A CASE CONTROL STUDY ON THE INFLUENCE OF HOUSEHOLD COMMERCIAL SUGARCANE GROWING ON THE NUTRITION STATUS OF CHILDREN UNDER FIVE YEARS IN NAMUTUMBA DISTRICT

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Declaration

I, **Odyek Joseph** declare that this particular dissertation is out of my original study and has never been submitted to any institution of higher learning for a similar purpose.

Signature…….. ……...

Odyek Joseph Date

2012-MPH-PT-031

I affirm that the above declaration is true to the best of my knowledge, and that this Dissertation has been supervised by me in accordance with the Institute of Health Policy And Management

Signed: ……..... Date: ……

Supervisor: **Dr. Kirabira Peter**

DEDICATION

I dedicate this report to My Late Mother Noelina Nakigonya for her commitment, encouragement and support she provided me while pursuing the Masters of Science Public Health of International Health Sciences University.

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ABSTRACT

Introduction: The nutrition status of children of less than five years is an important determinant to child growth and development. Poor nutrition status contributes to child morbidity and mortality as a result of poor feeding practices, child care, and agricultural practices. According to the Food and Agriculture Organization (FAO) 2012, 870 million people in the world do not have enough to eat and the vast majority of hungry people 98% live in developing countries, where almost 15% of the population is undernourished and over 28 percent of all deaths in Africa. In Uganda, there has been an increase in stunting from 39% in 2006 to 47% in 2011, underweight is 17% in 2011 and wasting is 8% and prevalence of anemia is 50% among children under five (UDHS 2011).

Objective: The study aimed to assess the influence of household commercial sugarcane growing on the nutritional status of children below the age of five in Namutumba district.

Methodology: A case-control study design was used to compare (cases) households growing sugar cane and (controls) not growing households growing sugar cane and how this is associated with the nutrition status of children. Collected quantitative data from 390 participants (130 cases and 260 controls) using questionnaires, while the qualitative data was collected through 8 Focus Group Discussions and 9 Key Informer Interviews. The quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) while the qualitative data was analyzed manually using a Manifest Content Analysis method, presented in verbatim.

Results: The study findings showed that the prevalence of stunting was critically high (56.9%) among the cases greater than the WHO recommended levels of stunting of 20% and national level of 47% (UDHS 2011). From further analysis (multivariate) with logistic regression, the

variables that had significant association with the nutrition status of children among cases were age of the head of the household ($p<0.040$), children above 25 months ($p<0.013$) frequency of breast feeding ($p<0.013$), frequency of complementary feeding ($p<0.046$), land size by acreage (less than one acre with $p<0.008$ with and (with 2-3 acres 0.035 with $p<0.035$ and common diseases like measles ($p<0.014$), and skin diseases ($p<0.006$) and where households where accessing the health facilities ($p<0.043$). The common staples associated with poor nutrition status included matooke and other plantain (<0.012) and porridge, bread, rice, millet, maize and other grains ($p<0.004$.) while among the controls were frequency of breast feeding (breastfed only once a day with $p<0.022$) and land size (2-3 acres $p<0.020$).

Conclusions and Recommendations: Therefore, there is need to develop and enforce bi-laws that limit sugar cane growing in relation to the size of land household members, train health workers on nutrition interventions to support households make informed decisions, Support mothers with complementary feeding practices, diet diversification, strengthen the control and coverage for measles, skin diseases and deworming and support farmers with knowledge of growing variety of food and control commercialization of foods grown at household level and improve land ownership practices.

LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
CI	Confidence Interval
FAO	Food Agricultural Organization
FGD	Focus Group Discussion
GDP	Gross Development Product
HC	Health Centre
HFA	Height for Age
IHSU	International Health Science University
IMAM	Integrated Management of Acute Malnutrition
IYCF	Infant and Young Child Feeding
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
MDG	Millennium Development Goals
MoH	Ministry of Health
MUAC	Mid Upper Arm Circumference
NCHS	National Centre for Health Statistics
OR	Odds Ratio
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SPSS	Statistical Packaged for Social Sciences
UAIS	Uganda AIDS Indicator Survey
UBOS	Uganda Bureau Of Statistics
UDHS	Uganda Demographic Health Survey

UNAP	Uganda Nutrition Action Plan
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WFA	Weight for Age
WFH	Weight for Height
WFP	World Food Programme

OPERATIONAL DEFINITIONS

Complementary feeding: Giving other foods (called complementary foods) in addition to breast milk.

