the efficient running of school feeding programmes. School meals are typically the only and largest meal of the day for many children, significantly lowering childhood hunger and enhancing nutritional intake (WFP, 2010). The need to include all schools in Makueni County (ASALs) in the HGSFP corresponded with the programme's initial goals when it was first implemented in Kenya (Espejo, 2009). A successful operation of any school-feeding programme depends heavily on funding because it defines the quantity and quality of meals served in the feeding programme (Banda, 2018). More funding from the HGSFP may probably ensure varied and nutritious meals are included in the feeding programme as specified by the WFP and FAO (2018). This request for extra funding for the HGSFP in the ASALs and the quality of the diets provided to children through the feeding programme may need to be backed up through more research.

5.6 A Model to Improve Implementation of HGSFP Makueni County

For the first time, comprehensive information regarding the Home Grown School Feeding Programme for Makueni County, one of the HGSFP's primary targets (ASALs), has been compiled. The nutritional benefits of the HGSFP for schoolchildren were evaluated, along with input from stakeholders on the HGSFP's implementation process. The nutrition assessments and stakeholder inputs offered information and strategies to improve the implementation of HGSFP

in Makueni County. Based on the message by Drakes et al. (2016) that there is “no one size fits all for school feeding,” a context-specific model was developed capturing strategies for improved implementation of HGSFP in Makueni County. The strategies were based on the specific challenges facing the implementation of HGSFP in Makueni County and the desired nutrition outcome (results) as stipulated in the HGSFP implementation strategy.

Results

Dietary diversity, consumption of foods rich in vitamin A and iron (micronutrients), as well as nutritional status of schoolchildren were used to evaluate the nutritional benefits of HGSFP. Dietary diversity has a correlation with micronutrient intakes and better nutritional status. In a study by Liu et al. (2023), dietary diversity was found to be of particular interest to school-aged children who have high nutrient requirements for growth. Low dietary diversity often results in nutritional deficiencies, especially in micronutrients (Verger et al., 2021). In young children, dietary diversity is an indicator of micronutrient adequacy (FAO and FHI 360, 2016) and improved nutritional status (Arimond & Ruel, 2004).

In line with this study's findings, school meals were not varied and, therefore, were unable to meet the micronutrient needs of growing children. This study model puts emphasis on the provision of diversified diets for schoolchildren through HGSFP. In the implementation of HGSFP, the purchase of diversified foods is encouraged (MoA 2011; Langinger, 2011), but due to system weaknesses, maize, and bean mixtures still constitute a majority of the food purchased. The potential to diversify diets, thus influencing micronutrient intakes and enhancing children's nutritional status, can be a distinctive property of the specific school feeding model for Makueni County. In areas where school meals constitute the main meal, HGSFP can play a vital role in delivering a diversified diet.

Challenges

As revealed in this study's qualitative data analyses, the implementation of HGSFP in Makueni County was plagued with varied challenges. The highlighted challenges seemed to pose a threat to the programme's success since they influenced how stakeholders participated in the programme. The challenges, as described in this study, can be utilised to show that Makueni County's implementation of the HGSFP fell short of the standards set out by the WFP and FAO (2018) as well as the Kenya national meals and nutrition strategy (Republic of Kenya, n.d.[a]). The listed challenges in the implementation of HGSFP in Makueni County, as shown in this study, are unique and not comparable to those listed in the studies of Olubayo (2015) in Emuhaya, Munuhe (2014) in Kajiado County, and Awour (2016) in Machakos County. Considering the challenges stakeholders were facing in implementing HGSFP in Makueni are distinct, creating a model that enumerates them is a sure bet that stakeholders and policymakers are likely to recognise them clearly when scaling up the programme to achieve its goals.

Strategies

Based on their challenges in fulfilling their roles, stakeholders submitted several comments and recommendations to help improve the implementation of HGSFP in Makueni. Some of the strategies that were highlighted by the participants in this study were aimed at providing nutritious and diverse meals to schoolchildren as outlined by the FAO and WFP (2018) and the Kenya National Meals and Nutrition Plan (Republic of Kenya, n.d[a]). Successful school feeding programmes are unique and context-specific but should consider internationally recognised standards and national guidelines (WFP, 2016). The outlined strategies in this study are based on in-depth stakeholder engagements and are tailored to address the challenges of dietary variety among schoolchildren. An improvement in the implementation of HGSFP in Makueni can be

achieved by organising the aforementioned strategies into a clear and visual display of actions that stakeholders and development partners use to strengthen the HGSFP and build a strong school-based nutrition intervention.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary

6.1.1 Consumption of Vitamin A, Iron-rich Foods, and Children's Dietary Diversity

The majority of schoolchildren consumed food high in vitamin A, whether they attended HGSFP-implementing schools or not. Very few schoolchildren, both those attending and those not attending HGSFP-implementing schools, consumed iron-rich foods. The difference in the percentages of children who consumed foods high in vitamin A and iron, whether they attended HGSFP-implemented schools or not, was not statistically significant.

According to the study's findings, more schoolchildren in schools implementing the HGSFP than those in schools not implementing the school feeding programme met the minimum dietary diversity score (≥ 5 food groups). This difference was significant.

6.1.2 Children's Nutritional Status

The findings from this study show that the majority of the children in and not in schools implementing HGSFP were of normal nutritional status in terms of BMI for age and height for age. The finding also reveals insignificant and low proportions of stunting rates across the two groups.

Further, this study shows significant numbers of children in schools not implementing HFSFP being underweight and severely underweight as compared to their counterparts who were in schools implementing the school feeding programme.

6.1.3 Stakeholders' Roles, Challenges, and Strategies in the Implementation of HGSFP

6.1.3.1 Roles

According to the results of this study, the school head teachers served as the HGSFP's accounting, procurement, and coordination officers at the school level. Parents made monetary, water, and fuel contributions toward the HGSFP's implementation. The school meal management committees collaborated closely with the head teachers to account for funds received for the HGSFP and purchase foodstuff for the school meals. The general coordinator of the HGSFP implementation at the Sub- County was a designated officer in charge of school feeding.

