DETERMINANTS OF NUTRITION STATUS AMONG ADOLESCENTS IN SELECTED SECONDARY SCHOOLS IN RURAL KANUNGU DISTRICT UGANDA

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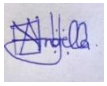
A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE IN EPIDEMIOLOGY AND DISEASE CONTROL OF MOUNT KENYA UNIVERSITY

APRIL 2025

DECLARATION AND APPROVAL

Student Declaration

I, Angella, hereby certify that my thesis is wholly original with no publication or offer of review from any other academic institution.

Signature  **Date: 17th, April, 2025**

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DEDICATION

I dedicate my work to all young stars, my parents and siblings, and DAAD for the financial support provided during the master's program.

ACKNOWLEDGMENT

I give thanks to the all-powerful God who has given me courage and discernment as I have conducted my investigation and written my thesis. I also thank the DAAD for providing me with the funding and awareness through the research-related courses that helped me to enhance my research. I am also grateful to the Kanungu district administration for making it simple for me to get in touch with and gather information from the adolescent students in the chosen schools. I acknowledge the Mount Kenya University supervisory body that offered me guidance especially through my school supervisors, and mentors Dr John Karuiki, Mr. Peterson Kariuki, Harrison Chege and Dr Joseph Juma Nyamai. Last but not least, I would like to thank myself for not giving up, and pressing on against the odds of health care to finish the work that I had set out to do.

ABSTRACT

Adolescence is a vital period for shaping overall future health and breaking the intergenerational cycle of malnutrition. Yet over 180 million school-going adolescents globally face malnutrition thus risking their overall development and survival. Limited adolescent-specific data hinders effective interventions, as most surveys focus on under-5 children or pregnant teens. The high nutrient needs in this period should catered for to prevent future consequences. Therefore this study examined factors influencing adolescents' nutrition in rural secondary schools in Kanungu District, an under-researched mountainous region. The specific objectives were to assess the nutritional status of adolescents, identify the associated factors mainly awareness levels, diet-related factors (meal frequency and dietary diversity), and social, demographic, and economic influences. The study was conducted in selected secondary schools and due to the unknown adolescent population, Cochran's formula was applied to calculate sample size (340). Multi-stage sampling approach and simple random sampling were used to select adolescents aged 13 to 19 years. A school-based cross-sectional analytical design alongside mixed-methods approach was employed to collect data. Informed consent from participants above 18 years and parental consent was sought for minors (below 18 years) were obtained before data collection. A KoBo interviewer-administered questionnaire was used on social demographic, diet-related and knowledge levels. Anthropometric measurements (Body Mass Index (BMI) and Mid-Upper Arm Circumference (MUAC)) determined the nutrition status. Data was exported from KoBo- software exported to Excel for cleaning and later analyzed using SPSS version 26. Qualitative data from key informants was analysed using narrative analysis whose findings complemented the quantitative verdicts. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) and a p-value ≤ 0.05 were used to determine statistical significance and associations. More than one-third (37.1%) of the respondents were malnourished, with overweight being the most prevalent form. Factors that significantly increased the odds of having a normal nutritional status included living in a father-headed household (AOR=1.8, 95% CI=1.03-3.20), meeting the recommended meal frequency (AOR=2, 95% CI=1.13-3.44), being aware about healthy dietary habits (AOR=2.2, 95% CI=0.29-0.71), having a small household size of 1-4 members (AOR=4.3, 95% CI=2.38-7.83), and having an employed guardian (AOR=2.1, 95% CI=1.17-3.93). Conversely, having only a primary level of education (AOR=3.6, 95% CI=0.11-0.68) and an inadequate dietary diversity score (AOR=2.1, 95% CI=0.28-0.76) reduced the odds of achieving normal nutritional status. Key determinants of adolescent nutrition status in the selected secondary schools included household headship, meal frequency, household size, and guardian employment status. To improve adolescent nutrition, stakeholders should integrate comprehensive nutrition education programs into school curricula that actively involve both adolescents and their guardians at appropriate stages. Policies, relevant stakeholders should promote dietary diversity and adequate meal frequency to support better nutrition outcomes among adolescents in this region.

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LIST OF ABBREVIATIONS AND ACRONYMS

BMI	Body Mass Index
CAO	Chief Administrative Officer
CDC	Center for Disease Control
DDS	Dietary Diversity Score
FAO	Food and Agricultural Organization of the United Nations
GOU	Government of Uganda
KAP	Awareness Attitude and Practices
LMIC	Low- and Middle-Income Countries
MUAC	Mid-Upper Arm Circumference
SAC	School-Age Children (SAC)
SD	Standard Deviation
SDGs	Sustainable Development Goals
SDI	Socio-Demographic Index
SPSS	Statistical Package for Social Sciences
UNCST	Uganda National Council of Science and Technology
UNFAO	United Nations Food and Agriculture Organization
USAID	United States Agency for International Development
VAD	Vitamin A Deficiency
WFP	World Food Programme
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Adolescents are currently the largest population group in Uganda and the world, totaling approximately 1.8 billion (Anand & Sharma, 2023)(Christian & Smith, 2018a). Despite being the largest demographic group, they have continued to face a growing threat from the double burden of malnutrition. A significant 90% of these young people reside in low- and middle-income countries (LMICs), where nutrition and health policies remain inadequate, and yet dietary intakes are suboptimal (Christian & Smith, 2018a). Findings from the Lancet Commission on Adolescent health highlight a lack of data to inform policies and interventions tailored to adolescent needs (Shinde *et al.*, 2022). Despite being critical to future health and economic outcomes, adolescents have historically been neglected in most nutrition interventions (Development Initiatives, 2018).

Adolescence is a crucial transition period between childhood and adulthood. It provides a unique window of opportunity to break the intergenerational cycle of malnutrition while also having a significant impact on an individual's present and future health and well-being, as well as that of future (Norris *et al.*, 2021). During this stage, adolescents experience an increase in nutrient requirements to support the rapid growth they are undergoing. This makes them more vulnerable to malnutrition like the children under 5 and pregnant women. Due to their extensive physiological development, adolescents require a sufficient and varied diet to support their rapid growth and normal pubertal growth (Mulu Birru et al., 2021). If these nutritional needs are not met, malnutrition sets in and can compromise their overall health and well being by increasing mortality and

mobility (Christian & Smith, 2018a). Adolescents who receive optimal nutrition are in a better position to develop physically, mentally, and socially. Contrariwise, malnutrition types such as deficiencies prevents one from reaching its full potential for growth (Wangaskar et al., 2021). More precisely, poor nutrition during adolescence causes slower linear growth, delayed sexual maturation, and delayed pubertal development.

Global and national efforts to eliminate malnutrition across all age groups under Sustainable Development Goal (SDG) 2 by the United nations and country governments have been put in place(Programme, 2020). Some progress has been noted for the children under 5 and pregnant/lactating mothers however slow progress as regards to adolescents (Cesare *et al.*, 2022). According to the World Health Organization (WHO, 2017). The number of malnourished adolescents continues to rise. Malnutrition has been ranked among the top ten causes of illness and mortality among adolescents in a WHO synthesis report. An estimated 1.2 million adolescents in LMICs die annually from preventable causes, with inadequate nutrition being a key contributing factor (WHO, 2018); (WHO, 2017). Overnutrition has also increased(Gebregyorgis *et al*., 2016), with the prevalence of overweight among adolescent boys rising from 8.1% to 12.9% and among adolescent girls from 8.4% to 13.4% since 1980 (Keeley et al., 2014). In Africa, many adolescents are reported to experience moderate to severe food insecurity, resulting in suboptimal dietary intake and poor nutrition status. In addition to diet-related factors, social and economic conditions significantly influence adolescent nutrition (Vanderlee et al., 2019). Poor nutrition status has severe consequences, including increased risk of early mortality, physical health problems, impaired neurocognitive function, and reduced productivity (Shahwar *et al.,* 2022). Globally, 180 million school-age children are affected by the malnutrition crisis, placing their learning, development, and growth at risk while

increasing the likelihood of illness and death (Morris, 2023). Adolescents in schools experience high rates of malnutrition especially in sub-Saharan African countries such as Uganda, Kenya, Tanzania (Lillie *et al*., 2019). Among school-going adolescents in Tanzania, 11.7% were underweight, 25% were stunted, 11% were classified as thin, and 5% were overweight or obese in a certain study by John (John *et al.*, 2022). The Uganda Nutrition Action Plan I (UNAP) which is implemented in Uganda to address malnutrition indicated a rising trend in adolescent malnutrition specially the adolescent (Ministry of Health, 2021). Presently, nutrition has become an important risk of morbidity and mortality among adolescents and adults (Bhandari, 2014). In Uganda, 13% of adolescent girls were undernourished and not to say male unstudied (Hamid Namaganda *et al.*, 2023). This has created an urgent need to prioritize adolescent nutrition for both present and future health and economic outcomes (Li et al., 2023). Globalization and changing dietary patterns have further exacerbated malnutrition among adolescents (WHO, 2017; Seferidi et al., 2022).

Since most adolescents are school-going children, secondary schools (which are the most common adolescent habitats) in Uganda present an important setting for addressing their nutritional challenges (Ministry of Education and Sports, 2020). The school environment plays a critical role in not only determining adolescent nutrition status but also improving it (Morris, 2023). Several initiatives, such as school meal programs, have been implemented to improve adolescent nutrition. Currently, 418 million children inclusive of adolescents worldwide benefit from school meal programs. Though the aims of these programs as per the School Meals Coalition aims to ensure all school-age children have access to healthy meals by 2030 are not yet close (Morris, 2023). This calls for a need to dig deeper into the determinants of adolescent nutrition status. As this will enable relevant

targeted program modifications that promote better nutritional outcomes (Pradhananga *et al*., 2022). The need for adolescent-specific studies is necessary for improving nutrition outcomes and addressing nutritional deficiencies (Shahwar *et al.,* 2022) (NCD-RisC, 2021). Therefore this research set out to provide insights into the factors influencing adolescents' nutritional status in selected secondary schools in Kanungu District, Uganda for relevant interventions and policies in the secondary schools of Kanungu district or similar settings.

1.2 Statement of the Problem

Adolescents worldwide, particularly in sub-Saharan Africa, face significant nutritional challenges. One out three adolescents is malnourished obese (Gebregyorgis *et al*., 2016). In the year 2022, roughly 390 million grownups aged 18 were underweight with over 2.5 billion overweight. This situation aligns with broader regional trends, where malnutrition rates among adolescents have become alarmingly high. Presently, nutrition has become an important risk of morbidity and mortality among adolescents and adults (Bhandari, 2014). It has emerged as one of the top causes mortality linked to 225,906 deaths. In Uganda, 13% of adolescent girls are undernourished, with limited data on boys(Hamid Namaganda *et al.,* 2023). The WHO ranks adolescents among the 3 malnutrition high risk groups (under 5 and pregnant woment) due to their high physiological growth. Unlike the children under 5 and pregnant women who are given more concern by research studies, adolescents remain with a pressing need for comprehensive research and nutritional assessments. The high rates of malnutrition among adolescents underscore the necessity for targeted interventions within school settings. Schools among other platforms offer a strategic stage to implement nutrition programs. This can be used as a basis to interact with adolescents effectively, address and mitigate the factors contributing to malnutrition.This benefits not only them as

individuals but back to their households. However, comprehensive data on nutrition determinants is not yet sufficient in Uganda due to unsuccessful and uninformed school feeding policies or adolescent targeted interventions. Therefore this study gathered information on the nutrition status of adolescents and the factors influencing the adolescents' nutritional status in secondary schools located in rural Uganda's Kanungu district.

1.4 Purpose of the study

This research gathered information on the determinants of nutrition status among selected secondary school adolescents in the Kanungu district Uganda. Data collected was used for academic purposes and published so as to inform innovative secondary school adolescent tailored programs that are relevant in the supporting of normal nutrition status among adolescents.

1.5 Objectives of the study

To find out the determinants of nutrition status among adolescents in selected secondary schools in rural Kanungu District Uganda.

1.5.1 Specific Objectives

1. To assess the nutrition status of adolescents in the selected secondary schools of rural Kanungu district Uganda.
2. To determine the social-demographic and economic factors influencing the nutrition status of adolescents in the selected secondary schools of rural Kanungu district in Uganda.

3. To find out the diet-related factors (diet diversity and meal frequency) influencing the nutrition status of adolescents in the selected secondary schools of rural Kanungu District in Uganda.
4. To find out level of the awareness the adolescents have in regards to a healthy plate and how it influences the nutrition status of secondary school adolescents of rural Kanungu District in Uganda.

1.5.2 Research Questions

1. What is the nutrition status of adolescents in the selected secondary schools of rural Kanungu district in Uganda?
2. What are the social-demographic and economic factors influencing the nutrition status of adolescents in the selected secondary schools of rural Kanungu district in Uganda?
3. How are diet-related factors (diet diversity and meal frequency) influencing the nutrition status of adolescents in the selected secondary schools of the rural Kanungu district in Uganda?
4. What is the level of the awareness the adolescents have in regards to a healthy plate and how it influences the nutrition status of secondary school adolescents of rural Kanungu district in Uganda?

1.6 Justification of the study

While children under five are the most vulnerable to malnutrition, adolescents represent a critical yet often overlooked group in nutrition research and interventions. Adolescence is a key period for growth and development, and nutritional deficiencies therefore, during this

stage they can have long-term consequences, including stunted growth, poor cognitive development, and increased risk of chronic diseases later in life. Addressing adolescent malnutrition is also very essential to breaking the cycle of intergenerational malnutrition.

Of the world's undernourished adolescents, 90% live in Low- and Middle-Income Countries (LMICs), where food insecurity is widespread, and interventions are often implemented with insufficient data (Acham *et al.,* 2019). Uganda, as an LMIC, faces similar challenges. Malnutrition among children and adolescents contributes directly or indirectly to up to 60% of deaths in these age groups (Berg et al., 2018). According to the Uganda Demographic and Health Survey, malnutrition remains a major concern, with 16% of children under five being underweight, 6% wasted, and 38% stunted (Isabirye et al., 2020). However, adolescent-specific nutrition data is scarce, limiting the ability to design effective interventions. This study aligns with Uganda's national strategies and policies, particularly the Uganda Nutrition Action Plan (UNAP) 2019-2025, which emphasizes school feeding programs as a means to improve children's nutrition. While these initiatives provide at least one nutritious meal per day, their effectiveness is hampered by a lack of adolescent-specific data. Understanding the determinants of adolescent nutrition is crucial for refining school feeding programs and broader adolescent nutrition interventions.

Additionally, this study supports the National Development Plan III (NDP III) and Comprehensive Africa Agriculture Development Programme (CAADP) by contributing to food and nutrition security, human capital development, and sustainable economic growth. Uganda's commitment to reducing malnutrition and ensuring a healthy, productive population aligns with global efforts. However progress has been slow due to evolving food systems, climate change, and economic disruptions. By generating evidence on adolescent nutrition, this study will aid policymakers, educators, and health practitioners in designing

targeted interventions that improve adolescent health and contribute to national and global nutrition goals.

In conclusion, focusing on adolescents rather than children under five fills a critical data gap and supports Uganda's national strategies for sustainable nutrition improvement for all. This study will provide the evidence base needed to design effective, adolescent-specific nutrition interventions, ensuring long-term health and socio-economic benefits especial for the secondary school adolescents in similar settings.