Exclusive breastfeeding: Giving the infant no other food or drink, not even water, apart from breast milk (including expressed breast milk), with the exception of drops or syrups consisting of vitamins, mineral supplements or prescribed medicines.

Households growing sugar cane: These were be homes where the main agricultural activity is sugar cane growing.

Mid Upper Arm Circumference Green (Normal): This indicates children well nourished.

Mid Upper Arm Circumference Yellow (Moderate): This indicates children with some degree of malnutrition.

Mid Upper Arm Circumference (Severe): This indicates children with severe malnutrition.

Severe Acute Malnutrition (SAM) (Wasting): This is defined as a weight-for-height (WFH) measurement of <70% of the median or <-3 SD below the mean NCHS reference values or the presence of bilateral pitting edema. Or the thinness which indicates in most cases a recent and severe process of weight loss that is often associated with acute starvation and/or severe disease.

Stunting: This is low Height-For-Age age below -2 SD from the NCHS/WHO reference median value.which reflects a process to reach linear growth potential as a result of suboptimal health and/or nutritional condition.

Underweight: This refers to Weight-for-Age that is less than (<) -2 SD from the National Centre for Health Statistics (NCHS)/World Health Organization (WHO) reference median value.

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CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter documents details of the back ground of the study, the statement of the problem, general objective, specific objectives, research questions, hypothesis, justification of the problem scope of the study and the significance of the study.

1.1 Background

Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and cognitive development. Economic growth and human development require well nourished populations who can learn new skills, think critically and contribute to their communities Liu *et al*, (2012). Child malnutrition impacts cognitive function and contributes to poverty through impeding individuals' ability to lead productive lives. In addition, it is estimated that more than one-third of under-five deaths are attributable to under nutrition Black *et al*, (2008).

The World Health Organization (WHO, 2001) defines malnutrition as the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions of the body. The World Food Programme (WFP, 2010) defines malnutrition as a state in which the physical function of an individual is impaired to the point where he or she can no longer maintain adequate bodily performance process such as growth, pregnancy, lactation, physical work and resisting and recovering from disease. And according to Ministry of Health Uganda 2010, Malnutrition is defined as a condition that results from the deficiency of protein, energy, minerals as well as vitamins leading to loss of body fats and muscle tissues.

Globally, the WHO considers malnutrition as a serious threat to public health, especially in Infants and young children (Global strategy on Infant and Young Child Feeding (IYCF), 2002/12). Malnutrition as result of under nutrition is associated with a majority of child deaths and stunts physical and mental development with serious implications for national productivity and wellbeing Grantham-McGregor, *et al.*, (2007).

According to the Food and Agriculture Organization (FAO, 2012), 870 million people in the world do not have enough to eat. The vast majority of hungry people 98% live in developing countries, where almost 15% of the population is undernourished. Poor nutrition causes nearly half 45% (3.1 million) of deaths in children under five children each year (Lancet, 2013). One out of six children approximately 100 million in developing countries is underweight and one in four of the world's children are stunted (WHO, 2011) and recent estimates indicate that globally over two billion people are at risk for vitamin A, iodine, and iron deficiency, in spite of recent efforts in the prevention and control of these deficiencies. According to UNICEF 2009, there are approximately 195 million children stunted in developing countries (one in three children) with Africa and Asia having high stunting rates of 40% and 36%, respectively and more than 90% of the world's stunted children live on these two continents. Children who suffer from wasting face a markedly increased chance of death and according to UNICEF 2009, 13% of children under 5 years old in the developing world are wasted, and 5% are extremely wasted, an estimated 26 million children worldwide and there are 129 million children under 5 years old in the developing world underweight, nearly one in four in children and 10% of children in the developing world are severely underweight**.** Under nutrition accounts for 11 per cent of the global burden of disease and is considered the number one risk to health worldwide (Black R E,