6.1.3.2 Challenges

According to this study's findings, the challenges facing stakeholders in the implementation of HGSFP in Makueni were as follows:

School head teachers had challenges of unpaid invoices for food supplies, complicated procurement processes, inadequate funds, and overwhelming responsibilities (in managing the HGSFP and school academic programmes).

Due to their limited financial resources and the high cost of living, parents were unable to fulfil their financial commitment to the HGSFP.

Members of meal management committees struggled to procure quality and adequate food supplies for the feeding programme because of inadequate funds and complex procurement processes.

Choosing which schools would benefit from the HGSFP was difficult for the sub-county office since all schools were qualified. This was in addition to the rising enrolments in the HGSFP-implementing schools.

6.1.3.3 Strategies

The food suppliers to schools implementing HGSFP needed the empowerment of resources to improve food production capacity, support from multiple sectors in the government, and permission to supply fortified foods to schools.

The government needed to be prompt in transferring money to the school accounts, increase finances for the HGSFP, and, if possible, allow for other sources of funding.

The school meal management committees and school head teachers requested an allowance to enrol in professional development training so they can gain knowledge and skills; if not, they will be allowed to employ experts, particularly in the disciplines of accounting and procurement. Parents asked for ways to help them become economically self-sufficient.

6.1.4 Developed Strategic Model for Implementation HGSFP in Makueni County

The study developed a new strategic implementation context-specific model that can help improve the implementation of HGSFP in Makueni County. Quantitative data from schoolchildren and stakeholders' input were both helpful sources of information.

6.2 Conclusions

The consumption of vitamin and iron-rich foods (micronutrients) for children in and those not in schools implementation of HGSFP were not significantly different. This study's findings dispute the use of school feeding as a sole strategy for ensuring micronutrient adequacy, especially for vulnerable segments of the population; other strategies may be incorporated. Children enrolled in schools implementing HGSFP attained the minimum dietary diversity score compared to children in schools without the feeding programme. These findings can be used to justify the definition for HGSFP by FAO & WFP (2018), 'a school feeding model that is designed to provide children in schools with diverse foods'

A significantly difference was observed in children nutritional status; a high percentage of children in schools implementing HGSFP were obese and overweight, and a significantly high proportion of children in schools not implementing HGSFP were underweight. These findings requires further research.

The roles played by school head teachers, school meal management committees, parents, and government representatives (in charge of school feeding) were fundamental in the implementation and success of the school feeding programme. Insights on stakeholders' challenges and inputs on strategies in the implementation of HGSFP in Makueni County can be key in reforming the nutritional quality of school meals in a sustainable manner.

This study's developed strategic model to enhance the implementation of HGSFP Makueni County can be used to strengthen the primary goal of HGSFP, in providing a diversified diet to schoolchildren in Makueni County and an upscaling tool for school feeding in Makueni.

Considering that children in the HGSFP attained the minimum dietary diversity score and had better nutritional status, the study suggests broadening of the school feeding initiative in all schools by taking into account the adoption of this study's developed model, which includes stakeholders' perspectives of an enhanced and sustainable feeding programme.

6.3 Recommendations

6.3.1 Recommendations for practice

- To improve on the consumptions of vitamin A and iron rich foods and the dietary diversity of school children benefiting from the HGSFP;
    - Farmers should be supported in growing micronutrient-rich local foods such as nutritious, leafy, fresh vegetables and fruits, which are important sources of vitamins and minerals. In addition, the HGSFP implementation model should incorporate the use of fortified food products to increase the consumption of micronutrients.
    - The menu options available to schoolchildren through the feeding programme in Makueni County need to be reviewed by policymakers involved in HGSFP to ensure that the variety of ingredients and portion sizes are improved. For HGSFP, the inclusion of fresh fruits, vegetables, and animal products in the menu as rich sources of vitamins is recommended.
- To better the nutritional status for children in schools implementing the HGSFP, the County Government of Makueni and the Kenyan National Government should consider enrolling more schools in the Home-Grown Feeding Programme.
- To improve on role related challenges facing the different stakeholders, the policymakers of the school feeding programme ought to equip all stakeholders with knowledge and

skills in the implementation of the HGSFP. If not, policymakers should consider engaging professionals on accounts and procurements to implement HGSFP at the school level.

- The implementation of HGSFP should adopt a model that addresses stakeholder challenges in providing quality (diversified) and quantity (portion sizes) of foods served to schoolchildren. A model like the one developed by this study.

6.3.2 Suggestion for Further Research

- This study designed a strategic model to help improve the implementation of HGSFP in Makueni County, but further research is required to test/investigate its feasibility.
- This was a cross-sectional study. A longitudinal may be carried out to help understand the effects of seasonality on the consumption of vitamin A and iron-rich foods, dietary diversity, and nutritional status of schoolchildren.
- Given that this study location is ASAL, there is a need for a study on the influences of household food security on the implementation of HGSFP in Makueni County.
- This study was unable to draw the conclusion that the high rates of obesity and overweight among schoolchildren were caused by school meals. Given that this is an ASAL area, more research is required to establish the factors associated with obesity and overweight cases among schoolchildren in schools implementing HGSFP in Makueni County.

6.4 Study's Contributions to the Science of Nutrition

This study has contributed new knowledge as follows:

1. Provided data on the contributions of HGSFP on children's micronutrient intakes. A significant finding has emerged on the nutritional deficiencies of school meals. Without gains in nutritional outcomes, it is unlikely that school feeding programmes (SFP) could improve the cognition and academic performance of schoolchildren despite the improvements in school enrolment.
2. Provided data on the nutritional status of children 6-13 years, a crucial stage in life
3. Provided data on the role and challenges of important stakeholders in the implementation of HGSFP
4. Developed a strategic model to enhance the implementation of HGSFP in Makueni County, a crucial tool emphasising diversified HGSFP diets for schoolchildren. Dietary diversity is a key principle in the implementation of HGSFP, but a challenge in the implementation of HGSFP in Makueni County and a contributor to micronutrient intakes.