1.7 Significance of the study

This study provides critical insights into the relationship between the nutritional status of secondary school adolescents and various social, demographic, economic, and diet-related factors, as well as their Awareness of healthy food habits. Thus addressing the gap in adolescent-specific nutrition research. The valuable evidence obtained by the study was published and can be used to inform Uganda's school feeding programs and public health policies in relation to adolescents.

Despite the existence of broader nutrition research, studies focusing on school-going adolescents remain limited. This research contributes new awareness on the unique factors influencing adolescent nutrition, helping shape targeted interventions for this demographic in schools. The findings add to the global body of awareness on adolescent health, supporting policies aimed at improving nutrition in school settings.

Furthermore, the study aligns with international health goals, particularly Sustainable Development Goal (SDG) 2, which aims to end hunger and improve nutrition. By guiding effective interventions, the study promotes better health, well-being, and quality education among adolescents. It also supports Uganda's commitments through the Ministry of

Education and Ministry of Health to enhance adolescent nutrition via school meal programs.

The findings will be shared for scholarly purposes and disseminated to relevant stakeholders in Kanungu District and similar contexts, ensuring practical applications in improving adolescent nutrition in secondary schools. Ultimately, the study contributes to evidence-based policymaking, fostering long-term improvements in adolescent health and national nutrition strategies.

1.8 Scope of the study.

This study focused on the factors influencing the nutritional status of adolescents in selected secondary schools in Kanungu District, South West Uganda. It examined key aspects, including nutrition status, dietary-related factors, nutrition awareness, and socio-economic and demographic influences and how they were associated with nutrition status.

The study targeted **357** adolescents from selected secondary schools in Kanungu district (geographical scope). Data collection was conducted over one month, while the overall research process spanned one year (time scope). The study utilized published research articles to gather information on social demographics, economics, nutrition awareness, and diet diversity and meal frequency to construct suitable research questionnaires that were fitted into the KOBO collect toolbox. The research was guided by the Health Belief Model and UNICEF's Conceptual Framework to analyze the determinants of adolescent nutrition (narrative scope).

1.9 Study limitations

i. The schools were located in hard to reach areas, but this was overcome by using KoBo toolbox soft ware to collect data which more portable than questionnaire thus reducing on the travel load for easy transportation.

ii. The adolescents are prone to recall bias especially on section for detailing the foods consumed, this was overcome by using a 24-hour recall tool that made it easy for adolescents to remember a day before.

iii. The study used a crossectional design which is limited to collect data at a particular point in time but a mixed methods approach was used to further enrich the data.

iv. The schools selected might not be representative of the situation in adolescents in schools, therefore a stratified random sampling procedure was employed to select the adolescents from the different schools

1.9 Delimitations

i. The study was only delimited to secondary schools in rural Kanungu District, Uganda. This geographic delimitation excludes urban areas and other districts in Uganda, which may have different determinants of nutrition status.

ii. The study was delimited to adolescents attending selected secondary schools. It did not include adolescents who are out of school, in primary schools, or in tertiary institutions, who may have different nutritional challenges and determinants.

iii. The study targeted adolescents within the typical age range for secondary school students in Uganda, generally between 13 and 19 years old. This excluded younger children and older youth who may face different nutritional issues.

iv. The study examined selected determinants of nutrition status, such as socioeconomic status, social demographic level of nutrition awareness, and dietary diversity score. Other potential determinants were outside the scope of this study.

1.10 Assumptions of the study

- All research participants submitted complete and accurate details on their diet intakes, as well as social, demographic, and economic information.
- The study assumed that the selected sample of adolescents is representative of the broader adolescent population in Uganda. This includes diversity in terms of geography, socioeconomic status, and other demographic factors.
- The study made the assumption that the subjects would answer questions about their socioeconomic circumstances, level of nutrition awareness, and eating habits honestly and accurately.
- The study assumed that the data collection tools for qualitative and quantitative were accurate and reliable, and they would provide valid measures of nutritional status and its determinants
- The investigation made the assumption that it would follow ethical guidelines, guaranteeing the participants' welfare as adolescents, informed consent, and confidentiality.

1.10 Operational definition of key terms

Adolescent	Adolescence is a developmental stage period between 13 to 19 years that is characterisitic of significant physical, cognitive, emotional, and social changes.
Diet-related factors	These include diet diversity and frequency of the meals adolescents consumed.
Diet diversity score	A quantitative measure used to assess the variety of food groups consumed by the adolescent over a specific period.
Nutrition	The scientific study of the relationship between adolescents and the substances they eat to stay alive, grow, and be healthy.
Nutrition status	Nutrition status" describes the adolescent's general state of wellness and health with regard to their dietary intake and how well their bodies use nutrients.
Nutrition Awareness	Nutrition Awareness refers to a person's understanding of nutrition principles, dietary guidelines, and the impact of food choices on health. It includes factual information such as knowing the benefits of a balanced diet, the role of specific nutrients, and the consequences of poor nutrition.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section discusses an introduction of adolescents and current nutrition status trends among adolescents. It further explains the researched determinants of the nutrition status of adolescents such as social-demographic factors, diet-related practices, and nutrition awareness levels among adolescents. The consequences of malnutrition and gaps in adolescent nutrition status research were also illustrated in this section. This chapter also included the theoretical framework of the study used to identify determinants and conceptual framework under which the study was done.

Objective one aimed to assess the nutrition status of adolescent students

2.1 Relevance of Studying Adolescents' Nutritional Status

Adolescents are defined by the WHO as individuals aged 10 to 19 (WHO, 2022). They represent the largest and fastest-growing demographic globally, with 1.8 billion adolescents expected to contribute significantly to economic and health development (Christian & Smith, 2018b; Hamid Namaganda et al., 2023; Olatona et al., 2023). Given their rapid growth and high nutritional demands during to their rapid phsioogical growth, this group faces high vulnerability to malnutrition, which can have lasting consequences, including the onset of chronic diseases if their nutrient needs are not met (Patton *et al.,* 2016). Addressing adolescents' nutrition is essential not only to improve their immediate health but also to prevent the intergenerational cycle of malnutrition in future generations (Das et al., 2018). Despite extensive research on childhood nutrition, awareness gaps remain regarding factors that influence adolescent nutritional status (Lillie et al., 2019),which necessitate further study.

2.1.1 Efforts to improve adolescent nutrition

The UN General Assembly's declaration of 2016–2025 as the UN Decade on Nutrition marked an important step towards eradicating malnutrition. A major step focused on achieving Sustainable Development Goals (SDGs) related to food security and health was highlighted (Taklual et al., 2020). However, progress has been slow, largely due to non effective interventions that lack relevant data to inform them in making comprehensive policies (Yuan *et al.,* 2023). School-based initiatives, such as school feeding programs, are some of the key interventions in regards to the rising malnutrition in adolescents UNAP (Uganda Nutrition Action Plan) under food and nutrition policy 2003 these have faced similar shortcomings, hindered by insufficient data to monitor progress and relevant decisions to improve program delivery (Morris, 2023). Most of the surveys regarding nutrition status have always focused on adolescent girls, neglecting adolescent boys (Ministry of Health, 2021).

2.1.2 Schools and adolescents' nutritional status

Schools serve as critical platforms for nutrition interventions due to their accessibility to adolescents. When combined with educational initiatives, school feeding programs have proven effective in improving nutritional status, promoting school enrollment and attendance, and reducing dropout (Morris, 2023).These programs not only ensure food security but also help address socio-economic disparities by providing equal access to nutrition, which is crucial for both cognitive and physical development (Feed the Future, 2022). However, further research is needed to examine the factors influencing adolescent nutrition within schools, as these could inform intervention targeted towards adolescent (Feed the Future, 2022). Malnutrition remains a leading cause of death among adolescents, with both undernutrition and overnutrition contributing to poor health outcomes. In several low- and middle-income countries (LMICs), particularly in sub-Saharan Africa and Asia, adolescent malnutrition is prevalent, with stunting, thinness, and anemia common among younger adolescents (Thurnham DI, 2013). However, recent studies have highlighted a rising incidence of overweight and obesity, particularly in LMIC regions (Anand & Sharma, 2023), which is now considered an emerging nutritional concern. In Uganda, routine surveys on adolescent girls' nutrition reveal high rates of underweight and obesity,

(Lillie et al., 2019). This disparity underscores the need for more comprehensive research on the full spectrum of adolescent nutritional challenges.

2.1.3 Consequences of malnutrition among Adolescents

Malnutrition, whether undernutrition or overnutrition has severe consequences, not only on the health of adolescents but also on the broader community. According to the WHO, 2.8 million deaths annually are attributed to obesity (WHO, 2018), while malnutrition contributes to educational deficits and diminished long-term health prospects (M. S. Ali et al., 2022). Overnutrition during adolescence is linked to increased risk factors such as high blood pressure, diabetes, and long-term obesity (Lloyd, L.J., 2012), while undernutrition, particularly in adolescent girls, can lead to complications in pregnancy, including maternal mortality (Kassebaum N, 2015). Micronutrient deficiencies, such as iron deficiency anemia, are prevalent and particularly impact adolescent girls, with studies showing a high prevalence of iron deficiency anemia in Uganda (Das et al., 2018) These effects are preventable through targeted interventions, highlighting the need to understand the underlying determinants of adolescent nutritional status (Degarege et al., 2015).

2.2 Determinants of Adolescent Nutrition Status

The determinants of adolescent nutrition are multifaceted, spanning dietary practices, socio-economic factors, and awareness of nutrition (Watson, 2001). Research has consistently highlighted the critical role of diet, nutritional awareness, and socio-demographic factors in shaping adolescents' nutritional outcomes. Family income, parental education, household structure, and access to nutrition education are among the most significant social and economic determinants (Casey, 2017). Despite these insights, research on specific socio-economic and demographic factors influencing nutrition in adolescents remains limited. There is a need for more focused studies that explore these factors in depth, particularly in low-resource settings like Uganda, to inform effective interventions.

2.2.1 Socio-Demographic and Economic Factors Influencing Adolescent Nutrition Status

Approaches tailored to cultural context, family dynamics, and individual characteristics contribute to more effective strategies for promoting optimal nutrition among adolescents (Olatona et al., 2023). A life course approach is necessary to address adolescent health effectively (Hossain et al., 2013). Therefore, context-based determinants must be studied to develop effective strategies for combating malnutrition.

Research suggests that social demographics, including gender, age, ethnicity, family structure, and educational attainment, significantly influence adolescent nutritional status. However, limited documentation exists regarding the specific factors affecting secondary school-going adolescents.

2.2.1.1 Age and Adolescent Nutrition

Nutritional needs vary across different adolescent age groups due to growth spurts and developmental changes (Wassie *et al.*, 2015). Studies indicate that adolescents aged 14-15 are 3.65 times more likely to be stunted than older peers, and those aged 15-19 have a 1.7-fold increased likelihood of consuming unhealthy foods (Faso et al., 2020). This study aimed to explore the relationship between adolescent age and nutritional status in secondary schools.

2.2.1.2 Gender and Nutritional Status

Biological differences and societal expectations impact male and female adolescents' nutritional choices (Abera et al., 2023b). Gender norms influence meal frequency, food consumption patterns, and expenditure on food (Sridhar *et al*., 2023). A meta-analysis revealed a stunting prevalence of 22.4%, thinness at 17.7%, and overweight/obesity at 10.6%, with stunting and thinness more common in boys, while overweight/obesity was higher in girls (Abera et al., 2023b). In Nigeria, male adolescents had lower odds of stunting, and underweight rates were higher in female-headed households (Rufina et al., 2018). Girls are particularly vulnerable to malnutrition due to increased nutrient needs during sexual development and menarche, compounded by socio-economic factors (Salam et al., 2016). This study examined the effect of gender on adolescent nutritional status in selected secondary schools.

2.2.1.3 Residential Location and Nutrition

Residential location influences nutritional status, as seen in a Tanzanian study that found disparities in nutrition between urban, peri-urban, and rural areas (Cordeiro et al., 2021). Rural adolescent girls had higher rates of thinness, while urban adolescents faced increased risks of obesity (Arage et al., 2019). In Tanzania, undernutrition was found in 10.9% of rural residents compared to 5.1% of urban residents (Cordeiro et al., 2021). Research suggests that rural adolescents have poorer dietary habits and lower nutritional status (Najiah et al., 2021). This study documented the impact of residential location on adolescent nutritional status in secondary schools.

2.2.1.4 Guardianship and household demographics

Occupation and education level of guardian

Parental education significantly influences adolescent nutritional status. A study in Uganda found an association between adolescent BMI and parental education level ($p = 0.001$), suggesting that better-educated parents can positively influence adolescent dietary habits. However, limited documentation exists on this factor in Kanungu District. Guardian occupation and economic status impact household food security and adolescent nutrition. A study found that adolescents of farming mothers had 5.27 times higher odds of being overweight (Sahel et al., 2022). Economic stability affects food access, healthcare, and lifestyle behaviors (Iyassu *et al.*, 2023). This study aimed to assess the impact of guardians' occupations on adolescent nutrition in Kanungu District.

2.2.1.5 Household Size and Income

Larger households face greater challenges in maintaining food security, often leading to poorer nutritional outcomes (Dogui et al., 2021). Conversely, smaller households may have more stable financial conditions, improving food access and dietary quality. Economic disparities influence healthcare access, physical activity, and exposure to unhealthy food marketing (Abera et al., 2023a). Addressing these economic disparities can contribute to better adolescent nutrition outcomes (Ersado et al., 2023).

2.2.2 Diet-Related Practices Associated with Adolescent Nutrition Status

2.2.2.1 Diet Diversity

A diverse diet ensures adequate nutrient intake. Food environments are increasingly energy-dense and micronutrient-deficient, negatively impacting adolescent nutrition (Tukahirwa, 2021). In Burkina Faso, 24.9% of adolescents met minimum dietary diversity, while 36.7% consumed excessive added sugars (Faso et al., 2020). A study in Uganda found that only 6.8% of adolescents consumed foods from more than six food groups (Tukahirwa, 2021). This study examined diet diversity among adolescents in Kanungu District.

2.2.2.2 Meal Frequency

Meal frequency plays a critical role in nutritional status. In Kenya, 38% of adolescents consumed one meal daily, 40.3% ate two meals, and only 21% had three (Machocho, Nafula Kuria, Kimiywe, et al., 2023). Skipping meals increases malnutrition risk and is associated with unhealthy eating habits (Neslisah et al., 2011). Schools significantly influence adolescent meal choices, affecting their overall nutritional status (Morris, 2023). However, limited research has explored the significance of meal frequency among secondary school adolescents in Kanungu District.

2.2.3 Nutrition Awareness Levels and their association with Nutrition Status

Nutrition awareness affects dietary choices and overall nutritional status. Understanding nutrition empowers adolescents to resist unhealthy food marketing and make informed food choices. A study in Nigeria found that only 15.9% of adolescents had good nutrition awareness, leading to poor dietary habits and malnutrition (FA et al., 2023). Poor nutrition awareness is linked to meal skipping, snack food consumption, and increased intake of sugary drinks (Neslisah et al., 2011).

A study in Enugu State found that the lack of functional school health and nutrition programs contributed to poor adolescent nutrition (Al-Yateem & Rossiter, 2017). Another study found that 86% of adolescents had poor nutrition awareness, with none demonstrating high levels of understanding (Al-Yateem & Rossiter, 2017). This study sought to determine the level of nutrition awareness among secondary school adolescents in Kanungu District.