et al (2008)). Child under nutrition remains one of the most fundamental challenges for improved human development. Under nutrition is a major risk factor for over 28 percent of all deaths in Africa and there 2.9 million deaths annually Ezzati *et al, (*2003). Children on the continent are unable to access and effectively use at all times the food they need for a healthy life. An estimated 200 million people on the continent, both children and adults, are undernourished, their numbers having increased by almost 20 percent since the early 1990s (FAO, 2003).

In Africa like in western Kenya, most nutrition problems stem from nutrition insecurity, poor complementary feeding practices and poverty. The agricultural sector presents the greatest potential for achieving sustained improvement in the nutritional status of the rural poor. Whereas cash crops can increase rural incomes, they tend to reduce diversity of crop mix. Kennedy, .E and B. Cogill, (1987) and this is often associated with increased risk of malnutrition. According to Fleuret P *et al* (1980), studies on the effect of mixed farming on income, food security and nutritional status show that a mix of subsistence, cash crops and livestock production are likely to result in increased food availability, thereby improving nutrition of rural farming communities.

Despite Uganda's fertile soils and adequate food supplies, the nutrition status of children remains significant challenges that impact the country's human development and economic growth. Among children less than five years, poor nutrition contributes to 60 percent of deaths (Uganda Bureau of Statistics (UBOS, 2007).

According to the UDHS, there has been an increase in stunting from 39% in 2006 to 47% in 2011, underweight is 17% in 2011 and wasting is 8% and prevalence of anemia is 50% among children under five. Under nutrition contributes to 14% low birth weight infants, more than half

of all child deaths, and thus to Uganda's low life expectancy at birth (53 years) and ranking on under five mortality rate 19th in the world at 128/100,000) UNICEF, 2008). The malnutrition situation in eastern region is above the WHO 2003 recommendations of Global Acute Malnutrition (GAM) greater than 5 %. According to the UDHS 2011 stunting in the east-central region where Namutumba is located is at 46% above 40% recommendations by WHO, (2003) and this is categorized as high. The anemia prevalence is 68% among children under 5 years above WHO recommendations of 40% and thus the region classified to be having severe anemia.

Micronutrient deficiencies in Vitamin A, Iron, Iodine and Zinc cost lives, diminish productivity and cause significant human capital and economic losses. More than 1500 women die annually of causes related to anaemia, 6,000 low birth weight infants and 67,000 hungry children (cost of huger report, 2012).Thus, despite abundant food availability, the causes of under nutrition among women and children in Uganda vary depending on the regions. These include limited diet diversification resulting from dependence agriculture practices and commercial farming like growing sugar cane

Feeding practices influenced by agriculture practices at household level play a significant role in influencing the nutrition status of children less than five years. Only 36% of children 6 to 23 months in east central region (UDHS 2011) where Namutumba is located consume a minimal acceptable diet of 4 or more food groups, at least twice a day (Infant and Young Child Feeding (IYCF) guidelines, 2010).

1.2 Background of the Study area

The study was carried out in Namutumba district located in central east region commonly known as Busoga region and is approximately 125 kilo meters from Kampala city. According to

Namutumba district reports 2009, the district is bordering Iganga District in the South, Bugiri in the South East, Kaliro and Pallisa in the North and Butaleja in the East. Namutumba District was created by Act of the Ugandan Parliament in 2005 and became operational on 1 July 2006. Prior to that the district was part of Iganga District and was known as Busiki County. Namutumba district has one county, seven sub-counties, 36 parishes' and 348 villages as the administrative units with agriculture as the main livelihood activity.