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APPENDICES

Appendix I: Letter of Introduction

Dear Respondent,

I am Angelica Mueni, PhD. Student from the Technical University of Kenya, in the Department of Human Nutrition and Dietetics. I am carrying out research on "Micronutrient status and dietary intakes of schoolchildren 6-13 years of age and potential strategies to improve dietary diversity in the Home-Grown School Feeding Programme in Makueni County."

I will interview schoolchildren, an official from the ministry of education, parents, school head teachers, and school meal management committees. I would appreciate it if you provide me with the information required. The information given will be treated with confidentiality and will only be used for the purpose of this study.

Thank You.

Yours Sincerely,

……..

Angelica Mueni

Appendix II: Consent Note

Please read the consent form below and indicate your willingness for your child (school) to participate in the research and respond to the questionnaire.

Title of Research Study: Micronutrient status and dietary intakes of schoolchildren 6-13 years of age and potential strategies to improve dietary diversity in the Home-Grown School Feeding Programme in Makueni County.

BY

Institutions and Investigators

Investigators	Institutions
Ms. Angelica M. Kimwele	The Technical University of Kenya
Prof. Sophie Ochola	Kenyatta University
Dr.Mary Mugambi	The Technical University of Kenya

Consent From

I am asking you to allow your child (school) to participate in a research study. Before agreeing to participate in the research, it is important that you read the information below. This statement describes the purpose, procedures, benefits, risks, discomforts, and precautions of the study. You also have the right to withdraw from the study at any time. You should feel free to ask any questions that you may have.

A. Purpose of the Research Study: The purpose of this study will be to determine the dietary intakes of schoolchildren 6-13 years of age and explore potential strategies to improve dietary diversity in the Home-Grown School Feeding Programme in Makueni County.

The study is being conducted as my requirement for the award of Doctor of Philosophy in Nutrition and Dietetics and possibly for publication in academic journals and presentations at academic conferences.

B. Procedures Description: You will grant yourself /your child the right to participate in this study by signing the section at the end of this form.

C. Duration: The study will be carried out during school term dates, but in answering questions, there is no limit on how long it will take to respond to the question. If you decide to stop or stop your child from participating, there will be no penalty for your decision, and it will not affect your future relationship with the school and teaching staff.

D. Risks or Discomforts of this Study: Your risk of participation in the study is unlikely and low. Questions on demographic and socioeconomic status (wealth status, marital status, religion, education level, and occupation) may make one upset. Questions on dietary intake may affect a child's relationships with other children.

Protection Against the Risks

You/your child is free to refuse to respond to any question, which can result in any of the mentioned risks. However, confidentiality and data protection will be assured on all information provided and unique identifiers used on the response records.

E. Confidentiality: To secure the confidentiality of your responses, your child's (school) name and other identifying information will never be attached to the answers. All codes and data will be kept in a locked drawer in a locked room or in a password-protected computer that is kept secure. Data access will be limited to the Principal Investigator and researchers working directly on this study. All data will be destroyed responsibly after the required retention period (usually three years). Privacy will be maintained in all published and written data resulting from this study. Name or other identifying information will not be used in our reports or published papers.

F. Benefits of this study: You/ your child (school) will receive no direct benefit from participating in this study; however, participation may generate useful information for the Ministry of Education, Ministry of Health, Non-governmental Organisations, World Food Programme, school management committees, and parents in improving school feeding programme and therefore the health of school-aged children.

G. Use of Research Recordings for Educational Purposes or Presentation Purposes: In addition to analysing your recording for this research study, we would like to ask your permission to use excerpts from your recording. You can choose whether you want to allow your recording to be shared. If you choose to allow us to share your recording, we will not use your name or other identifying information in any report, publication, or presentation. Please tell us your decision(s) by placing a check beside your choice(s).

- o I agree that my recording can be shown in public presentations to scientific/nonscientific groups.
- o I agree that my recording can be shown to participants in other research studies.
- o I agree that my recording can be used for scientific publications.
- o I agree that my recording can be shown in classrooms to students for education and training

H. Compensation/Incentive: There will be no payments for participating in this study.

I. Payment for research-related injuries: There are no expected injuries because of participating in the study or for questions related to the study. In case of further clarification, you may contact the people below (contact information)

J. Contact Information: If you have any questions, concerns, or complaints, contact the following people: Prof. Sophie Ochola (phone number 072144980) or Dr. Mary Mugambi (phone number 0702169767)

To clarify issues concerning this research, write to the undersigned,

Appendix III: Parent's Oral and Written Consent

Option 1: Oral Consent:

Do you have any questions about the above information? (Researcher reads the consent form)

(YES/NO)

Do you wish your child to participate in this study?

(YES/NO)

Option 2: Written consent

I have read and understood the above information (in the consent form). I agree to allow my child to participate in the research study.

Parents Name: _____ Date: _____

Parent's signature: _____

Appendix IV: Child Assent Form

I (write name) or (say their name) ----------of ----------years.

Have been informed that my parent(s)/caregiver have given permission for me to participate in this study if I want to. This study is on dietary intakes of schoolchildren 6-13 years of age and potential strategies to improve dietary diversity in the Home-Grown School Feeding Programme in Makueni County. My participation in this project is voluntary, and I have been told that I may stop my participation in this study at any time. If I choose not to participate, it will not affect me in any way.

Name ---------- Date----------

Appendix V: Head Teacher Written Consent

I have read and understood the above information (consent form). I agree (school) to participate in this research study.

Head teacher's Name: _____ Date: _____

Head teacher's signature: _____

Appendix VI: Government representative on School Feeding Consent

I have read and understood the above information (consent form). I agree to participate in the research study.

Name: _____ Date: _____

Signature: _____

Appendix VII: School Meal Management Members Consent

I have read and understood the above information as contained in the consent form. I agree to participate in the research study.