2.3 Conclusion

The reviewed literature highlights the multifaceted nature of adolescent nutrition, shaped by socio-demographic, economic, and diet-related factors. Age, gender, residential location, guardianship, and household demographics significantly influence adolescent nutrition. Additionally, diet diversity, meal frequency, and nutrition awareness play crucial roles in determining nutritional status. However, gaps exist in understanding these relationships in specific contexts, such as secondary school adolescents in Kanungu District. Therefore, this study aims to contribute to the body of awareness by documenting the specific socio-demographic and diet-related determinants affecting adolescent nutritional status in this region.

2.4.0 Theory of the Study

2.4.1 The Health Belief Model (HBM)

The Health Belief Model (HBM) and the UNICEF Framework provide complementary perspectives for understanding the determinants of nutrition status among adolescents in selected secondary schools. These theories collectively inform how socio-demographic and economic factors, diet diversity, meal frequencies, and awareness levels interact to influence adolescent nutrition status.

2.4.1.1 Application of the Health Belief Model (HBM)

The HBM is particularly useful in explaining how individual perceptions and behaviors shape nutrition outcomes. These perceptions and behvaiors are highly shaped by social and economic factors sorrounding the adolescents. Since nutrition status is primarily influenced by dietary habits (behavior), the HBM helps analyze how adolescents perceive and respond to their nutritional needs.

- **Perceived susceptibility and severity:** Adolescents' perception of their vulnerability to malnutrition-related health risks, such as stunted growth, obesity, or micronutrient deficiencies, determines their motivation to adopt healthy eating

behaviors. If they recognize the severity of poor nutrition on their academic performance, physical health, and future well-being, they may be more inclined to adopt better dietary practices.

- **Perceived benefits and barriers:** Understanding the benefits of a balanced diet—such as enhanced cognitive function, better physical health, and improved social acceptance—can encourage adolescents to make better food choices. However, barriers such as financial constraints, food preferences, and limited awareness about healthy eating can hinder positive dietary changes.
- **Cues to action and self-efficacy:** School-based nutrition education, peer influence, and parental guidance serve as critical cues to action. If adolescents are provided with practical strategies to overcome obstacles (such as affordable, nutritious food options), their self-efficacy in making healthier choices increases.

By integrating the HBM into this study, the analysis can identify how adolescents' perceptions and behaviors influence their dietary intake, meal frequencies, and overall nutrition status.

2.4.2 Application of the UNICEF Framework

The UNICEF Framework provides a broader structural understanding of nutrition status by identifying its immediate, underlying, and basic causes.

- **Immediate Causes:** This study examines dietary intake, including meal frequency and diet diversity, which directly impacts adolescent nutrition status. Consuming fewer meals than recommended or lacking dietary diversity contributes to inadequate nutrient intake, leading to malnutrition or poor growth outcomes.

- **Underlying Causes:** Socioeconomic and demographic factors, such as household income, parental education, and food security, influence adolescents' ability to access nutritious meals. Furthermore, awareness about healthy eating and care practices also plays a critical role. If adolescents lack proper nutrition education, they may engage in unhealthy dietary behaviors, exacerbating nutrition-related issues.
- **Basic Causes:** Structural determinants such as policies on school nutrition programs, economic stability, and cultural beliefs around food shape the environment in which adolescents make dietary choices. Access to health services, sanitation, and education further influences their overall well-being and nutrition status.

By utilizing the UNICEF Framework, this study can contextualize adolescent nutrition within broader socio-economic and policy landscapes, allowing for a holistic understanding of the determinants of nutrition status.

2.4.3 Integration of the two Models

The HBM focuses on individual behaviors and psychological determinants, while the UNICEF Framework addresses structural and systemic influences. Together, they provide a comprehensive approach to analyzing adolescent nutrition. Understanding both behavioral and systemic factors ensures that interventions are tailored at both the personal and policy levels, fostering improved nutrition outcomes for adolescents in secondary schools.

Thus, this study applies the HBM to explore how adolescents' perceptions and behaviors shape their nutrition status, while the UNICEF Framework helps examine the structural and systemic factors influencing dietary habits, meal frequency, and food accessibility. This combined approach ensures a well-rounded analysis of the determinants of nutrition among adolescents.

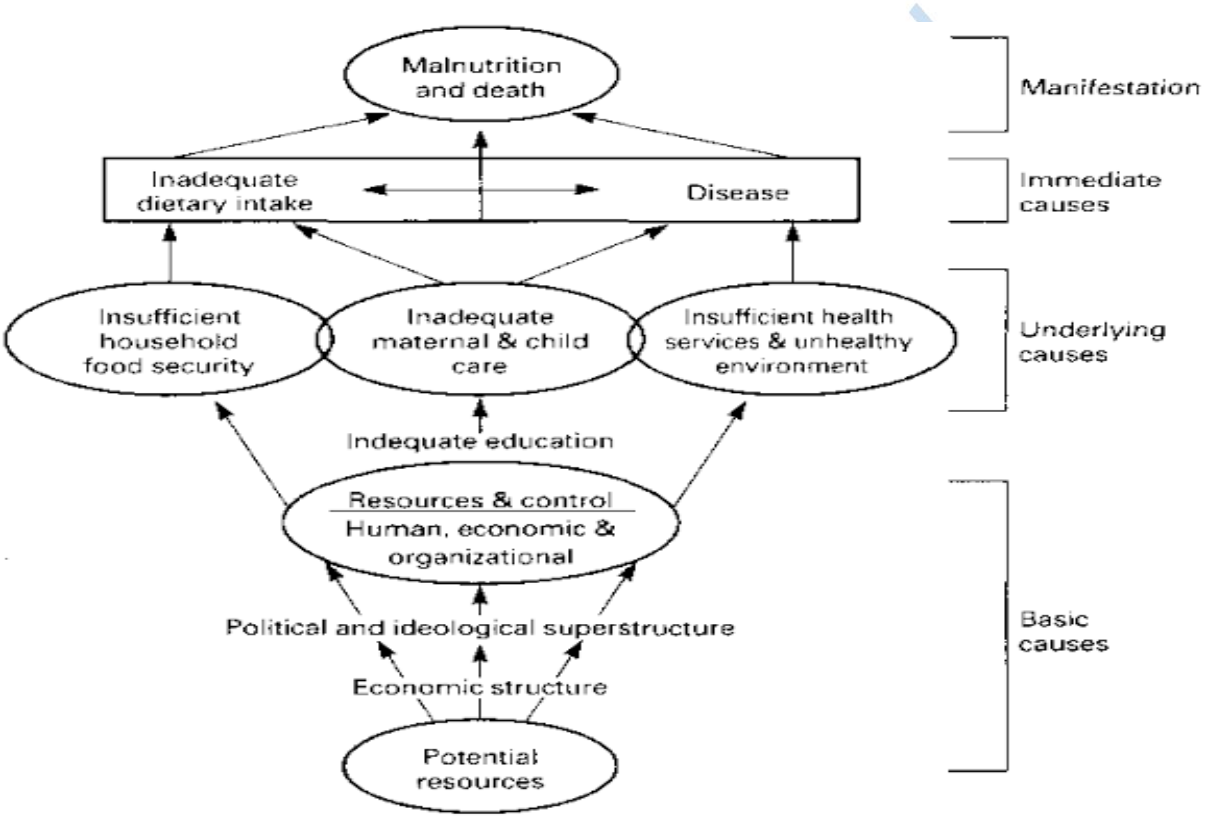

Figure 1: The UNICEF conceptual framework

2.5. Conceptual Framework

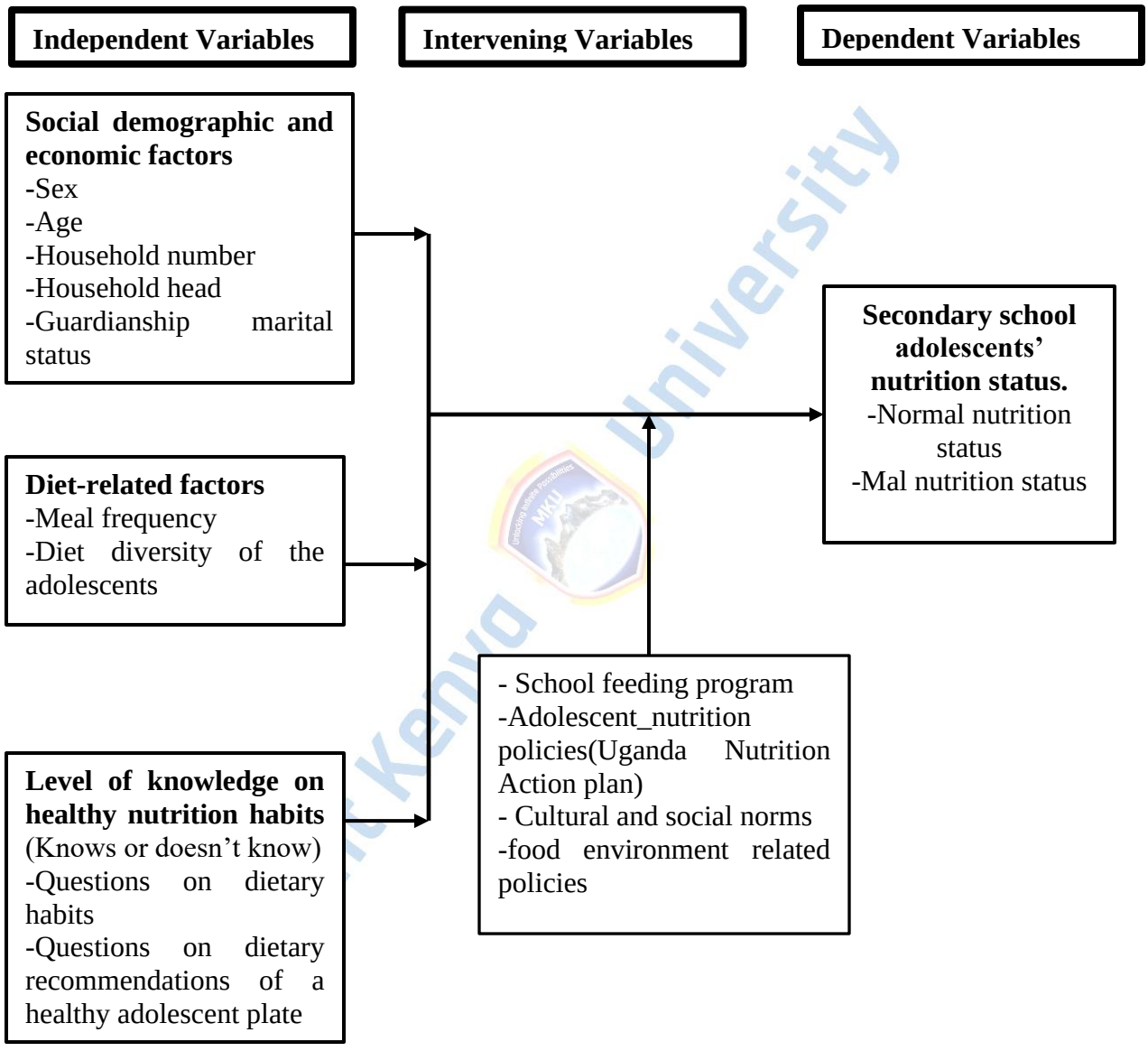

Figure 2:Conceptual framework adapted from a literature search

2.6 Recaps of the data gaps in adolescent nutrition.

Household demographic characteristics, encompassing factors such as age, gender, ethnicity, family structure, parental education, and socioeconomic status, significantly impact adolescent nutrition status. Research by (Feed the Future, 2022) has shown that parental education, particularly maternal education, is strongly linked to better dietary diversity and nutritional outcomes among adolescents. Families with higher socioeconomic status tend to have greater access to nutritious foods, while those with lower income levels face barriers such as food insecurity and reliance on energy-dense, nutrient-poor diets. Additionally, family structure plays a pivotal role, with studies indicating that adolescents from single-parent or extended families may experience different dietary patterns compared to those from nuclear families. These differences are often influenced by parental involvement in meal planning and food preparation. Moreover, cultural and ethnic factors shape dietary habits, food choices, and attitudes toward nutrition, contributing to variations in adolescent nutrition status across different population groups.

While existing studies highlight the role of social demographic and economic factors, diet diversity, and nutrition knowledge in shaping adolescent nutrition status, significant gaps remain. Limited context-specific studies: Most research has been conducted in general school-age populations, with limited focus on secondary school-going adolescents in specific regions, such as sub-Saharan Africa. Lack of integrated theoretical applications: Although models like the Health Belief Model and the UNICEF Conceptual Framework provide a strong foundation for understanding nutrition behaviors, few studies have systematically applied them to secondary school adolescents to examine the interplay between knowledge, dietary habits, and social determinants. Minimal focus on meal

frequency and dietary diversity: While some studies recognize the importance of meal frequency and dietary diversity, there is inadequate documentation on how these factors specifically influence adolescent nutrition status in different socioeconomic contexts. Inadequate longitudinal studies: Much of the existing literature relies on cross-sectional data, limiting the understanding of how adolescent nutrition evolves over time and the long-term impact of different interventions. This study aimed to bridge these gaps by investigating the determinants of nutrition status among secondary school adolescents, with a focus on social demographic and economic factors, dietary diversity, meal frequency, and nutrition knowledge. By applying both the Health Belief Model and the UNICEF Conceptual Framework, so as to provide a comprehensive understanding of how these factors interact and contribute to adolescent nutrition outcomes.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter covers the components of the investigation methodology, including the design of the research, study area, target population, sampling strategies, procedures, sample size calculations, criteria for inclusion and exclusion, methods for gathering data, tool validity and reliability, analysis of data, data presentation, and ethical considerations.

3.1 Study research design

The study employed a cross-sectional analytical design, which allowed for the collection of primary data from secondary school students at a specific point in time. This design was chosen for its effectiveness in assessing the study's key objectives, including social-demographic factors, nutrition awareness levels, and diet-related practices and yet cost friendly at the same time (Macdonald & Headlam, 2008). A mixed-methods approach was utilized to enhance data richness and mitigate the limitations of a single-method study (Terrell & Ph, 2012). Quantitative data were collected from adolescents, while qualitative insights were gathered from key informants so as to complement the findings. The analytical component of the study examined correlations between diet-related practices—such as dietary diversity scores and meal frequency based on 24-hour recall—nutrition awareness levels, with nutrition status.

3.2 Study Variables

3.2.1 Dependent Variable;

The dependent variable in this study was the nutritional status of secondary school adolescents. This was assessed using Mid-Upper Arm Circumference (MUAC) and Body Mass Index (BMI)-for-age, as recommended by the World Health Organization (WHO) for evaluating adolescent nutritional health.

Measurements of height and weight were taken using ShorrBoard height boards and Seca weighing scales, respectively. These measurements were then used to calculate BMI-for-age, referencing the WHO growth standards. While these assessments cannot provide a complete picture of nutritional status, they can indicate the need for further diagnostic evaluations to ensure timely interventions (Terrell & Ph, 2012).