The district is divided into the following administrative divisions: Bulange sub-county, Ivukula Sub-county, Kibaale sub-county, Magada sub-county, Namutumba Sub-county, Namutumba town Council and Nsinze Sub-county. The District is 801.87 square kilo meters most of which is land. The district has 2 small lakes located in Ivukula Sub County. The total area covered by water bodies including wetlands is 137.94 square kilo meters. Namutumba district is comprised of remnant Busoga surfaces and valleys. According to the 2002 population and housing census, the district has a population of 167,691 and annual growth rate of 2.6 % (Census, 2002) compared to the national average of 3.3% (Census, 2002). It is estimated that the population of Namutumba District was approximately 1,310,100 in 2010 and children less than 5 years were 248,919.

Agriculture is the main economic activity in Namutumba District. There are many small producers engaged in a wide range of crops like sugar cane, cotton, coffee which are grown for cash while maize , beans, groundnuts, cassava, rice, sweet potatoes, millet and bananas are major food crops. Over 80% of the farmers practice subsistence agriculture and in most cases the production is not economically viable.

1.3 Statement of the problem

The role of agriculture in improving the nutrition status of children less than five years has been a subject of concern and to whether to promote the growing of subsistence crops or cash crops for domestic and export market. In Uganda especially the central east (Busoga region) where Namutumba is located, more people have taken to growing sugarcane on a commercial basis, resulting in the conversion of different land-use types to monoculture sugarcane plantations.

According to the Uganda Demographic Health Survey (UDHS) 2011, the east central region where Namutumba district is located has high rates of malnutrition especially among children less than five years with severe stunting at 34% compared to the national prevalence of 33% and severe wasting is 5% similar to the national prevalence, the prevalence of anemia is 68% compared to the national prevalence of 50% among children under five. Namutumba district nutrition survey report 2011, indicates that the district has been affected by high Global Acute Malnutrition (GAM) rates at 7.2 % and the prevalence of Severe Acute Malnutrition (SAM) at 4.3 % among children 6-59-months predisposing children less than five years.

The consequences of malnutrition are diverse and at an early age include reduced physical and mental development during childhood. It leads to stunting that affects educational achievements, Iodine deficiency that causes of mental retardation and brain damage. According to study done by the department of Forestry Bio-diversity and Tourism Makerere university in 2011 that the nutrition status among children less than five years in Namutumba district have been worsened by farming practices like increasing sugar cane growing practices that has influenced the growing of indigenous food crops due to commercialization of agriculture in the Uganda. This

has affected availability of food for households in Namutumba district and thus predisposing children less than five years to malnutrition.

It is on the premise of this that a case-control study was carried out to ascertain the influence of household commercial sugarcane growing on the nutritional status of the children below the age of five in Namutumba district in Uganda.

1.4 Study objectives

1.4.1 General objectives

The purpose of this study is to assess the influence of household commercial sugarcane growing on the nutritional status of children below the age of five in Namutumba district.

1.4.2 Specific objectives

i. To determine the prevalence of malnutrition among household growing both sugar cane and other food crops in Namutumba district.
ii. To identify the feeding practices influencing the nutrition status of children in households growing sugar cane and other food crops in Namutumba district.
iii. To establish the relationship between the sugarcane farming practices and the nutrition status of children less than five years in Namutumba district.
iv. To identify the familial factors of households growing sugar cane and other food crops influencing nutrition status of children less than five years in Namutumba district.
v. To examine the relationship between child caring practices of households growing sugar cane and other food crops influencing nutrition status of children less than five years in Namutumba district.

1.5 Research Questions

What is the prevalence of malnutrition among household growing both sugar cane and other food crops in Namutumba district?

What is the relationship between feeding practices and the nutrition status of children in households growing sugar cane and other food crops in Namutumba district?

How is sugarcane farming practices influencing the nutrition status of children less than five years in Namutumba district?

How are the familial factors influencing nutrition status of children less than five years among of households growing sugar cane and other food crops in Namutumba district?