Name: _____ Date: _____

Signature: _____

Appendix VIII: Structured Questionnaire

Questionnaire no----- Name of respondent---------- Name of interviewer---------- Date----------

Section A: Socio-economic and demographic information

1.0 Sex of the child 1=male 2=female	**1.1 Birth date in years**	**1.2Mothers education level** 1. None 2. Completed Primary 3. Primary dropout 4. Completed Secondary 5. Secondary dropout 6. Certificate 7. Diploma 8. Technical 9. University 10. Other (specify_____	**1.3 Fathers education level** 1. None 2. Completed Primary 3. Primary dropout 4. Completed Secondary 5. Secondary dropout 6. Certificate 7. Diploma 8. Technical 9. University 10. Other (specify_____	**1.4 Parents marital status** 1. Married 2. Single 3. Divorced; 4. Separated 5. Widower 6. Other 7. (Specify) _____	**1.5 Main occupation of the mother/caregiver** 1. Waged labour(salaried) 2. Waged labour (casual) 3. Pretty trade 4. Housewife 5. Student 6. Farmer 7. Other ---------- (specify)	**1.6 Main occupation of the father/caregiver** 1. Waged labour(salaried) 2. Waged labour (casual) 3. Pretty trade 4. Unemployed 5. Student 6. Farmer 7. Other ---------- (specify)
		Enter the code				

1.7

Socio-economic status of the households	Indicate YES or NO if your household owns the following		**ENTER CODE**
	YES	NO	
Material of the house	1 = concrete or wood	0 = mud or thatch	
Roof material	1 = tiles or galvanised iron or concrete	0 = grass	
Crowding	1 = 5 or fewer people per room	0 = 6 or more people per room	
Type of lighting	1 = electricity or gas	0 = candle or wood	
Source of water	1 = piped into dwelling or borehole with a pump or protected dug well / Water tank	0 = pond or unprotected well or vendor-supplied (donkey carts)	
Toilet facilities	1 = flush or ventilated improved latrine	0 = open pit or none (Bush field)	
Has a sewing machine	1 = yes	0 = no	
Has a radio	1 = yes	0 = no	
Has a TV	1 = yes	0 = no	
Has a stove	1 = yes	0 = no	
Has a fridge	1 = yes	0 = no	
Has a mobile phone	1 = yes	0 = no	
Has a bicycle	1 = yes	0 = no	
Has a motorbike	1 = yes	0 = no	
Has a car	1 = yes	0 = no	

Section B: Vitamin A, Iron Intakes, and Dietary Diversity

Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home. Start with the first food or drink of the morning.

Write down all foods and drinks mentioned. When composite dishes are mentioned, ask for the list of ingredients.

When the respondent has finished, probe for meals and snacks not mentioned.

Breakfast	**Snack**	**Lunch**	**Snack**	**Dinner**	**Snack**

When the respondent recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

Question number 1.8	Food Group	Examples	YES=1 NO=0
1.8.1	Starch staples	Cereals corn/maize, rice, wheat, sorghum, millet, or any other grains or foods made from these (e.g., bread, noodles, porridge, or other grain products) + *insert local foods, e.g., ugali, nshima, porridge or pastes*	
		White roots and tubers white potatoes, white yam, white cassava, or other foods made from	
1.8.2	vitamin A-rich fruits and vegetables	VITAMIN A-RICH VEGETABLES pumpkin, carrot, squash, or sweet potato that are orange inside + *other locally available vitamin A rich vegetables (e.g. red sweet pepper)* ripe VITAMIN A RICH FRUITS ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried	
1.8.3	DARK GREEN LEAFY VEGETABLES	dark green/leafy vegetables, including wild forms + *locally available vitamin A-rich leaves such as amaranth, cassava leaves, kale, spinach*	
1.8.4	OTHER FRUITS AND VEGETABLES	other vegetables (e.g., wild fruits, lemon, oranges, onion, eggplant) + *other locally available vegetables* other fruits, including wild fruits and 100% fruit juice made from these	
1.8.5	ORGAN MEAT	liver, kidney, heart, or other organ meats or blood-based foods	
1.8.6	MEAT AND FISH	beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds,	

		insects fresh or dried fish or shellfish	
1.8.7	EGGS	eggs from chicken, duck, guinea fowl, or any other egg	
1.8.8	LEGUMES, NUTS, AND SEEDS	dried beans, dried peas, lentils, nuts, seeds, or foods made from these (e.g., hummus, peanut butter)	
1.8.9	MILK AND MILK PRODUCTS	milk, cheese, yogurt, or other milk products	
1.8.10	Did you eat anything (meal or snack) OUTSIDE the home yesterday?		

1.8.11 Was food intake unusual? □1. Yes □2. No If yes, how was it unusual	**1.8.12Probe for tablets:** □1. Yes □2. No □Iron □Vitamins □Other Supplements □Anti-malaria
Was it a feast day? □Yes □No Was it a market day? □Yes □No Was it a fasting day? □Yes □No	**Code*** Method of preparation: 1=eaten raw, 2=boiled, 3= steamed, 4= roasted, 5= deep fried, 6 =shallow fried 7=baked, 8= others specify

Section C: Children's Nutritional Status (BMI–for–age/ Height-for-age)

1.9. Anthropometric measurements				
Name of the child	**Date of interview**	**Year of birth** ----------	**Sex** ----------	
	1st reading	2nd reading	Average	Remarks
Height				
Weight				