BMI is calculated by dividing an individual's weight in kilograms by the square of their height in meters (kg/m^2) and serves as an indicator of body fatness relative to height. For adolescents,

$$BMI = \frac{\text{body weight in kilograms}}{(\text{height in meters})^2}$$

BMI-for-age percentiles are used to interpret nutritional status, with the following cutoffs:

- Overweight: greater than or equal to the 95th percentile
- At risk of overweight: 85th to less than the 95th percentile
- Underweight: less than the 5th percentile

MUAC was another anthropometric measurement used to assess nutritional status, particularly in resource-limited settings. Studies have shown a strong correlation between MUAC and BMI in describing nutritional status(Lillie et al., 2019). For instance, a study conducted among adolescent male students in Kolkata found that MUAC was 94.6% sensitive and 71.2% specific in identifying malnutrition when compared to BMI assessments. The study demonstrated a significant correlation between MUAC and BMI measurements ($r = 0.822$; SE = 0.035; 95% CI; $P < 0.000001$; $r^2 = 0.74$) (Dasgupta et al., 2010).

In summary, both BMI-for-age and MUAC were valuable tools for assessing the nutritional status of adolescents. Utilizing both measurements can enhance the accuracy of nutritional assessments and aid in identifying adolescents at risk of malnutrition, thereby facilitating timely interventions.

3.2.2 The Independent variables

The independent variables in this study included students' socio-demographic and economic factors, diet-related factors (diet diversity score and meal frequency), and adolescent awareness levels regarding healthy dietary recommendations and habits. These variables were assessed using a semi-structured questionnaire divided into four sections, each corresponding to a specific variable.

Students provided information on their socio-demographic and economic backgrounds, including age, gender, household income, and parental education level. Diet-related factors were evaluated using a 24-hour dietary recall. During this stage, students reported all foods and beverages consumed in the past day. The diet diversity score was determined by categorizing the consumed foods into different food groups, as per the FAO guidelines for assessing dietary diversity. Meal frequency was recorded by asking students how many meals they consumed in a day, including snacks.

To assess adolescent awareness of dietary recommendations and healthy eating habits, students answered multiple-choice about healthy dietary habits such as balanced diets, and the importance of various nutrients. Their responses provided insights into their awareness and adherence to dietary guidelines for adolescents.

3.3 Study area

The study was conducted in Kanungu District, a rural area located on the fringes of the western East African Rift Valley in southwestern Uganda. Kanungu was chosen due to its predominantly rural nature, (80.5% of its population reside in rural areas). The district's remote (approximately 450 km from Kampala city) and mountainous landscape, presents logistical and transportation challenges that have historically hindered research activities.

Kanungu has an estimated population of 252,144 people, with an average household size of 4.7. The local economy is primarily driven by agriculture, particularly subsistence farming, with limited livestock keeping. The district's fertile soils and favorable climate support food production for both household consumption and surplus sales. However, poor road infrastructure and the rugged terrain pose significant challenges for food transportation and other economic activities.

Kanungu has a total of 45 secondary schools, categorized into 25 government-funded (public) schools and 20 privately owned institutions (Kanungu Local Government, 2022). Each school implements a feeding program for students, though the quality and extent of these programs vary between institutions. Public schools generally rely on government-supported feeding programs which is often inadequate as reported by the media, while private schools may have different arrangements, often requiring parental contributions. The district's dietary patterns are largely influenced by locally available food resources. Commonly consumed foods include protein sources such as beans, peas, and milk, along with carbohydrate-rich staples like bananas (matooke), maize, rice, potatoes, cassava, and sweet potatoes. Additionally, cash crops such as coffee and tea contribute to the local economy.

Despite the presence of feeding programs in all secondary schools, the nutritional status of adolescents in Kanungu district has not been comprehensively documented. Furthermore, the social, demographic, and economic factors influencing adolescent nutrition remain largely unexplored. This study aimed to address these gaps by investigating the determinants of adolescent nutritional status within both public and private secondary schools in Kanungu District.

3.4 Target population

The primary target population for this study consisted of adolescents enrolled in secondary education at the four selected schools in Kanungu District. The study focused on adolescents aged 13 to 19 years given that these are the expected adolescent years in secondary schools in Uganda.. Since this age range included minors under 18, parental consent was obtained prior to data collection, in addition to the students' assent. For participants aged 18 and above, only their informed consent was required.

In addition to the adolescent students, key informants from the selected secondary schools also participated in the study. These included head teachers or designated welfare personnel responsible for student feeding programs. Their insights provided additional context and helped in interpreting the data collected from the adolescents, particularly regarding school feeding practices and nutritional support systems in both public and private institution

3.5 Sampling Procedures and Techniques

Sample size determination and sampling technique

3.5.1 Study sample size calculation

Cochran’s formula was used to determine the sample size for adolescent students in this study. This formula is widely applied in survey research when estimating sample sizes for large populations, particularly when the prevalence of a condition is known. It ensures statistical reliability by accounting for sampling variability and providing an adequate

representation of the target population within a defined confidence level and margin of error.

A previously published study on adolescent malnutrition in Kampala reported a prevalence of 32.3% among secondary school-aged adolescents (Namanda, 2018). Using this prevalence, the sample size was calculated with a 95% confidence level and a 5% margin of error. Cochran's formula is given as:

n=Z2pqe2n = \frac{Z^2pq}{e^2}n=e2Z2pq

Where:

- **n** = required sample size
- **Z** = 1.96 (significance level for 95% confidence interval)
- **p** = estimated proportion of malnutrition (0.323)
- **q** = 1 - p (0.677)
- **e** = margin of error (0.05)

Substituting the values:

n=(1.96)2×0.323×0.677(0.05)2=336n = \frac{(1.96)^2 \times 0.323 \times 0.677}{(0.05)^2} = 336n=(0.05)2(1.96)2×0.323×0.677=336

To account for potential non-response, a 10% adjustment was made, leading to a final sample size of **370** adolescents. This sample size ensures sufficient statistical power to generalize findings about adolescent nutritional status in Kanungu District while minimizing errors due to variability in the population.

3**.6 Sampling technique**

3.6.1 Selection of Schools; To ensure representativeness in the study, a systematic approach was used to select four secondary schools from the total of 45 schools in Kanungu District. The following steps were taken:

Stratification by School Type: The 45 secondary schools were categorized into two strata—government-funded (public) schools (25 schools) and privately owned schools (20 schools)—to ensure both types were adequately represented.

Proportional Selection: Two schools were randomly selected from each stratum, ensuring that both government and private institutions were included in the study. This approach accounted for potential differences in school resources, feeding programs, and socio-economic backgrounds of students.

Random Selection of Schools: A simple random sampling technique was applied within each stratum. Schools were assigned identification numbers, and throgh random selection method, two government and two private schools. This eliminated selection bias and ensured fair representation.

3.6.2 Selection of adolescent students; After selecting the four schools, stratified random sampling was used to select adolescent students while ensuring proportional representation across school types and grade levels. The process was as follows:

Stratification by school type: The total sample size of 370 students was divided proportionally between the selected government and private schools based on their total student population. This ensured that students from both types of schools were fairly represented.

Stratification by grade level: Within each school, students were further stratified by class level (Senior 1 to Senior 6) to capture a diverse range of adolescents at different stages of secondary education.

Random Selection of Students: After stratification, simple random sampling was used to select students from each class level. A list of students was obtained from school records, and participants were selected using a lottery method. This ensured that every student had an equal chance of being chosen, reducing selection bias.

By using stratified random sampling, the study ensured that the final sample included students from both government and private schools, across different age groups and grade levels. This approach improved the representativeness of the study findings regarding adolescent nutrition in Kanungu District.

3.7 Inclusion and exclusion criteria

3.7.1nclusion criteria

- Adolescents who were studying in the selected secondary schools.
- Teenagers who were enrolled in the chosen schools at the moment of the investigation and with the age range of 13 to 19 years.
- Teenagers under the age of eighteen who ascented and whose parents gave their informed consent
- Teenagers over the age of eighteen who gave their informed consent to take part in the investigation

3.7.2 Exclusion criteria

- Teenagers who weren't present when the study during the period for data collection.
- Very sick adolescents , disabled those who didn’t give their consent.

- Adolescents under 18 years whose guardians didn't give consent to participate in the study.

3.8 Data collection tools and preparation procedures

3.8.1. Development of the semi-structured questionnaire

To collect the relevant data, a four-section semi-structured questionnaire was adapted from similar studies on assessing for determinants. These were reviewed by master's student supervisors at Mount Kenya university to check their validity. The experts on nutrition from TASO (The AIDs Support Organisation) ethical review board further reviewed the questionnaire to be used inorder to ensure all ethical concerns considered. These were information sheet, parental consent, adolescent consent. To better tailor the semi-structured questionnaire to the specifics of the research investigation, a pilot study was conducted. Modified questions were added to the KoBo collect toolbox to facilitate the process of gathering data. The semi structured questionnaire consisted of four section to answer the four objectives which were.

To evaluate the teenagers' nutritional status in the chosen secondary schools in Uganda's rural Kanungu district. To address this, the semistructured questionnaire was inserted in KoBo to ease data collection. Adolescents' anthropometric measurements BMI and MUAC were entered after assessment.

The questionnaire also contained questions to ascertain the socio-demographic and economic variables such as age, sex, area, household and guardian. The third section had a multi-pass qualitative 24-hour dietary recall was entered into the KOBO tool to ascertain the factors connected to diet. The last section had a few true/false statements and multiple choice questions on dietary habits were asked assess the level of awareness on healthy (e.g., "Skipping breakfast helps with weight loss – True or False? on dietary habits.

3.8.2 Development of the Key informant interview (KIIs) guide

A Developing a Key Informant Interview (KII) Guide was a systematic process as reliable and structured tool that ensured relevant and insightful data is collected from key stakeholders. Below were the steps followed in designing the guide for this study:

- The first step involved reviewing the research objectives and here key themes and areas of interest were identified. The focus was on understanding the determinants of adolescent nutritional status, including social, economic, and school-related factors.
- The second step involved selection of key informants in the schools that were selected. This was done based on their expertise and involvement in adolescent nutrition and school feeding programs. The study targeted head teachers and welfare personnel responsible for school feeding and student well-being.
- A semi-structured approach was used to allow flexibility while ensuring all key areas were covered. The guide included open-ended questions to encourage detailed responses and probing for deeper insights. The questions were arranged in a logical sequence, starting with general topics before moving to more specific ones. The language was kept simple and neutral to avoid leading responses.

- The questions were categorized into narrative areas:
    - School feeding programs: Availability, quality, and challenges.
    - Nutritional policies: Implementation and adherence in schools.

- Adolescent eating habits: Observations on meal patterns and preferences.
- Barriers to proper nutrition: Economic, social, and environmental challenges.

- The draft KII guide was reviewed by the supervisory board at Mount Kenya University for validity and relevance.
- Feedback was incorporated to refine the questions and ensure they aligned with the study's objectives.
- A pilot test was conducted with a few non-participant key informants to assess the clarity and effectiveness of the questions.
- Adjustments were made based on the pre-test feedback to improve the guide.
- The final version was structured to ensure consistency across interviews.
- Guidelines were included on how to probe for additional details and maintain neutrality during interviews.

3.8.3 Timing of the field work

Fieldwork began in August, coinciding with a short school holiday for secondary schools. During this period, a pilot study was conducted at a different school to refine the questionnaires and ensure they were suitable for the context of Kanungu District. The actual data collection took place over a period of three weeks in September across the four selected schools.

3.8.4 Recruitment and training of research assistants

Before the data collection process, four research assistants were recruited and trained over a two-day period. The training was conducted by the researcher, a Master's in Public Health student and a professional nutritionist. A call for research assistants was made to the schools, specifying the need for individuals with strong proficiency in English and prior experience in data collection. The training covered ethical guidelines for administering the four sections of the semi-structured questionnaire. It also included practical sessions on assessing nutrition status using anthropometric measurements, such as BMI and MUAC. The objectives of the study and the details of the information sheet were thoroughly explained to ensure clarity. The training aimed to equip the research assistants with the necessary skills to collect accurate and reliable data, emphasizing the importance of using an appropriate interview approach to ensure the integrity of the data.

3.9 Data collection methods and procedures

KoBo collect tool box that had a semi-structured questionnaire was used by the researcher to gather quantitative data. Anthropometric measurements were used to assess for the adolescents nutrition status using BMI and MUAC to assess the nutrition status of adolescents in the selected secondary schools.

3.9.1 Measuring BMI

Firstly, weight measurements were taken, where the scale was zeroed and placed on a flat surface. The adolescent was requested to remove their shoes or any heavy clothing. Then they were then asked to step on the scale with feet evenly spaced apart. After this a steady

reading was reading was noted to the nearest 0.1kgs. For consistency the same equipment was used for all the study participants.

A height board was used to measure the height. The teenager was instructed to take off their shoes and any head or hair products before this was placed on a level surface. They were instructed to stand upright, their backs against the wall, and their feet together. Face forward while keeping your heels, buttocks, shoulder blades, and back of your head in contact with the wall.The headpiece was lowered and placed atop the head. Readings were recorded at level with the eye to the closest centimeter, ensuring that the surface was level and flat. The height was measured in meters instead of centimeters.

The formula for BMI was used. BMI=Weight (kg)/Height $(m)^2$

The adolescent were then asked to confirm their age. Then adolescents BMI-for-age was determined using the CDC (Centers for Disease Control) gender specific growth charts. The age of the adolescent was located on the To assess whether the adolescent's BMI is within a healthy range. After this the BMI-for-age percentile was determined using age and gender-specific reference data from the **World Health Organization (WHO)** growth standards. The BMI-for-age categories (according to WHO):

- Underweight: BMI < 5th percentile
- Normal weight: BMI between 5th and 85th percentile
- Overweight: BMI between 85th and 95th percentile
- Obesity**:** BMI > 95th percentile

WHO anthro plus was used to identify the appropriate percentile based on the adolescent's age and gender.

The categorization will help assess if the adolescent's nutrition status is within the healthy range or if intervention is requiredhorizontal axis, and calculated BMI on the vertical.

3.9.2 MUAC

Mid-Upper Arm Circumference (MUAC) is a simple and effective method for assessing nutritional status**,** particularly for identifying under nutrition in adolescents that doesn't require complex calculations. The measurement is taken using a MUAC tape, a flexible, non-stretchable tape specifically designed for anthropometric assessments. A clean not stretched out of shape MUAC measuring tape (color-coded) was used. Then the adolescent was asked to sit with their arm relaxed and hanging loosely by their side. The midpoint between the tip of the shoulder (acromion process) and the tip of the elbow (olecranon process) on the left upper arm (the standard arm used for MUAC measurements) was located. The midpoint was marked lightly using a pen or your finger. After which the same tape was wrapped around the marked midpoint, ensuring that it is snug but not too tight (it should not compress the skin) just flat against the skin without twisting or folding. The research assistant ensured that the measurement was taken to the nearest 0.1 cm or 1 mm and read at the exact point where the tape meets the measurement scale. At least two measurements were taken to ensure reliability. And if the two measurements would differ significantly, the process was repeated and a record the most consistent value.

3.9.3 Step 3

The adolescent was asked to give details on their demographics, household and guardian details. This was done to ascertain the socio-demographic and economic variables, diet related factors such meal frequency and a 24-hour recall and the level of awareness adolescents had on healthy dietary habits and recommendations.