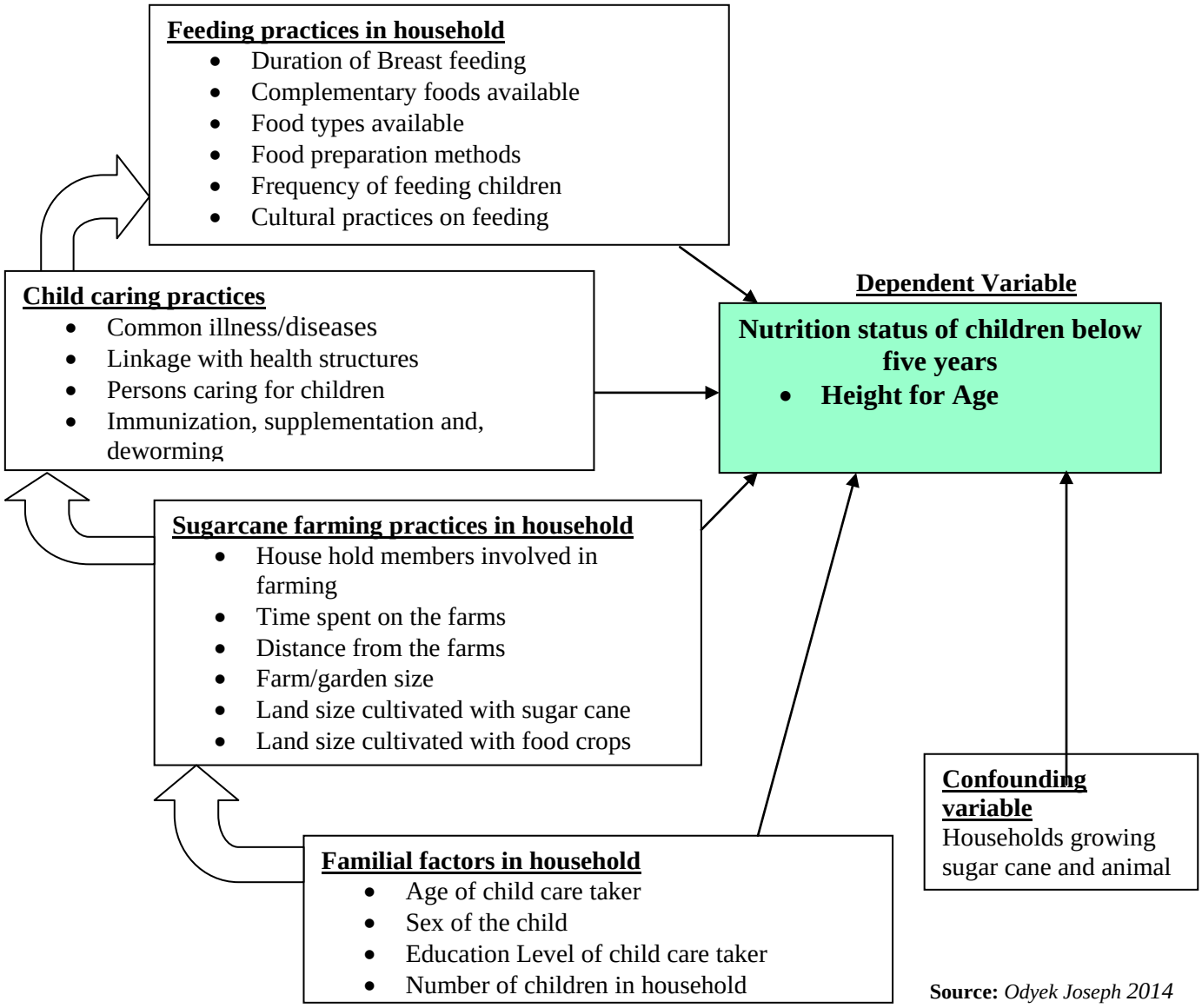
1.6 Research Hypothesis

The growing of sugar cane and other food crops affects the nutrition status of children of children less than five years in Namutumba district.