Appendix IX: Key Informant Interview Guides

Section A: Government representative in charge of school feeding

1. What are the goals of the home-grown school feeding programme (HFSFP) as mentioned in the education sector plan?
2. Who are the target beneficiaries, or which schools does the government target? Why?
3. For how long will HGSFP continue in the identified schools?
4. What are some of the specifications or requirements for the implementation of the programme?
    a) By the ministry
    b) By the school
5. Who is responsible for the implementation of HGSFP at the various levels?
    a) National level
    b) County-level
    c) Sub county level
    d) School level
6. Who are the other stakeholders or partners in the implementation of HGSFP?
7. What are their (qns.6 above) roles in the implementation of HGSFP?
8. What is your role in the HGSFP implementation?
9. Who decides what food rations are included in the HGSFP?
10. As a government, are there generally recommended food rations for all benefiting schools?
11. At the different levels of implementing HGSFP, is the staff trained and knowledgeable on school feeding issues, e.g., Meal management, provision of varied diets, proper food preparations and storage, purchase, and general child nutrition requirements?
12. What are the funding arrangements for sustainable school feeding?
13. Is the government the sole funding agency of HGSFP, or are there any donors financing the programme through one of these mechanisms (for example, the World Bank)?
14. If so, how much of the programme is covered under these funding arrangements?
15. Has the government progressively increased the number of resources allocated to school feeding, or has it been static in its contributions?
16. Have there been conversations with partners and the government on a possible increase in financial responsibility to agriculture sectors?
17. Apart from HGSFP, are there other nutrition and health improvement programmes currently in the schools?
18. What are some of the challenges the government is facing in implementing HGSFP?

19. Are there remedies for the above challenges
20. What is the future of nutrition for Kenyan schools?
21. Any other information that you would want to tell me in relation to HGSFP

Section B: School head teachers

1. School socio-demographic characteristics

1.1 **Name of the school**	**1.2** **No. of students present in school today (the date of interview)** 1=Male--- 2=Female-	**1.3** **No. of new students enrolled in the school** 1=Male-- 2=Female	**1.4** **Do you provide food here in school** **1**=Yes 2=No	**1.5** **If yes, which meal(s) do you provide** 1=Breakfast only 2=Lunch only 3=Breakfast and lunch 4=Others (specify) _____	**1.6** **Please list the food items included in the meals and specify the amounts used.**

2. Who is responsible for the implementation of HGSFP at the school level?
3. What is your role in the HGSFP implementation?
4. Are the above people (1) trained on HGSFP implementation procedures?
5. What foods are currently produced locally and can be used by the programme?
6. Are there some food items not available locally that the school may wish to include in the school feeding? If so, why are they not available?
7. What are the recommended sources of food rations for use in the HGSFP (Strictly from local farmers and local stores or can be imported from other counties)?
8. Are there local small-scale farmers that might be able to supply food for the programme currently?
9. Currently, where do you get your supplies from? Why
10. What are some food commodities being used for the programme in your school?
11. Could the food commodities be modified to include various local foods, or are there specific recommended food items that should be used in the programme?
12. What is the approximate demand of the school feeding programme for local foodstuffs in your school per term? Is it adequate?
13. Are meals provided for the pupils daily, and which specific meal (lunch, breakfast)?
14. Has the government formulated policy objectives and monitoring systems in the implementation of the HGSFP?

15. HGSFP is funded through cost-sharing between the government and parents.
16. Specify their role (government, parents).
17. Is there a policy guideline to ensure the sustainability of the programme?
18. Does the programme enjoy support from international organisations?
19. What are some of the challenges you have faced as a head teacher since the implementation of HGSFP?
20. Are there remedies for the above challenges?
21. What are some of your opinions on diversifying meals in the school
22. Any other information that you would want to tell me on HGSFP

Appendix X: Focus Group Discussion Guide

Section A: School Meal Management Committee

1. What are the roles and responsibilities of the school meal management committee in relation to HGSFP?
2. Is the committee staff trained on, e.g., Meal management, provision of varied diets, proper food preparations and storage, purchase, and general child nutrition requirements)?
3. What foods do you purchase for use in the HGSFP?
4. Is food produced locally regularly, or are there cases of food deficit?
5. As for this school, where do you purchase the food commodities for the programme?
6. Are there cases when you can purchase food items locally or import from other sub-counties, for example?
7. What are some of the advantages, challenges, and constraints in procuring food locally?
8. Could these problems be solved by putting in place specific strategies to tackle them so that more food can be purchased locally?
9. Have there been discussions with the government on possible procurement modalities for school feeding that can be more locally appropriate, including the possibility of linking procurement with agriculture?
10. How can the agriculture sector be more involved in procurement for school feeding?
11. At the local level, are the requirements for the school feeding programme communicated to the agriculture sector so that more crops are grown for the programme?
12. During procurement of food commodities, is there consideration for variety, or are there specific food items for use within the programme?
13. Is government funding adequate for the purchase of various food commodities, and if not, are there appropriate adjustments that can be made to provide variety?
14. What are some of the challenges you are facing as a committee since the implementation of HGSFP?
15. Are there remedies for the above challenges?
16. What are some of your opinions on diversifying meals in the school
17. Any other information that you would want to tell me on HGSFP

Section B: Parents

1. What is your responsibility in the implementation of HGSFP
2. What are some of the benefits to you as a parent and to your child?
3. Were you consulted in the design of the HGSFP,
4. If yes, on what issues
5. If not, what issues would you want to be addressed or included in the programme?
6. If you were to recommend which food products should be provided in the programme? Reasons?
7. What are the similarities and differences between school meals and family meals?
8. What family meal adjustments have you put in place, considering the role of the meals provided at school?
9. Your contribution to the programme (pay cooks, firewood provision, etc.) Is it within household' means, or is it burdening you excessively?
10. What other contributions could you make that do not burden you?
11. What are some of the challenges you are facing as a parent in relation to HGSFP?
12. Are there remedies for the above challenges?
13. What are some of your opinions on diversifying meals in the school?
14. Is there any other information that you would want to tell me on HGSFP?

Appendix XI: TUK Clearance for Data Collection

Technical University of Kenya, Haile Selassie Avenue, P. O. Box 52428- 00200 NAIROBI
Tel +254 (020) 343672, 2249974, 2251300, 251300, 251822, 2250522

SCHOOL OF GRADUATE AND ADVANCED STUDIES

May 9, 2017 REF: PHD/SHNX/06550P/2016

TO WHOM IT MAY CONCERN

This is to inform you that the bearer, Mrs. Angelica Mueni Kimwele, is a registered PhD student in the Department of Human Nutrition and Dietetics, School of Health Sciences and Technology, Technical University of Kenya. She is currently proceeding for field work which will involve data collection using approved surveys and research methods.