3.10 Testing validity and reliability

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The degree to which instruments designed for gathering data yielded comparable results when administered to the same research participants in multiple scenarios is referred to as reliability(Ahmed & Ishtiaq, 2021). Ten(10%) of the sample size from a neighboring secondary school was used in this instance to assess the reliability of the data-gathering instruments. The reliability was ascertained by means of the Cronbach alpha coefficient analysis, utilizing the pilot test data. $\alpha = 0.70$ and higher is the recommended reliability coefficient, according to the Cronbach alpha reliability. Cronbach alpha is a useful reliability metric because, when all other variables are held constant, internal consistency accuracy increases with test content and administration conditions similarity. According to Fraenkel and Wallen (2006), a reliability test yielding Cronbach alpha (α) values greater than 0.70 is sufficient to determine the reliability of the questionnaires. An internal consistency of greater than 0.7 is accepted in the literature. The reliability test yielded a score of 0.84, indicating that the instruments were deemed dependable for gathering data. The semi-structured questionnaire was modified and adapted from related literature such as the UN FAO guidelines on nutrition-related KAP studies, which was further adjusted after the pilot study to fit the context of Kanungu district.

During data collection, a nutrition officer and skilled investigators performed all of the anthropometric assessments. Prior to receiving two days of instruction on measuring height and weight, using BMI wheels and MUAC measuring tapes, and distributing the partially structured questionnaire. Nutrition experts from Kanungu district and Mount Kenya University supervisors directed and offered guidance from the start of the study throughout

data collection to publication. Before data collection, the masters student trained the research assistants on ethical issues and strategies for dealing with unanticipated circumstances . All the data collection tools were reviewed by a nutrition expert and supervisory board of Mount Kenya University to ensure that the questions fit to capture accurate information of the study's objectives

3.11 Data Analysis

3.11.1 Quantitative data analysis

Anthropometric analytical software WHO Anthro Plus was used to analyze for BMI-for-age. Data from the 24-hour recall was entered in a diet diversity score excel sheet. All data from the semi-structured questionnaire was cleaned, coded, and exported to SPSS. The SPSS (Version 26) was used to compute correlations (P-vales), descriptives, and regressions. The descriptive data such as frequency and percentages were produced from the SPSS analysis. Frequencies and percentages were used to sum up the responses for nutrition status, sociodemographic traits, diet-related factors, and teenage nutrition awareness. To show the relationship between the dependent and independent variables, cross tabulations were employed. To find statistically significant correlations between nutrition awareness, diet-related factors, and social demographic variables, regression analyses and odds ratio calculations were performed. The qualitative data was subjected to narrative analysis.

3.11.2 Qualitative data analysis

The qualitative data collected from the Key Informant Interviews (KIIs) were transcribed verbatim by notes taking and analyzed using narrative analysis. This approach allowed for the identification of key themes, patterns, and insights from the interviews, offering a deeper understanding of the factors influencing adolescent nutrition. The analysis involved

reviewing the transcriptions, categorizing responses, and extracting relevant narratives that provided context and explanation for the quantitative findings. The qualitative data helped to complement the quantitative data by offering detailed perspectives on the determinants of adolescent nutrition that were not captured through numerical data alone.

During the analysis, some contradictory statements emerged from different key informants, which highlighted diverse perspectives on certain issues. For example, while one informant emphasized the effectiveness of the school feeding program in improving student nutrition, another indicated that lack of sufficient resources limited the program's impact. Such contradictions were carefully analyzed to understand the underlying factors and to explore the different realities and challenges faced by various schools. These contrasting views were considered in the overall interpretation of the qualitative data, ensuring a comprehensive understanding of the adolescent nutrition status.

Data Presentation

Results were presented in tables, pie charts and paragraphs to describe associations of the determinants of nutrition status while qualitative Qualitative data form the key informants was triangulated and presented in words to explain quantitative findings.

3.12 Ethical consideration

Ethical clearance for this study was obtained from the Institutional Scientific Ethics Review Committee at Mount Kenya University prior to data collection. Additionally, the study was approved by the Ugandan TASO Research Ethics Committee, which is recognized by the Uganda National Council for Science and Technology (UNCST), the body responsible for research licensing in Uganda. Permission was also granted by the UNCST before the research proceeded.

The study's license and information sheet were submitted to the Chief Administrative Officer (CAO) responsible for school administration in Kanungu District. After reviewing

the study, the CAO provided an acceptance letter and an official letter of collaboration requesting participation from all secondary schools in the district. The head teachers of the selected schools reviewed the necessary approvals and the official collaboration letter from the CAO before informing teachers and students about the research.

To ensure ethical standards, adolescents under the age of 18 provided informed assent, while their parents signed parental consent forms prior to participation. Adolescents aged 18 and older signed an informed consent form that outlined their rights as study participants. Participation was voluntary, and there were no consequences for withdrawing from the study at any time.

To protect the participants' confidentiality and anonymity, their names were not recorded; instead, coded identifiers were used. The participants and their teachers agreed upon suitable times for data collection that occurred during non-class hours, ensuring that students' academic schedules were not disrupted. This approach maintained the ethical standards of privacy and voluntary participation throughout the research process

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CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Preamble

This section provides the research response rate, the nutrition status of the study respondents, the dietary diversity score, the social demographic and economic factors, and finally the awareness level on health diets influencing the nutrition status of adolescents.

4.2 Research response rate

To the 370 participants who were eligible, this study distributed 370 questionnaires. This study had a response rate of 91.9%. This indicated that 340 of the study's questionnaires were deemed suitable for data analysis.

4.3Nutrition status of the study respondents

Objective 1: To assess the nutrition status of adolescents in the selected secondary schools of rural Kanungu district Uganda.

Majority (62.9%) of the participating adolescents had a normal nutrition status while the rest (37.1%) had a form of malnutrition (<-3SD, <-2SD, <-31D and >+1SD, >+2SD) . A similar study in India revealed a close range prevalence of (46%) (Anand & Sharma, 2023). Also another study showed in Ethiopia showed the malnourished adolescents at a prevalence (26.4%)(Yimer & Wolde, 2022). Similar to the study by (Anand & Sharma, 2023), the most prevalent (71.4%) form of malnutrition was overweight..

The majority of research participants (87.4%) had MUACs greater than 18.5 cm, while 12.6% had MUACs below 18.5 cm, indicating undernutrition. The results of the study on the nutritional status of the participants are summarized in Table 1 below.

Table 1:Nutrition status of the study respondents

Independent variables	Categories	Frequencies	Valid percentage
Nutrition status	Well-nourished	214	62.9%
	Mal-nourished	126	37.1%
Malnutrition	Overweight	90	71.4%
	Underweight	36	28.6%
MUAC reading	<18.5	43	12.6%
	>18.5	297	87.4%

4.4 Descriptive Statistics on social demographic and economic factors

Under objective 2 which was to determine the social-demographic and economic factors influencing the nutrition status of adolescents in the selected secondary schools of rural Kanungu district in Uganda.

One of the social demographics assessed was gender of the study partakers. Majority (59.1%) of the study respondents were males while the rest (40.9%) of the study participants were females. This could be linked to poor uptake of female adolescents into the Ugandan education system. Concerning the age of the study adolescents majority (84.7%) of the study respondents were aged between 16-19 years while only a few(15.3%) of the study partakers were aged between 13-15 years.

Guardianship demographics were also collected where by concerning the education status of the guardians, Only a few (13.8%) of the study respondents' guardians had attained a tertiary level of education while more than a quarter (34.4%) had attained a primary level of education. This could be linked to easy access to a lower level of education than the upper sections of the education system. Concerning the marital status of the guardians, the

majority (71.2%) of the study guardians were married while only a few (5.6%) reported being windowed. Regarding the occupational status of the guardians, close to half(62.6%) of the study partakers were employed while only a few (16.5%) were self-employed.

Another variable on social demographics studied was the household demographics. More than half (57.9%) of the study respondents reported a household size of 1-4 members while close to a quarter (24.4%) of the study partakers had a household size of more than eight members. Household demographics are vital, adolescents in larger households may face challenges in accessing an adequate and diverse diet if the household has limited financial resources. Concerning the head of the household, the most adolescents (75.3%) had a father as the head of the household while only a few (24.7%) had a mother as the head of the household. Lastly concerning the area of residence of the study partaker, more than half (58.5%) of the study respondents were from rural areas while more than a quarter (37.9%) were from peri-urban regions, while only a few (3.5%) were from urban areas. Table 2 shows a summary of the descriptive statistics on social demographic and economic factors

Table 2:**Descriptive statistics on social demographic and economic factors**

Independent variables	Categories	Frequencies	Valid percentage
Age	13-15	52	15.3
	16-19	288	84.7
Gender	Male	201	59.1
	Female	139	40.9
Guardian education level	Primary	117	34.4
	Secondary	95	27.9
	Vocational	81	23.8
	Tertiary	47	13.8
Guardian marital status	Single	79	23.2
	Married	242	71.2
	Window	19	5.6
Guardian occupation	Employed	213	62.6
	Self-employed	56	16.5
	Casual labour	71	20.9
Size of household	1-4	197	57.9
	5-8	60	17.6
	>8	83	24.4
Head of household	Father	256	75.3
	Mother	84	24.7
Area of residence	Urban	12	3.5
	Peri-urban	129	37.9
	Rural	199	58.5

4.5 Social demographic and economic factors associated with nutrition status

4.5.1 Age of the adolescents with adolescent nutrition status

As indicated in Table 3, Concerning the age of the study respondents, more than half (66.2%) of the study respondents aged 13-15 years had a normal nutrition status while more than a quarter (41.7%) of the study respondents aged 16-19 years had malnutrition.

When the age of study participants was compared to their nutritional status using the chi-square test for independence, no statistically significant correlation was found ($X^2=2.196$, $df=3$,$p=0.138$). Therefore for this study, ages within the adolescent stage were not a factor that influenced nutrition status. These differed from with the study conducted in Kenya where the age within adolescent age group had an influence on nutritional status of the adolescents (Machocho, Nafula Kuria, Kimiywe, *et al.*, 2023). Its known that the overall age rage of 12 to 18 years these young people are at the puberty stage. This is a phase characterized by significant physical and hormonal changes. Growth spurts during puberty increase the demand for nutrients such as protein, calcium, and iron (Lillie et al., 2019). Meeting these increased nutritional needs is crucial for optimal growth and development.

The qualitative data, in which one of the key informants described that, contradicted these findings:

"*Older adolescents may be more vulnerable to developing disordered eating behaviors or unhealthy relationships with food. Societal pressures related to body image and appearance can contribute to dieting practices or restrictive eating, potentially affecting nutrition status especially the girls fear to go for school meals during this age. Furthermore, dietary patterns may change with age as adolescents are exposed to different social and environmental influences. Older adolescents may be more susceptible to factors*

like peer influence, advertising, and societal expectations, which can impact their dietary choices…."

The results of this investigation aligned with those of a Tanzanian study (Said *et al.*, 2023) and the study conducted in Kenya where the age within adolescent age group had an influence on nutritional status of the adolescents (Machocho, Nafula Kuria, Kimiywe, *et al*., 2023).

4.5.2 Gender of adolescent and adolescent nutrition status

As indicated in Table 3, Concerning the gender of the study respondents, malnutrition was more prevalent among the boys compared to the females. Majority of the females had normal nutrition status (66.3%) and the rest (33.7%) had a form of malnutrition. While the males, (55.8%) had a form of malnutrition and only (44.2%) presented a normal nutrition status. This could be due to the female related programs especially those inline with menstrual health and hygiene that train girls on healthy diets. Or from the information from the key informant interviews, boys have high appetite and consume large amounts of carbohydrates which is the largest portion served on the school menu. However, in another study carried out in Tanzania, females were at risk of malnutrition as compared to males (Lillie *et al*., 2019).

The results of this investigation aligned with those of a Tanzanian study. When the gender and nutrition status were tested for independence using the chi-square method, there was a significant statistical correlation ($X2=9.214$, $df=3$, $p=0.002$). In the binary logistic analysis, this did not, however, replicate ($p=0.48$).

The findings from this research were consistent with those of a study carried out in Ethiopia and Nigeria(Olatona *et al.*, 2023; Wassie *et al*., 2015).

4.5.3 Education level of the guardian and adolescent nutrition status

As indicated in Tables 3 and 4 below, when correlations were done using SPSS software, When the education level and nutrition status were compared using the chi-square test for independence, there was a statistically significant correlation (X2=10.034, df=3,p=0.01). Of the malnourished individuals, only a few (19.1%) said their guardians to have attained tertiary level of education.

Guardians with higher education levels often have better awareness about nutrition and a deeper understanding of the importance of a balanced diet (Sridhar *et al*., 2023).. Educated guardians are more likely to be aware of the nutritional needs of adolescents during their growth and development. These findings were consistent in the binary logistic analysis where education level was an independent factor for nutrition status (p=.019). Furthermore, study partakers who had guardians with a primary level of education were 3.6 times less likely to have normal nutrition status. Uneducated guardians may have limited nutrition awareness, leading to challenges in understanding the dietary needs of adolescents during their critical growth and development stages. The findings from this study were in agreement with those of a study done in Zambia (Sridhar *et al.*, 2023). However, another study conducted in Ethiopia was not in agreement, as education level was not associated with the nutrition status of adolescents (Kim *et al.*, 2023). These results were consistent with the qualitative information provided by one of the key informants, who described that
:

"*I would say educated guardians may be more likely to adopt positive parenting practices related to nutrition, such as promoting healthy eating habits and modeling a balanced diet for their adolescents. This is because they are often earning enough income to purchase the necessary food items for a good nutrition status.But schools lack such nutrition engaging programs for parents.Most meeting swith parents held are for discussion of academic*

performance rather than nutrition a determinant of the performance. Further unveiling the link between education level, economic status and ability to provide nutritious foods.

4.5.4 Occupation status of the guardians and adolescent nutrition status

As indicated in Tables 3 and 4 below, Concerning the occupation status of the guardians, more than half (65.7%%) of the study respondents who were well nourished, their guardians reported being employed, while only a few (23.2%) of the study respondents who were mal-nourished their guardians reported being self-employed**.** Employment can enhance the capacity of guardians to purchase a variety of nutrient-dense foods, contributing to a well-balanced diet for adolescents. A stable income allows for greater flexibility in food choices and the ability to afford foods that meet the nutritional needs of growing adolescents. When the chi-square test for independence was used to compare the nutritional status and occupational status, there was a significant a statistical relationship (X2=16.625, df=2, p=<.001). These results were in line with the binary logistic analysis, which found that nutrition status was independently influenced by occupational status (p=.008). Furthermore, study partakers whose guardians were employed were 2.1 times less likely to have malnutrition. Employed guardians are more likely to provide a stable and secure food environment for adolescents, reducing the risk of food insecurity. Stable employment may contribute to consistent access to food, preventing periods of inadequate nutrition.

The results of this investigation aligned with those of an investigation conducted in Ethiopia (Abera et al., 2023a). However, another study carried out in Somalia found no association between the occupational status and nutrition status of adolescents (A. M. Ali & Abdi, 2022).

4.5.5 Marital status of the guardians and adolescent nutrition status

As indicated in Table 3, Concerning the marital status of the guardians, more than half (64.9%) of the study respondents who were well nourished, their guardians reported being married, while more than a quarter (41.8%) of the study respondents who were mal-nourished their guardians reported being single**.** Single-parent households, where the parent is divorced, separated, or widowed, may face economic challenges that affect the ability to afford a varied and nutritious diet. Single parents may have to juggle work, parenting, and household responsibilities, potentially impacting the time and resources available for meal planning. When the marital status and nutrition status were tested for independence using the chi-square method, there was no statistically significant correlation (X2=1.348,df=2,p=0.51).