Feeding practices among sugar cane growing households and food crops affect the nutrition status of children below 5 years

1.7 Conceptual framework

Independent variables



Source: *Odyek Joseph 2014*

1.9 Justification and Significance of the study

The study findings may guide the administration and community of Namutumba district as well as the east central region and Uganda to review, develop and enact policies, guidelines, plans, and advocacy strategies to guide in land protection of households susceptible for land persuasion

and eviction to grow commercial crops that will not improve the nutrition security of households to overcome the burden of under nutrition in the household among children lees than five years.

The study might support the district of Namutumba to develop policies/bi laws that will guide in land use that is designate land to be used for both commercial and subsistence farming in the district.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter documents details of the actual literature review of the research, in depth analysis of previous studies in relation to the prevalence of malnutrition targeting three nutrition indices stunting, wasting and underweight among household growing both sugar cane and other food crops, feeding practices, sugarcane farming practices and familial factors that are influencing the nutrition status of children less than five years in households growing sugar cane and other food crops in Namutumba district.

Most of the previous research studies on the influence of commercial cash crop production on the nutrition status of individuals globally, Sub Saharan Africa, East Africa and in Uganda have concentrated on evaluating outcomes that is cash cropping good or bad. The approach to the studies is notably simplistic, since presumably cash crops can have different influence on income, consumption, and health. More important, the results of these types of studies whether positive or negative have limited usefulness for policy formulation. Emphasis exclusively on outcomes tells us nothing about the mechanisms through which commercial agriculture like commercial sugar cane farming affects the nutrition of children less than five years.

2.1 Assessment for the prevalence of malnutrition

The overall health is related to the foods one puts into the body. Having a deficiency of a nutrient may increase ones risk of illness. It is important to carry out a nutritional assessment for one's current and future nutrition status, even if one appears to be generally healthy. Nutritional status of a child can be determined through measurement of growth and body composition and through clinical examination of external physical signs of nutrient deficiencies.

Anthropometric indices are related to body size and composition and at the individual level, anthropometry is used to assess the person as being in need of special interventions. Anthropometric indices like Weight for Age (WFA), Height (length) for Age (HFA), and Weight for Height/Length) (WFH/L) are used when compared to a reference standards of anthropometry to assess the magnitude, distribution and severity of a nutritional problem in an area. Underweight, stunting, and wasting, are the nutrition indices for the nutritional status concerned in anthropometric assessment.

2.1.1 under weight

Underweight is the most common assessment of child nutrition status. It is routinely collected in growth promotion programs, and is a good indicator for children less than 24 months because of the need to do precise measurements of weight for these age groups. Weight-for-age has historically been the most commonly used index of childhood under nutrition and is still widely used for growth monitoring. Extremely low weight-for-age is known as underweight, and underweight is one of the indicators chosen to monitor progress of MDG 1.

However, children who have a low weight-for-age may be underweight for two different reasons. First, they may indeed be very thin which would result in them having a low weight for their age. But second, they may be short or stunted, which would also result in them having a low weight for their age. Weight-for-age therefore provides a composite of weight-for-height and height-for-age and as such is not useful in defining under nutrition.

Levels of underweight are considered a public health concern when they reach above 10% in a population. A table showing cut-offs of public health significance for underweight prevalence rates and the results were compared in relation to the table below.

Table 2.1 showing cut-offs of public health significance for underweight

Categories under weight	Prevalence
Low	<10%
Medium	10 - 19
High	20 - 29
Very high	≥30

2.1.2 Stunting

Stunting is a measure of linear growth. It is indicates long-term, cumulative effects of inadequate nutrition and poor health status. According to Center for Social Research University of Malawi, (2001), nearly one-third of children die before their fifth birthday, and more than half of those under age 5 are stunted, the result of chronic, long-term malnutrition. A recent study conducted in Malawi's southern region (Zomba South) revealed that approximately two-thirds of children suffer at least moderate malnutrition in the post-harvest period, when food is most abundant, a figure that increases to nearly three-quarters before the next harvest. Children are considered stunted when their height is less than 97% of that of all children in a well-nourished population of the same age.