Her research topic is: Micronutrient Status of school aged Children (6-13 years) and Potential Strategies to improve Dietary Diversity in the home grown school feeding program in Makueni County.

Any assistance accorded her will be highly appreciated.

SCHOOL OF GRADUATE & ADVANCED STUDIES
DIRECTOR
09 MAY 2017
THE TECHNICAL UNIVERSITY OF KENYA

Prof. J.O. Lalah

Director- School of Graduate and Advanced Studies.

Appendix XII: Ethical Approval

NACOSTI ACCREDITED

ERC/PhD/001/2019

Pwani UNIVERSITY

ETHICS REVIEW COMMITTEE

ACCREDITTED BY THE NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION (NACOSTI, KENYA)

CERTIFICATE OF ETHICAL APPROVAL

THIS IS TO CERTIFY THAT THE PROPOSAL SUBMITTED BY:

ANGELICA M. KIMWELE

REFERENCE NO:
ERC/PhD/001/2019

ENTITLED:
Micronutrient status and dietary intakes of School children aged 6 - 13 years and potential strategies to improve dietary diversity in the home grown School feeding program in Makueni County

TO BE UNDERTAKEN AT:
MAKUENI COUNTY, KENYA

FOR THE PERIOD
FROM: 22/01/2019 TO: 21/01/2020

HAS BEEN **APPROVED** BY THE ETHICS REVIEW COMMITTEE

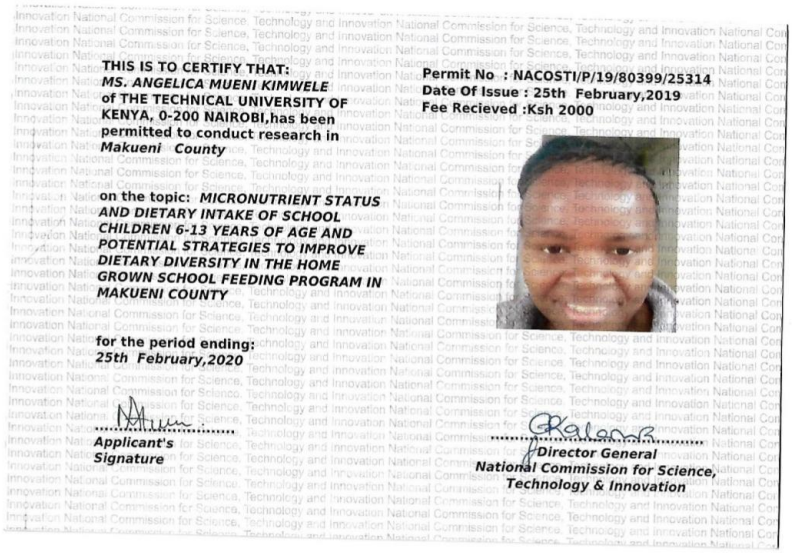
AT ITS SITTING HELD AT PWANI UNIVERSITY, KENYA

ON THE 18/01/2019

CHAIRMAN | SECRETARY | LAY MEMEBER

Pwani UNIVERSITY
Ethics Review Committee,
Pwani University, www.pu.ac.ke, email: ierwec@pu.ac.ke, tell: 0719 182218.
The ERC, Giving Integrity to Research for Sustainable Development

Appendix XIII: Research Permit by NACOSTI



THIS IS TO CERTIFY THAT:
MS. ANGELICA MUENI KIMWELE
of THE TECHNICAL UNIVERSITY OF KENYA, 0-200 NAIROBI,has been permitted to conduct research in *Makueni County*

on the topic: *MICRONUTRIENT STATUS AND DIETARY INTAKE OF SCHOOL CHILDREN 6-13 YEARS OF AGE AND POTENTIAL STRATEGIES TO IMPROVE DIETARY DIVERSITY IN THE HOME GROWN SCHOOL FEEDING PROGRAM IN MAKUENI COUNTY*

for the period ending:
25th February,2020

Permit No : NACOSTI/P/19/80399/25314
Date Of Issue : 25th February,2019
Fee Recieved :Ksh 2000

Applicant's Signature

Director General
National Commission for Science, Technology & Innovation

Appendix XIV: Approval NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/80399/25314**

Date: **25th February, 2019**

Angelica Mueni Kimwele
The Technical University of Kenya
P.O. Box 52428 - 00200
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Micronutrients status and dietary intake of school children 6-13 years of age and potential strategies to improve dietary diversity in the home grown school feeding program in Makueni County"*** I am pleased to inform you that you have been authorized to undertake research in **Makueni County** for the period ending **25th February, 2020.**

You are advised to report to **the County Commissioner, the County Director of Education and the County Director of Health Services, Makueni County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Makueni County.

The County Director of Education
Makueni County.

Appendix XV: Approvals County Commissioner

THE PRESIDENCY
MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telegram:
Telephone: 0743-987-177
Fax:
Email: ***cc.makueni@interior.go.ke***

COUNTY COMMISSIONER
MAKUENI COUNTY
P.O. Box 1-90300
MAKUENI

Ref: MKN/CC/ADM.6/1 VOL.III/221

10th June, 2019

Angelica Mueni Kimwele
The Technical University of Kenya
P.O. Box 52428 - 00200
NAIROBI

RE: RESEARCH AUTHORIZATION

Reference is made to Director General National Commission for Science Technology and Innovation letter **Ref. NACOSTI/P/19/80399/25314** dated **25th February 2019** on the above subject.

You are hereby authorized to undertake research on ***"Micronutrients status and dietary intake of school children 6 – 13 years of age and potential strategies to improve dietary diversity in the home grown school feeding program in Makueni County"*** for a period ending ***25th February*****, 2020.**

By a copy of this letter the Deputy County Commissioner Makindu Sub County is requested to give you the necessary assistance.