These results ran counter to the qualitative information provided by one of the key informants, who described that:

"In households where both parents are married and employed, there may be greater financial resources available to provide a diverse and nutritious diet for adolescents. Dual-income families often have more stability in terms of income, reducing the risk of food insecurity. We usually notice that adolescents whose guardians are married tend to easily pay school fees than single parents adolescents"

This study's findings were consistent with one conducted in SSA (Efevbera *et al.*, 2019).

This was in contrast to a study done in Ethiopia that found marriage increased the likelihood of having a normal nutritional status (Zemene *et al.*, 2022).

4.5.6 Size of the household and adolescent nutrition status

Regarding the size of the household, as shown in Tables 3 and 4 below, the majority of study participants (72.1%) with families of 1-4 had a normal nutritional status, whereas over half (65.1%) of those with malnutrition had families of more than eight members. Larger families may face difficulties in ensuring a consistent supply of nutritious food due to increased demand and resource constraints. Access to a variety of fresh fruits, vegetables, and protein sources may be limited in larger households.

When household size and nutrition status were compared using the chi-square test for independence, there was a statistically significant relationship (X2=36.915,df=2,p=<.001). The binary logistic analysis supported these findings, where household size was an independent factor for nutrition status (p=<.001). Furthermore, study respondents with a household size of 1-4 were 4.3 times more likely to have a normal nutrition status as compared to households that had more than eight members. In families with many members, there may be increased competition for food, and adolescents may face challenges in accessing sufficient portions of nutrient-dense meals. This competition can impact the overall nutrition status of adolescents within the household.

These results disagreed with the qualitative information provided by one of the key informants, who stated that:

"Families with larger sizes may still have sufficient economic resources to provide a diverse and nutritious diet for all members, including adolescents. A higher income or effective resource management can mitigate the potential negative impact of family size on nutrition…."

Another key informant noted that;
"*Families, regardless of size, that have access to support systems, community programs, and resources may better navigate the challenges associated with providing a nutritious diet. Support systems can provide assistance in areas such as healthcare access, nutritional education, and financial support*. *Though a smaller household implies less costs in feeding the households and ease to access healthy foods*"

The results of this investigation were consistent with those of an investigation conducted in Uganda (Isabirye et al., 2020). This was in contrast to a study done in Ethiopia that found a relationship between household size and nutritional status (Abera et al., 2023a).

4.5.7 Head of household and adolescent nutrition status

Regarding the head of the household, as shown in Tables 3 and 4 below, mothers headed households for over half (52.4%) of study participants who were malnourished, whereas fathers headed households for nearly three-quarters (75%) of study participants who were well-nourished. Fathers often serve as the primary financial provider for the family. Their income level and financial decisions influence the household's ability to afford nutritious food for adolescents. When the head of household and nutrition status were tested for independence using the chi-square method, there was a statistically significant correlation ($X2=11.229, df=1, p=0.001$). These findings were consistent in the binary logistic analysis where the head of household was an independent factor for nutrition status ($p=.040$). Furthermore, households that had a father as the head of the household were 1.8 times to have adolescents with normal nutrition status as compared to female-headed households.

These results were consistent with the qualitative information provided by one of the key informants, who described that :

"Fathers contribute to the overall access to resources, affecting the quality and quantity of food available to adolescents. Higher-income and stable employment can positively impact resource availability. Fathers serve as important role models for their children. In most households where they reign as providers, they are usually richer than female headed households……"

The results of the study were consistent with research conducted in Ethiopia and Tunisia. (Dogui *et al.,* 2021; Tegegnework *et al*., 2023). Nevertheless, the results of another study carried out in Rwanda were different (Ekholuenetale *et al*., 2023).

4.5.8 Area of residence and adolescent nutrition status

As indicated in Table 3, Regarding the area of residence, The majority (75%) of the study respondents who lived in urban areas had a normal nutritional status while more than a quarter (35.7%) of the study partakers who were malnourished in peri-urban areas. Urban areas typically have better access to a diverse range of foods, including fresh fruits, vegetables, and a variety of protein sources. Rural areas may face challenges in accessing a wide array of nutrient-rich foods, potentially impacting the nutritional diversity of adolescents' diets.

When comparing the area of residence and nutrition status using the chi-square test for independence, there was no statistically significant association ($X2=0.976, df=2, p^*=0.615$).

The findings from this study were consistent with those of a study done in Tanzania(Cordeiro et al., 2021). However, another study conducted in Ethiopia was not in harmony, as urban adolescents were three times more likely to be malnourished as compared to those from rural areas (Ersado et al., 2023).

Table 3:Social demographic and economic factors influencing nutrition status

Independent variables	Categories	Nutrition status		Statistical Significance (Chi-square test)
		Mal-nourished N(=126)	Well-nourished N(=214)	
Age	13-15	68(33.8%)	133(66.2%)	X^2=2.196
	16-19	58(41.7%)	81(58.3%)	df=3
				p=0.138
Gender	Male	68(33.8%)	23(66.2%)	X^2=9.214
	Female	58(41.7%)	81(58.3%)	df=3
				p=0.002
Education level	Primary	52(44.4%)	65(55.6%)	X^2=10.034
	Secondary	38(40)%	57(60%)	df=3
	Vocational	27(33.3%)	54(66.7%)	p=0.01
	Tertiary	9(19.1%)	38(80.9%)	
Guardian Marital status	Single	33(41.8%)	46(58.2%)	X^2=1.348
	Married	85(35.1%)	157(64.9%)	df=2
	Windowed	8(42.1%)	11(57.9%)	p=0.51
Occupation	Employed	73(34.3%)	140(65.7%)	X^2=16.625
	Self-employed	13(23.2%)	43(76.8%)	df=2
	Casual labour	40(56.3%)	31(43.7%)	p=<.001
Size of household	1-4	55(27.9%)	142(72.1%)	X^2=36.915
	5-8	17(28.3%)	43(71.7%)	df=2
	>8	54(65.1%)	29(34.9%)	p=<.001
Head of household	Father	82(32%)	174(68%)	X^2=11.229
	Mother	44(52.4%)	40(47.6%)	df=1
				p=0.001
Area of residence	Urban	3(25%)	9(75%)	X^2=0.976
	Peri-urban	46(35.7%)	83(64.3%)	df=2
	Rural	77(38.7%)	122(61.3%)	p*=0.615

Fisher test=p*

Table 4:Binary logistic regression analysis on social demographic and economic factors influencing nutrition status

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	**Upper**
Step 1a	Gender	.179	.257	.484	1	.487	1.196	.723	1.978
	Female						**ref**		
	Education level			9.979	3	.019			
	Primary	-1.284	.461	7.762	1	.005	3.6	.112	.683
	Secondary	-1.241	.473	6.877	1	.009	.289	.114	.731
	Vocational	-.703	.483	2.118	1	.146	.495	.192	1.276
	Tertiary						**ref**		
	Occupation			9.777	2	.008			
	Employed	.760	.310	6.027	1	.014	2.139	1.166	3.925
	Self- employed	1.267	.431	8.632	1	.113	3.550	1.525	8.265
	Casual labor						**ref**		
	Household- size			24.446	2	.000			
	1-4	-1.462	.304	23.115	1	.000	4.313	2.377	7.827
	5-8	1.412	.399	12.501	1	.070	4.103	1.876	8.975
	>8						**ref**		
	Household head	-.596	.290	4.229	1	.040	1.814	1.028	3.200
	Mother						ref		
	Constant	**-.586**	**.558**	**1.105**	**1**	**.293**	**.556**		

4.6 Descriptive Statistics on Dietary Diversity Score

Objective 3: To find out the diet-related factors influencing the nutrition status of adolescents in the selected secondary schools of rural Kanungu District in Uganda.

Table 5 below provides descriptive statistics on dietary diversity scores.

Based on the FAO recommendation for assessing individual dietary diversity, DDS was calculated using the data gathered from the 24-hour dietary recall. For the purpose of calculating dietary diversity scores, each food group consumed during the reference period was given one point, and the total number of points was computed. Dietary diversity

categories were created using the 16 food groups: low (≤3 food groups), medium (4-5 food groups), and high (≥6 food groups) .As indicated in Table 5 below, Majority (59.7%) of the study partakers had a medium dietary diversity, a few (12.9%) had a high dietary diversity and (27.4%) had a low dietary diversity.

A lack of dietary diversity can contribute to malnutrition, including both undernutrition and overnutrition. Adequate diversity helps prevent nutrient deficiencies as well as excessive intake of specific nutrients associated with over consumption. Concerning meal frequency, majority (80.9%) of the study partake had the recommended number of meals that each of the adolescents took 3 meals a day. There was noted over consumption of carbohydrates as porridge was the most consumed for breakfast, posho (maize flour) and beans with no vegetable and avocado, and the same, posho (maize flour) and beans with no vegetable and avocado. Fruits such as bananas and avocados were also consumed and sold at the school canteens for some schools.

Table 5: Descriptive Statistics on Dietary Diversity Score

Independent variables	Categories	Frequencies	Valid percentage
Dietary diversity	Low	93	27.4
	Medium	203	59.7
	High	44	12.9
Took recommended number of meals (3)	Yes	275	80.9
	No	65	19.1

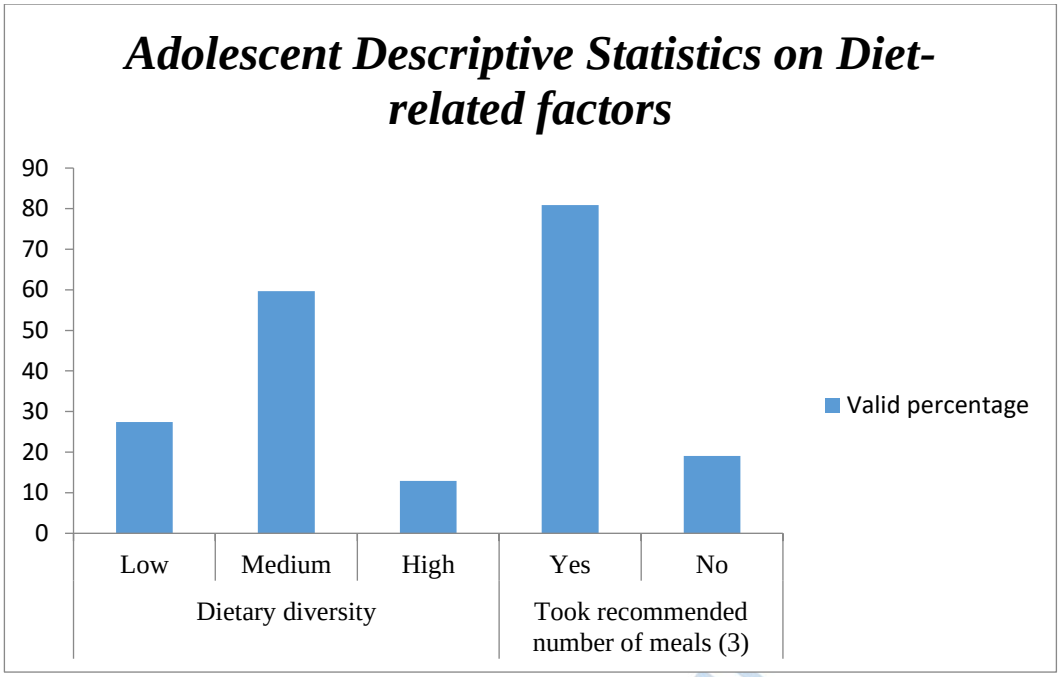

Figure 3:A graph showing diet –related factors of the adolescents

4.6.1 Multiple- responses on the consumption of food from various food groups from 24-hour recall

Table 6 below provides multiple responses on the consumption of food from various food groups as per the 24-hour recall. The majority (84.1%) of the respondents reported having consumed cereals (mainly posho and "Matooke" bananas which could be linked to easy availability in the school meals menu as posho. The respondents who reported to have consumed pulses these were mainly beans were 83.8% and 84.7% had taken white tubers and roots mainly sweet potatoes and cassava which are grown so much in the region. The adolescents who were apart of the study 58.8% had taken fruits mainly avocados, mangoes while (32.9%) had taken meat and meat products. The consumption of dark green vegetables (32.4%%) and other vegetables (88.1%) which were mainly cabbages. More than half (84.4%) of the study respondents had taken sugar while of the study partakers 59.1% reported having taken milk and milk products.

Table 6:Multiple- responses on the consumption of food from various food groups consumption of the various food groups

		Responses		Percent of
		N	Percent	Cases
Proportion of food groups[a]	Cereals	286	11.4%	84.1%
	Pulses	285	11.3%	83.8%
	White tubers and roots	288	11.5%	84.7%
	Fruits	200	8%	58.8%
	Meat	112	4.5%	32.9%
	Eggs	226	9.0%	32.4%
	Other vegetables	302	12%	88.1%
	Dark green vegetables	110	4.4%	32.4%
	Milk and milk products	201	8%	59.1%
	Fats (Ghee)	217	8.6%	63.8%
	Sugar	287	11.4%	84.4%
Total		**2514**	**100%**	**739.4%**

4.6.1.1 Association between dietary diversity score and nutrition status

As indicated in Tables 7 and 8 below, Regarding dietary diversity, (49.5%) of the study partakers who were malnourished had inadequate dietary diversity. While (70.2%) of the study respondents who were well-nourished had an adequate dietary diversity of their diet. When the chi-square test for independence was used to compare nutrition status and dietary diversity, there was a significant statistical association (X2=11.524,df=2,p=0.003). The binary logistic analysis confirmed these results, where dietary diversity was an independent factor for nutrition status(p=.01). Furthermore, study respondents who had inadequate dietary diversity were 2.1 times more to have malnutrition. A diverse diet provides adolescents with a broad spectrum of essential nutrients, including vitamins, minerals,

proteins, and carbohydrates. Consuming a variety of foods helps meet the specific nutritional needs required for growth, development, and overall well-being.

These results corroborated the qualitative data, which included the following narrative from one of the key informants:

"*The diet diversity is made possible because school students often pack fruits like avocado, which is sold at the school canteen. During vegetable seasons the school purchases vegetables such as cabbages and adds to the beans served at lunch time. But this is a seasonal activity .....".*

The results of the study were consistent with a Ghanaian study that found a link between dietary diversity and good nutrition status. (Saaka *et al.*, 2021). This was contrary to another study carried out in Ethiopia(Bikila *et al.*, 2023)

As indicated in Tables 7 and 8 below, Regarding meal frequency, more than a half (52.3%) of the study partakers who were malnourished had not met the required number of meal frequencies, while more than a half (66.5%) of the study respondents who were well-nourished had met the required meal frequency. This differed from the study in Kenya where the adolescents took only two meals (Machocho, Nafula Kuria, & Kimiywe, 2023).

When the chi-square test for independence between meal frequency and nutrition status was performed, there was a statistically significant correlation ($X^2=8.011, df=1, p=0.005$). These findings were consistent in the binary logistic analysis where meal frequency was an independent factor for nutrition status (p=.018). Furthermore, study partakers who had met the required meal frequency were 1.9 to be well nourished. Meal frequency, or the number of meals and snacks consumed throughout the day, is an important aspect of adolescent

nutrition status. The relationship between meal frequency and nutrition status can influence various aspects of health and well-being. Regular meals contribute to a more even distribution of nutrient intake throughout the day, reducing the risk of nutrient deficiencies. Ensuring an adequate intake of essential nutrients supports overall health and growth.