B.K. NICHOLAS
FOR: COUNTY COMMISSIONER
MAKUENI
c.c.
Deputy County Commissioner
MAKINDU SUB COUNTY

County Director of Education
MAKUENI COUNTY

Appendix XVI: Approval County Director of Education

REPUBLIC OF KENYA

MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION

Telephone: .....
Fax: .....
Email:cdemakueni@gmail.com
When replying please quote

Ref No. MKN/C/ED/5/33/VOL.2/182

COUNTY DIRECTOR OF EDUCATION
MAKUENI COUNTY
P.O. BOX 41 - 90300
MAKUENI

10th June ,2019

Angelica Mueni Kimwele
The Technical University of Kenya
P. O Box 52428-00200
NAIROBI

RE: RESEARCH AUTHORIZATION FOR ANGELICA MUENI KIMWELE

The office is in receipt of letter from the Director General, National Commission for Science, Technology and Innovation (NACOSTI) authorizing Angelica Mueni Kimwele of Technical University of Kenya to carry out research on **" Micronutrients status and dietary intake of school children 6-13 years of age and potential strategies to improve dietary diversity in the home grown school feeding program in Makueni County, Kenya,"** for the period ending 25th February, 2020.

Kindly accord her the necessary assistance.

Gladys Malonza
For County Director of Education
MAKUENI COUNTY.

COUNTY DIRECTOR OF EDUCATION
DATE: 10/6/19
P.O. BOX 41-90300
MAKUENI
MAKUENI COUNTY

Appendix XVII: Approvals County Director of Health

REPUBLIC OF KENYA

GOVERNMENT OF MAKUENI COUNTY

OFFICE OF COUNTY DIRECTOR HEALTH SERVICES
PO BOX 89-90300 MAKUENI
Email:countyhealthmkn@gmail.com contact@makueni.go.ke
Website: www.makueni.go.ke

REF: GMC/DOH/CDH/GEN.IV/ (136)

10th June, 2019

Angelina Mueni Kimweli
The Technical University of Kenya
P o Box 52428 - 00200
Nairobi

RE: AUTHORIZATION TO CARRY OUT RESEARCH

Reference is made to the letter referenced: NACOSTI/P/19/80399/25314 dated 25th February, 2019 regarding the above matter.

You are hereby authorized to undertake research on "***Micronutrients status and dietary intake of school children 6 – 13 years of age and potential strategies to improve dietary diversity in the grown school feeding program in Makueni County***"

By a copy of this letter, the SCMOH – Kibwezi West Sub County is requested to accord you the necessary assistance for the success of your research work.

Yours faithfully,

COUNTY DIRECTOR OF HEALTH
MAKUENI COUNTY
10 JUN 2019
P. O. Box 89 - 90300, MAKUENI.
Email: countyhealthmkn@gmail.com

Dr. Kiio S. Ndolo
Director Medical Services
Makueni

- ECM –Health Services
- CO –Health Services
- Director(s) Health,
- SCMOH – Kibwezi West

Appendix XVIII: Approval Sub- County Director Of Education

REPUBLIC OF KENYA
MINISTRY OF EDUCATION

makindudeo@yahoo.com
Telephone:
Fax :

SUB COUNTY DIRECTOR OF EDUCATION
MAKINDU SUB COUNTY
P.O BOX 178-90138
MAKINDU

When replying please quote:

Date:22nd July, 2019

Ref No.MKD/ED/TUK/VOL.1/1

Angelica Mueni Kimwele
The Technical University of Kenya
P.O. Box 52428-00200

To The Heads of Primary School
- Kalii Primary
- Makindu A primary
- Ngwiwa Primary
- Nthia Primary
- Makindu GNCA Primary
- Yekisemei Primary

MAKINDU

RE: RESEARCH AUTHORIZATION FOR ANGELICA MUENI

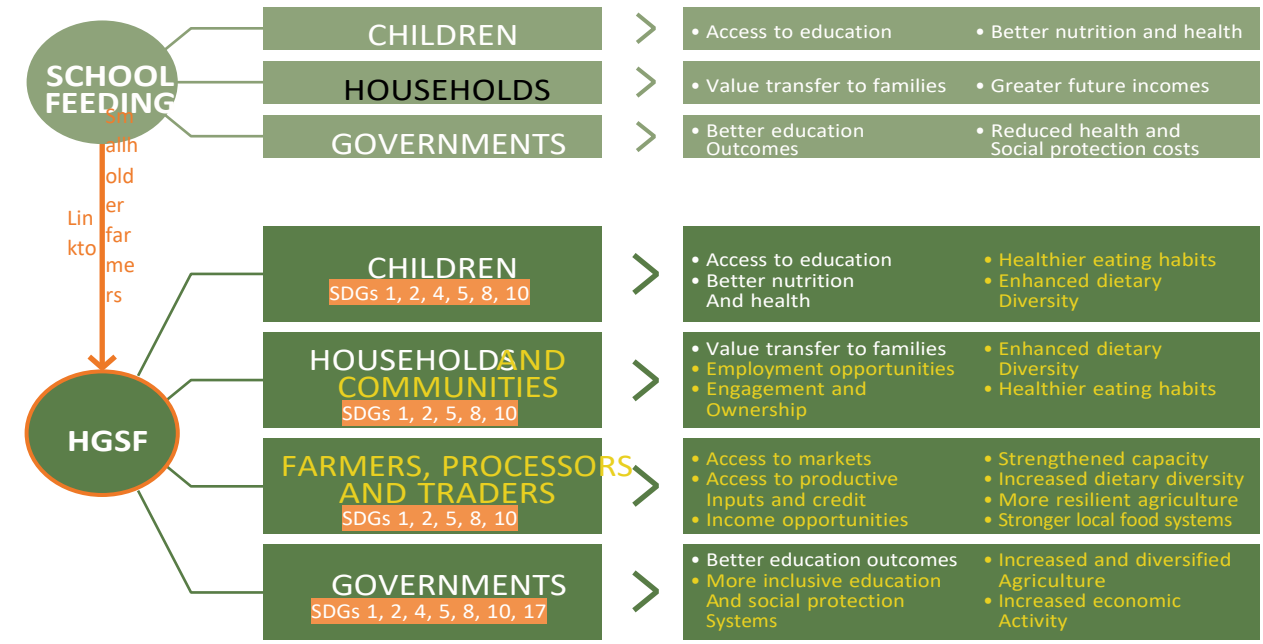
The bearer of this letter has been authorized to carry out research in our selected schools on **"Micronutrients status and dietary intake of schol children 6-13 years of age and potential strategies to improve dietary diversity in the home grown school feeding program in Makueni County, Kenya".** The research will take place from 22nd July,2019 till the period ending 25th February,2020.