These results were consistent with those of two additional studies conducted in Somalia and Ethiopia (Fite *et al*., 2021; Mohammed *et al*., 2023). However, another study conducted in Uganda found no association between meal frequency and nutrition status (Kolliesuah *et al*., 2023).

Table 7:Association between dietary diversity score and nutrition status

Independent variables	Categories	Nutrition status		Statistical Significance (Chi-square test)
		Mal-nourished N(=126)	Well-nourished N(=214)	
Dietary diversity	low	50(49.5%)	52(50.5%)	X^2=11.524
	medium	59(29.8%)	139(70.2%)	df=2
	High	17(41.5%)	24(58.5%)	p=0.003
Meal frequency	Yes	92(33.5%)	183(66.5%)	X^2=8.011
	No	34(52.3%)	31(47.7%)	df=1
				p=0.005

Table 8: Binary logistic analysis between dietary diversity score and nutrition status

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step	Dietary diversity			9.217	2	.010			
1[a]	Inadeqaute	-.770	.256	9.065	1	.003	2.1	.280	.764
	Moderate	-.431	.358	1.445	1	.229	.650	.322	1.312
	Adequate						**Ref**		
	Meal frequency	.677	.285	5.624	1	.018	1.967	1.125	3.441
	No						**Ref**		
	Constant	**.286**	**.284**	**1.010**	**1**	**.315**	**1.331**		

4.7 Descriptive Statistics on Adolescent Nutrition Awareness

Objective 4: To find out the nutrition awareness level influencing the nutrition status of secondary school adolescents of rural Kanungu District in Uganda.

Table 9 below provides descriptive statistics on adolescent nutrition awareness.

Awareness among adolescents regarding nutrition recommendations and dietary habits was assessed using a combination of true/false questions**.** This approach ensured that the assessment effectively captured both basic recognition of nutrition concepts (awareness) and deeper understanding of nutritional knowledge**.** To evaluate the awareness of adolescent students, they were presented with true/false statements related to nutrition guidelines and healthy eating practices. These statements aimed to assess whether students had heard of or recognized key nutrition concepts, even if they lacked a deeper understanding. Examples of true/false awareness statements included:

- "Skipping breakfast can negatively affect concentration in school."
- "Drinking sugary beverages is a healthy way to stay hydrated."
- "Eating vegetables and fruits daily is essential for good health."

Respondents had to select 'True' or 'False', indicating whether they recognized these statements as correct or incorrect. Concerning dietary habits, close to a half (61.2%) of the study partakers were aware while more than a quarter (38.8%) were not aware. Dietary habits during adolescence play a crucial role in determining the nutrition status of individuals. Adolescents experience rapid growth, development, and changes in lifestyle, making it essential to establish healthy eating patterns. Positive dietary habits contribute to overall well-being, support proper growth, and reduce the risk of nutritional deficiencies

and health issues. A question on dietary recommendations specifically constitution of a balanced diet was asked and majority (67.9%) didn't know.

Table 9:Descriptive Statistics on Adolescent Nutrition Awareness

Independent variables on awareness	Categories	Frequencies	Valid percentage
Dietary Allowance	Yes	231	67.9
	No	109	32.1
Healthy dietary habits	No	231	67.9
	Yes	109	32.1

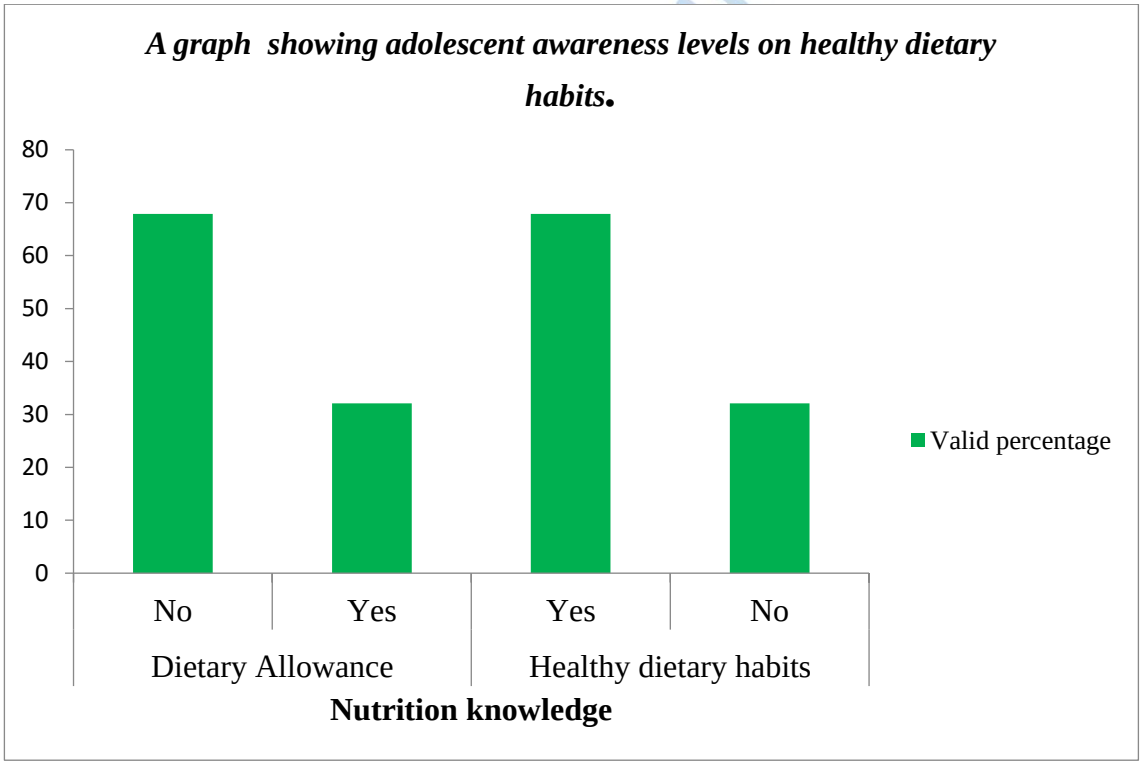

Figure 4: A graph showing adolescent awareness levels healthy dietary habits.

4.7.1 Association between adolescent nutrition awareness and nutrition status

Tables 10 and 11 below show that of the participants who were aware of healthy dietary practices, 70.2% had good nutrition status and only 29.8% had poor nutrition status.48.2% of individuals who were ignorant of good eating practices had low nutrition, or more accurately, were malnourished.

Healthy dietary habits play a crucial role in determining the nutrition status of individuals. Adopting and maintaining positive dietary habits contribute to overall well-being, support optimal growth and development, and reduce the risk of nutrition-related health issues. Adequate nutrition awareness on dietary habits can contribute to the prevention of nutrient deficiencies. Adolescents who are aware of the importance of various nutrients are more likely to include a variety of foods in their diet to meet their nutritional needs. When the chi-square test was used to determine the independence between nutrition status and awareness of healthy eating practices, there was a significant statistical relationship ($X2=12.077, df=1, p=0.001$).These findings were consistent in the binary logistic analysis where healthy dietary habit was an independent factor for nutrition status($p=.001$). Furthermore, study respondents who practiced healthy dietary habits were 2.2 times more likely to have a normal nutrition status as compared to their counterparts. The adoption of these healthy dietary habits collectively contributes to positive nutrition outcomes, reduces the risk of nutrient deficiencies or excesses, and supports overall health and well-being

These findings were in agreement with the qualitative data where one of the key informants narrated that:

"I would say the association between awareness on healthy dietary habits and nutrition status is profound, as dietary choices directly impact the intake of essential nutrients,

energy balance, and overall well-being. Choosing which food to eat is often governed by the dietary habits we attribute to being healthy. Though we have not concertrated much on including these in curricula of the school, our canteens usually sell bananas and aocados because they are widely grown in the region."

Study findings were in harmony with those of a study carried out in Uganda where healthy dietary habits were associated with good nutrition status (Saaka *et al*., 2021). This was contrary to another study carried out in Ethiopia (Bikila *et al.*, 2023)

Table 10:Association between adolescent nutrition awareness and nutrition status

Independent variables	Categories	Nutrition status		Statistical Significance (Chi-square test)
		Mal-nourished N(=126)	Well-nourished N(=214)	
Knows about healthy dietary habits	Yes	62(29.8%)	146(70.2%)	X^2=12.077 df=1 p=0.001
	No	64(48.5%)	68(51.5%)	

Table 11: Logistic analysis Analysis Between Adolescent Nutrition Awareness and Nutrition Status

			B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
									Lower	Upper
Step 1[a]	dietary Awareness	habits	-.797	.234	11.591	1	.001	2.2	.285	.713
								Ref		

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Preamble

The study's summary, conclusion, and recommendations are all included in this section.

5.1 Summary

From the first objective, which was to assess the nutrition status of the selected secondary school adolescents.Majority (62.9%) of the participating adolescents had a normal nutrition status while the rest (37.1%) had a form of malnutrition (<-3SD, <-2SD, <-31D and >+1SD, >+2SD) . The most prevalent form of malnutrition was overweight. Most of the study participants (87.4%) had their MUAC above 18.5cm while a few (12.6%) were underweight with a MUAC less than 18.5cm.

From the second objective on social demographic and economic factors associated with nutrition status, the following variables were evaluated against nutrition status which included, age, gender of the study respondents, guardian's education level, marital status, occupation, household head and household number of the adolescent.

The variables, gender of the study respondents, occupation, education level, guardian's occupation, household size, and head of household were found to be statistically associated with nutrition status hence they were imported for multivariate analysis. However the following variables, marital status, area of residence, and age of the study partaker didn't reveal any statistical significance during bi-variate analysis.

From the third objective on the association between dietary diversity score and nutrition status. The following variables, dietary diversity score and meal frequency were found to

be statistically associated with nutrition status hence they were imported for multivariate analysis.

Finally from the fourth objective on the association between nutrition awareness and nutrition status. The following variables, Awareness of nutrition awareness and healthy dietary habits were found to be statistically associated with nutrition status hence they were imported for multivariate analysis. However, the following variable; Awareness of recommended dietary allowance didn't reveal any statistical significance during bivariate analysis.

5.2 Conclusion

From the first objective, A significant number 37.1% of the study respondents had malnutrition which is a public health concern. Overweight was the prevalent form of malnutrition among these adolescents. From the second objective on social demographic and economic factors associated with nutrition status; households that were father-headed, having a small household size of 1-4 members, and being employed increased the odds of having a normal nutrition status while having a primary level of education reduced the odds of having a normal nutrition status. From the third objective on the association between dietary diversity score and nutrition status; having met the recommended number of meal frequency increased the odds of having a normal nutrition status while having an inadequate dietary score increased the odds of having malnutrition. Finally from the fourth objective on the association between nutrition awareness and nutrition status; being aware of healthy dietary habits increased the odds of having a normal nutrition status.

5.3 Recommendations

5.3.1 Recommendations from the study

- The Ugandan **ministry of Health and Education**, alongside relevant stakeholders, should assimilate nutrition education into school curricula to enhance adolescents' understanding of healthy eating habits. Practical components to name climate-smart school gardens, cooking classes, and awareness packages that target both students and parents. Partnerships between schools and healthcare professionals to support key dietary habits uptake.
- The Ugandan ministry of Health and Education should include funding to improve school feeding programs that safeguard diverse and balanced meal choices. If schools adapt their food environments to support increased diversity of foods sold in school canteens, establish kitchen gardens that ensure consistent vegetable supplies all over the year.
- To confront the impact of economic and social factors on adolescent nutrition, schools and stakeholders should engage guardians in nutrition awareness programs. Such as programs that educate families on affordable, nutritious meal options to improve adolescents' dietary habits at home.
- The ministry of Health and Education should launch nutrition awareness campaigns that emphasize the importance of portion control, regular meals, dietary diversity. Additionally, policies that regulate high-calorie snacks and incorporate physical exercise programs should be created to prevent malnutrition especially obesity among students.

5.3.2 Recommendation for further research

The study recommends an intervention study to evaluate the role of nutrition education programs on the nutrition status of school-going adolescents. Also more longitudinal studies with regards to this study are highly needed.

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APPENDICES

Appendices 1:Ascent and Informed consent form

Good morning/afternoon Mr/Ms… My name is Natukunda Angella, a masters in public health student at Mount Kenya and my colleague is …… We would like to collect some information for a research project on secondary school adolescents.

"To find out the factors that influence of nutrition status among adolescents in selected secondary schools in rural Kanungu District Uganda" is the overarching goal of this study. The goal of the study is to comprehend the factors that influence adolescents' nutritional status in a chosen secondary school in Uganda's rural Kanungu District. The data gathered will only be published to support adolescent programs in comparable environments and used strictly for scholarly purposes. This study takes into account all teenagers enrolled in the chosen secondary schools, aged 13 to 19.

Please, note Mr/Ms _____ we hereby invite you to participate in this study. Before you decide it is important that you understand the background of the study, its purpose, procedures involved, potential risks and benefits and your rights as participant. Please know that your participation in this study is voluntary. You will not be penalized in any way if you reject to take part in this study. You have a right to withdraw from this research study at any moment during the data collection process. The data collection process will involve;

1. We shall assess your nutrition status through taking measurements of your height, weight and arm so as to calculate your BMI (Body Mass Index) and MUAC (middle upper arm circumference).
2. We shall invite you to answer a semi-structured questionnaire on four sections, social –demographics and economics, diet related factors, awareness on dietary patterns.
3. This data will be collected at a time that does not inconvenience your class work for period of 3 20 to minutes.

Mr/Ms _____ please be informed that this study will not grant you instantaneous or direct benefits.the information. It may assist in developing secondary school nutrition policies that are aimed at improving adolescent nutrition status.

Risk of the study: I affirm to you that there will be no foreseen risks during the time of study.

You by signing this form is a confirmation to show you agree to publishing of this study. Your identity will be kept confidential.

Compensation note: You will not be paid to take part in this study. During the data collection process, you can ask or report any worries by calling reporting to headteacher or masters student researcher on;

Angella Natukunda Phone Number: +254 718582380 / +256780671687 masters student

ADOLESCENT STATEMENT OF CONSENT

I _____have understood the aim of this study and how I am expected to be involved. Hence, I willingly accept to participate in this study and confirm my acceptance by signing/putting my thumb print below.

Participant's signature/Thumb print
……..……
Date ……..……...

PARENT CONSENT FORM (*For adolescents under 18 years*)

I _____have understood the objective of this study and how I am expected to be involved. Hence, I willingly accept my child to participate in this study and confirm my acceptance by signing/putting my thumb print below.

Participant's signature/Thumb print
……..……
Date ……..……...

Appendices 2:Questionnaire

Semi-structured questionnaire and consent form for adolescent Learner

Questionnaire ID; ……
Interview date: …….
Name of School:……
Interview Date:……
Dear respondent, please be informed that this questionnaire is not evaluate you or disapprove you so don't feel pressured or stressed to answer a question. Feel free to revise the information sheet and respond to the questions at your pace.