Please accord the researcher the maximum cooperation while in your school.

SUB-COUNTY
DIRECTOR OF EDUCATION
MAKINDU
P.O. Box 178-90138, MAKINDU.

Richard Waithaka Wamburu
For: Sub County Director of Education
MAKINDU

Appendix XIX: Beneficiaries and Benefits of HGSFP



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Appendix XX: Food Served Through the HGSFP

Appendix XXI: Study Location-Makueni County

Appendix XXII: Research Budget

ITEM	QUANTITY	UNIT COST (Kshs)	TOTAL COST (Kshs)
Proposal writing			
Printing (pages)	120	10	1200
Photocopying (10 sets *50 pages)	500	3	1500
Binding sets of proposal	10	100	1000
Subtotal			**3,700**
Communication/ Internet services			
Phone calls			5,000
Internet services			5,000
Research Permit			10,000
Sub-total			**20,000**
Pre-testing of research instruments			
Questionnaire printing (pages)	15	100	1500
Photocopying -questionnaire (15*10pages)			**1500**
Sub-total			
Research instruments			
Questionnaire printing (15 pages)	300	50	150 000
Hiring weighing scales and height boards	6-weighing scales 6- height boards	@200 for 50 days @200 for 50 days	60,000 60,000
Sub-total			**270,000**
Data collection phase			
-Personnel allowances	3 months	50,000	150,000
Transport to research destination	----------	100,000	100,000
-3 Research assistants (3 months)	40,000	120,000	120,000
Sub-total			**350,000**
Transport			
Preliminary preparation	4	10,000	40,000
Pre-testing centre (trip)	2	2,500	5,000
Sub-total			**45,000**
Data entry and analysis			
Data entry			5,000
Data analysis			50,000
Statistician consultation			100,000
Sub-total			**155,000**
Report writing			
Typing and printing 1 set (pages)	300	10	3,000
Photocopying 10 sets * 300 (pages)	3000	3	9,000
Binding (sets)	10	500	5,000
Sub-total			**17,000**
Total			**742,200**
Contingency (total budget)	10%		**50,000**
GRAND TOTAL			**932,200**

Appendix XXIII: Work Plan for the Study

YEAR	2016	2017				2018			2019			2020			2021		2022-2024
Activity	Sep/Oct	Jan-Mar	Apr-June	July-Sep	Nov-Dec	Jan-April	May-Sep	Sep-Dec	Jan-April	May-Sep	Aug-Dec	Jan-Apr	May-Agu	Sep-Dec	Jan-April	May-June	July-Dec
Concept Preparations	■																
Proposal preparation	■																
Proposal defence		■	■														
Proposal corrections		■	■														
Development Data collection tool				■	■	■											
Pretesting and permit clearance							■	■									
Data Collection									■	■	■						
Data Analysis												■	■	■			
Thesis Writing														■	■	■	
Presentation Findings Notice of Submission Defence of the final report Submission of bound report Graduation																	■

Appendix XXIV: Journal and Conference Presentations

- Angelica,M., Ochola. S.& Mugambi. M. (2019). *School feeding programmes, national food policies, action of plan and strategies on school meals and food security among school children in Kenya. (review)* [Paper presentation]. Machakos University 2nd International Conference, April, 24th -25th. http://ir.mksu.ac.ke/bitstream/handle/123456780/4465/Angelica%20Kimwele.pdf?sequence=1&isAllowed=y

- Kimwele, A., Ochola, S. A., & Mugambi, M. (2021). Influence of homegrown school feeding programme on dietary diversity among school children 6-13 years of age in Makueni County, Kenya. *European Journal of Health Sciences*, *6*(1), 57-72. https://ajpojournals.org/journals/index.php/EJHS/article/view/678

- Kimwele, A., Ochola, S. A., & Mugambi, M. (2023). Challenges facing school head teachers' roles in the implementation of Home Grown School Feeding Programmes in Makueni County, Kenya. Journal of Education and Practice, 14(19),21-26. https://iiste.org/Journals/index.php/JEP/article/download/61213/63198

- Kimwele, A., Ochola, S. A., & Mugambi, M. (2024). Contributions of Homegrown School Feeding Programme to consumptions of vitamin A and iron rich foods among schoolchildren in Makueni (Manuscript awaiting submission)

Appendix XXV: Plagiarism Report

17% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

Filtered from the Report

- Bibliography
- Quoted Text
- Small Matches (less than 9 words)

Match Groups

- **319** Not Cited or Quoted 14%
  Matches with neither in-text citation nor quotation marks
- **85** Missing Quotations 3%
  Matches that are still very similar to source material
- **0** Missing Citation 0%
  Matches that have quotation marks, but no in-text citation
- **0** Cited and Quoted 0%
  Matches with in-text citation present, but no quotation marks

Top Sources

16% Internet sources
5% Publications
7% Submitted works (Student Papers)

Integrity Flags

1 Integrity Flag for Review

Hidden Text
0 suspect characters on 1 page
Text is altered to blend into the white background of the document.

Our system's algorithms look deeply at a document for any inconsistencies that would set it apart from a normal submission. If we notice something strange, we flag it for you to review.

A Flag is not necessarily an indicator of a problem. However, we'd recommend you focus your attention there for further review.