SECTION A: NUTRITION STATUS ASSESSMENT

SEX	AGE	
BMI MEASUREMENTS		
HEIGHT 1	HEIGHT 2	AVERAGE
WEIGHT 1	WEIGHT 2	`

MUAC; …….

SECTION B: SOCIAL-DEMOGRAPHIC AND ECONOMIC DATA

This section requires student's information about yourself. Please make the most appropriate answer

1. Study respondents' gender

a. Male
b. Female

2. How many people live in your household?

……..

3. Describe the type of area where you stay.

a. Urban [ ]
b. Peri-Urban [ ]
c. Rural [ ]

4.Who is the head in your household? (who caters for financial decisions at your home)

……..

Guardianship

*1.*Guardian Status of Marriage

a. Married [ ]
b. Divorced [ ]
c. Single [ ]
d. Widowed [ ]
e. Separated [ ]

2. Guardian's Level of education

a. No formal education [ ]
b. Primary school [ ]
c. Secondary school [ ]
d. Vocational training [ ]
e. College/university [ ]

3. Guardian's Typeof employment

a. Formal employment [ ]
b. No employment [ ]
c. Self employment [ ]

SECTION C: DIETARY PRACTICES

MEAL FREQUENCY

1. Are you given meals by the school administration ?

a) Yes b) No

If yes, how many meals are provided per day?.....

Fill in the table by either ticking yes or no

Did you have the meal below in the past week? If no, tick the reason why didn't you have the meal?							
Type of meal	Yes	No	Had no time	Had no money	Had no appetite due to illness	Don't like the meal	Other reason
a.Breakfast (When you woke up, what was the food you ate							
b. Mid-morning snack (10:00- 11:59)am							
c. Lunch (12:00-2:30)pm							
d. Evening snack(2:31- 6:29)							
e. Supper(6:30- 8:00) pm							

24-HOUR RECALL

Please tell me description of what the meal was composed of Starting at the time you woke up, what did you eat and drink? What would you eat if yesterday wasn't a typical day—say, if it had been your birthday.

Time (When meal was taken)	Food description (meal composition and preparation)	Method of preparation	Source (Place where food was received from e.g canteen, home)
Breakfast			
Snack			
Lunch			
Snack			
Supper			
Snack			

SECTION D; ADOLESCENT NUTRITION AWARENESS

"I am going to ask you some questions about the adolescents' food-based dietary guidelines. Please let me know if you need me to clarify any of my questions. Feel free to ask any question you may have. Every answer is fine"Please tick the most appropriate answer. (Kindly note this is not an evaluation, answer the question according to your awareness whether you agree or disagree with the stated statement on food guidelines for an adolescent)

Statement	*This section is to be filled by respondent*		*This section is to filled by the researcher*	
	True	False	Knows	Does not Know
1. Eating fruits and vegetables good for our bodies to fight against flues and other body illness?				
2. A balanced diet and high water intake is the most important for adolescents				
3. Sausages and chips provide no nutrients but energy				
4. Carbohydrates, fats, meats, salt, vitamins. Proteins and water are the 6 essential nutrients. Is a good idea to eat				
5. Proteins are foods such as beans , eggs and Milk				
6. It is good that half a meal taken is Vegetables				
7. Not eating enough fruits and vegetables can lead to low immunity				
8. Adolescents are not a risk of malnutrition since they are of good age				
9. Bad nutrition is eating too much for the body or too small				
10. Carbohydrates (Posho, cassava) should be ½ of the plate				

Adolescents awareness score			

Appendices 3:Questionnaire for Head teacher

Respondent ID ……..…… School ID ……..…….

Social-demographic and economics

1. Do social demographic factors and economic factors that could influence the nutrition status of adolescents in your school ? (Please give the explain how they do affect their nutrition status)

……

Meal frequency

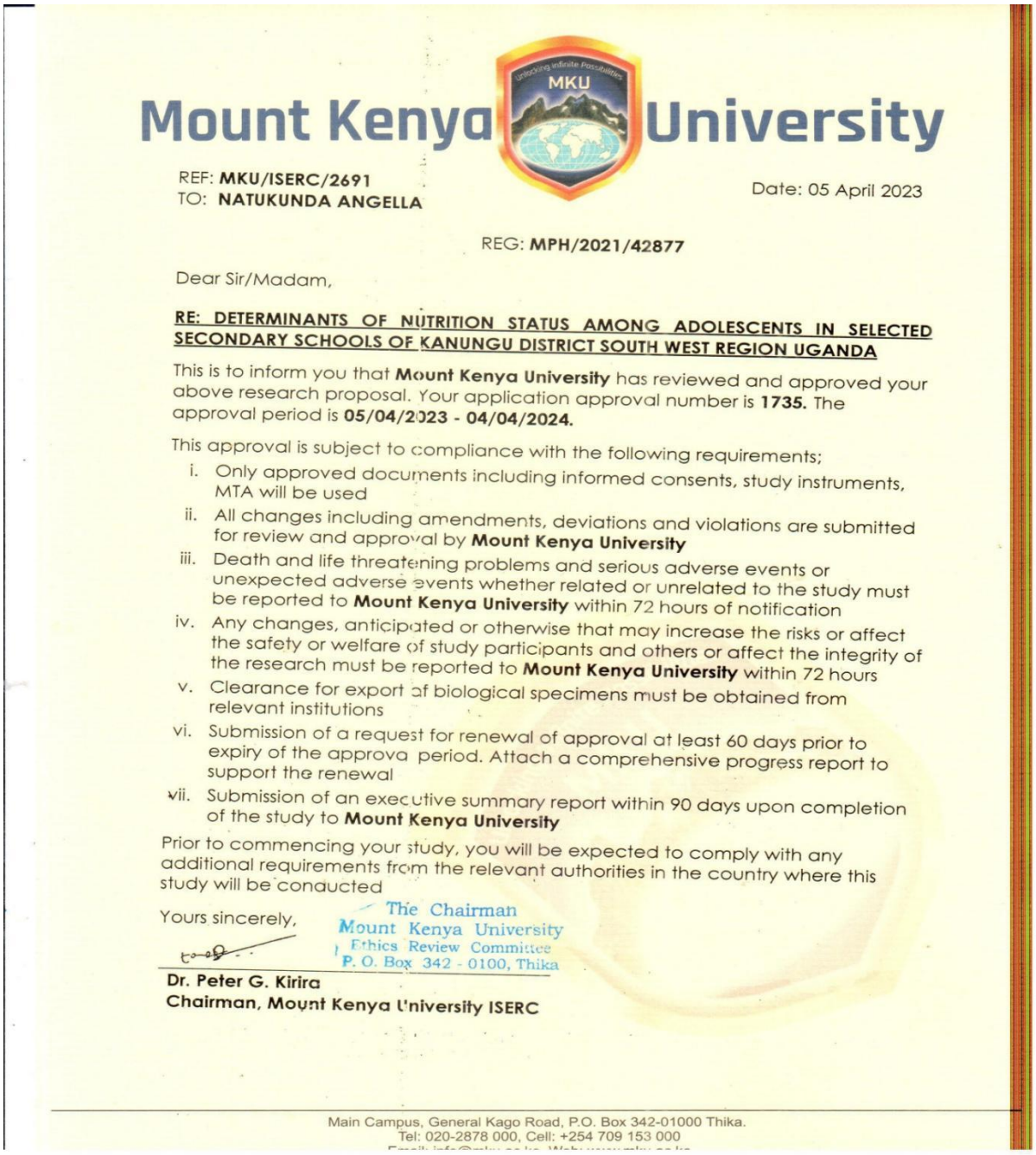
2. How often are meals provided at your school (Explaining how the number of meals could influence the adolescents nutrition status)

3. What are the most consumed fruits and vegetables by the learners? (Please explain the source and any seasonal effects)

Nutrition awareness

4. Are nutrition education programs important for one's nutrition status? Are they provided at your school (Explaining reasons to your answer)

Appendices 4: Mount Kenya ERC Certificate



Mount Kenya University

REF: **MKU/ISERC/2691**
TO: **NATUKUNDA ANGELLA**

Date: 05 April 2023

REG: **MPH/2021/42877**

Dear Sir/Madam,

RE: DETERMINANTS OF NUTRITION STATUS AMONG ADOLESCENTS IN SELECTED SECONDARY SCHOOLS OF KANUNGU DISTRICT SOUTH WEST REGION UGANDA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **1735.** The approval period is **05/04/2023 - 04/04/2024.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approva period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to comply with any additional requirements from the relevant authorities in the country where this study will be conducted

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Dr. Peter G. Kirira
Chairman, Mount Kenya University ISERC

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: 020-2878 000, Cell: +254 709 153 000

Appendices 5: Introductory Letter

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2021/42877

6th April, 2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: NATUKUNDA ANGELA – REGISTRATION NO. MPH/2021/42877

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health** in the department of **Community Health Epidemiology and Biostatistics** in the school of **Public Health.**

The title of the research is **"Determinants of Nutrition Status Among Adolescents in Selected Secondary Schools of Kanungu District South West Region Uganda."**

It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **April, 2023 and June, 2023.**

Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University
P. O. Box 342 - 01000, THIKA
Office of the Director
Graduate Studies

Dr. Samuel M. Kareng'a, Ph.D
Director, Graduate Studies
Enc.

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: 020-2878 000, Cell: +254 709 153 000
Email: info@mku.ac.ke, Web: www.mku.ac.ke
Chartered and ISO 9001 : 2015 Certified Institution.
Unlocking Infinite Possibilities

Appendices 5: Introduction letter from the district to the schools

Telephone Contacts:
CAO: 0772 320 912
PAS: 0772 423 804
PHRO: 0784 922 525

Our Ref: ***CR/164/1***
Your Ref:

KANUNGU DISTRICT LOCAL GOVERNMENT
Office of the Chief Administrative Officer
P. O Box 1,
Kanungu - Uganda

24TH February 2023

To: All Head teachers/Secondary

.....

RE: INTRODUCTORY LETTER

This is to introduce **Ms. NATUKUNDA ANGELLA** a student at Mount Kenya University pursuing a Master of Public Health.

The topic of her study is Determinants of Nutrition Status Among Adolescents in the Secondary Schools of Kanungu District, South West Region Uganda.

The purpose of this communication is to request you to accord her any necessary assistance during the period of her training.

Yours faithfully,

CHIEF ADMINISTRATIVE OFFICER
KANUNGU DISTRICT

Tweheyo Betega David
CHIEF ADMINISTRATIVE OFFICER/KANUNGU DLG

Appendices 6: UNCST (Uganda National Council of Science and Technology) Permit from Uganda

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

Our Ref: SS1812ES **14 July 2023**

Angella Natukunda
Mount Kenya University
Kampala

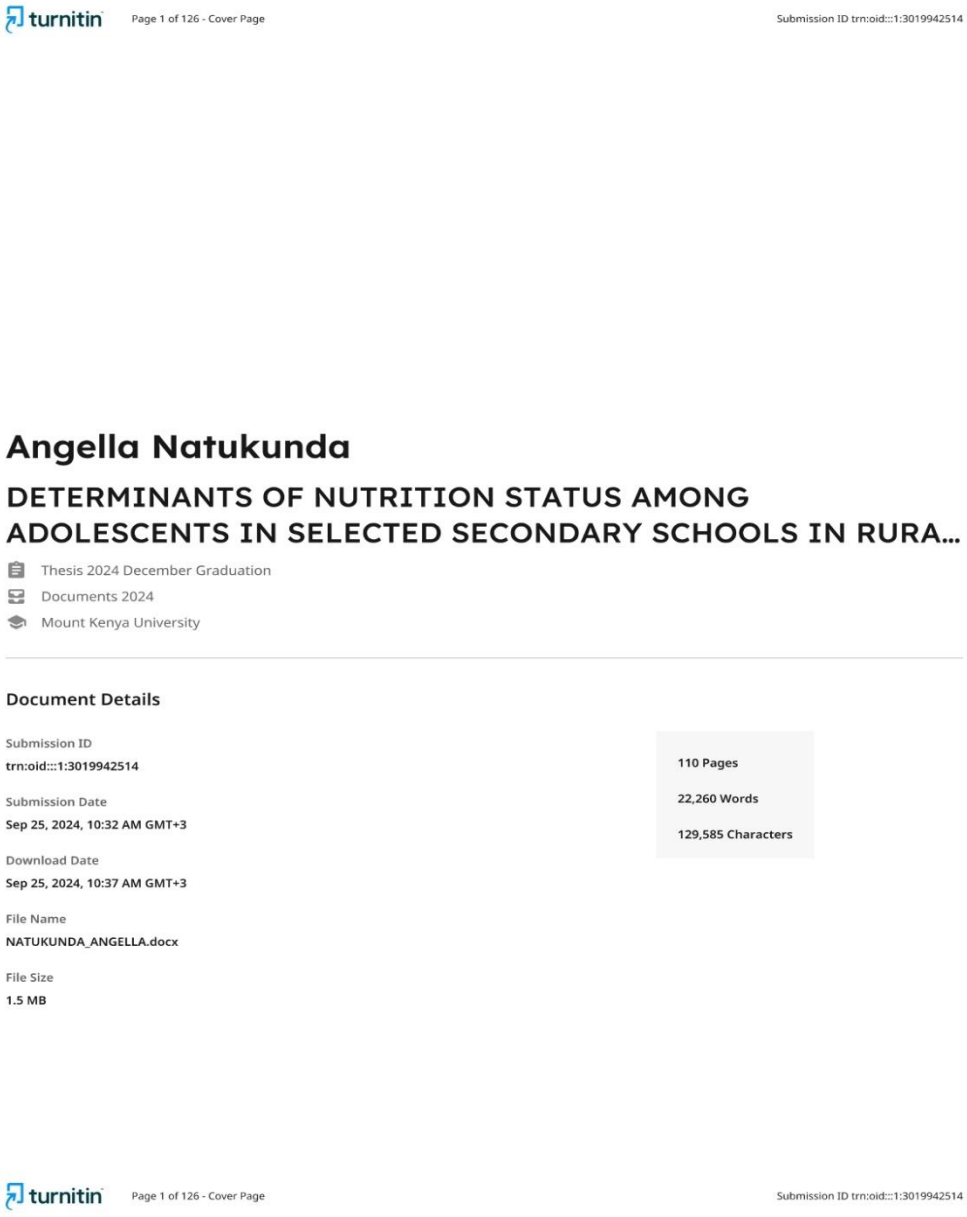
Re: Research Approval: **DETERMINANTS OF NUTRITION STATUS AMONG ADOLESCENTS IN SELECTED SECONDARY SCHOOLS OF KANUNGU DISTRICT SOUTH WEST REGION UGANDA**

I am pleased to inform you that on **14/07/2023**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **14/07/2023** to **14/07/2024**.

Your research registration number with the UNCST is **SS1812ES**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project. As the Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. Keeping all co-investigators informed of the status of the research.
2. Submitting all changes, amendments, and addenda to the research protocol or the consent form (where applicable) to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority and a notification to the UNCST.
4. Unanticipated problems involving risks to research participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST notification after review by the REC.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.

Appendices 7:Similarity Index Report



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Angella Natukunda

DETERMINANTS OF NUTRITION STATUS AMONG ADOLESCENTS IN SELECTED SECONDARY SCHOOLS IN RURA...

Thesis 2024 December Graduation

Documents 2024

Mount Kenya University

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Appendices 8:Map and Location of the study area Kanungu district in Uganda