Height-for-age is a measure of long-term or chronic nutritional status in children. Children who suffer from chronic under nutrition grow poorly and have low height for their age i.e. they are short. Children who grow poorly in height are termed stunted Stunting occurs when a child is not growing in length or height according to his/her potential. A child is defined as stunted when his height-for-age is below -2 Standard deviation (SD) of the WHO child growth standard and stunting occurs over the child's first 2 years of life and often begins early in life. Stunting contributes to impaired cognitive development and increased risk of illness and death in young children (WHO, 2006).

Stunted children are likely to be stunted adults. Stunting negatively impacts work capacity and productivity, increases the risk of obesity and related non-communicable diseases, such as hypertension and diabetes, and poor delivery and birth outcomes in women who are stunted adults Martorell R *et al* (2000).

Levels of stunting and underweight are considered a public health concern when they reach above 20% in a population. The study was to investigate and compare the prevalence of stunting in households growing sugarcane and those growing other foods and the results were compared in relation to the table below.

Table 2.2 showing cut-offs of public health significance for stunting

Categories stunting	**Prevalence**
Low	<20
Medium	20 - 29
High	30 - 39
Very high	≥40

2.1.3 Wasting

Wasting is sensitive to changes in calorie intake or the effects of disease. WFH is a measure of current body mass. It is the best index to use to reflect wasting malnutrition, when it is difficult to determine the exact ages of the children being measured. Levels of stunting and underweight are considered a public health concern when they reach above 15% in a population.

Table 2.3 showing cut-offs of public health significance for wasting

Categories wasting	**Prevalence**
Acceptable	<5%
Poor	5 - 9%
Serious	10 - 14%
Critical	≥15%

2.1.4. Mid Upper Arm Circumference

The Mid Upper Arm Circumference (MUAC) is the circumference at the mid-point of the left upper arm. According to Habicht, 2004 he recommends Mid-Upper Arm Circumference (MUAC) as a good predictor of child wasting and mortality but the performance varied by age. MUAC was used in this study because it is a proxy measure of total body fatness and is relatively constant in children aged 6 months to 5 years and is therefore a useful overall measure of nutritional status. The study investigated and compared the prevalence of wasting using MUAC in households growing sugarcane and those growing other foods and the results will be compared in relation to the table below.

Table 2.4 showing cut-offs for MUAC

Age category	**Severe Acute Malnutrition (MUAC Red)**	**Moderate Acute Malnutrition (MUAC Yellow)**
6 months to <6 yrs	< 11.5cm	11.5 < 12.5cm
Adults (≥ 18 years) Pregnant/mothers	<19.0cm	19.0 to < 22.0cm

2.1.5 Oedma

Poor nutrition severely hinders personal, social and national development. The problem is more obvious among the poor and disadvantaged. The ultimate consequence is millions of severely malnourished children throughout the world. In order to determine the severity of the nutrition status of children under five years, children were assessed for edema in relation to the IMAM guidelines for Uganda 2010. Edema is the retention of water in the tissues of the body. Bilateral edema is a sign of kwashiorkor, a form of severe acute malnutrition.

To diagnose the nutritional edema, normal thumb pressure is applied to the tops of the feet for about three seconds. If there is edema, an impression remains for three seconds.

The child should only be recorded as edematous if both feet present pitting edema. These children are at high risk of mortality and need to be treated in a therapeutic feeding program urgently. Nutritional edema always starts from the feet and extends upwards to other parts of the body.

Depending on the presence of edema on the different levels of the body it is graded as follows. An increase in grades indicates an increase in the severity of edema.

Table 2.5 showing grading of edema

Grading of edema	
0	No edema
+	Below the ankle (pitting pedal edema)
++	Pitting edema below the knee
+++	Generalized edema.

2.2 Feeding practices in household

2.2.1 Breast feeding practices

The WHO, 2003 recommends exclusive breastfeeding during the first six months beginning from the first hour of life for optimal growth, development and health. Breastfeeding has to be continued up to two years or more and nutritionally adequate, safe, and appropriately-fed complementary foods should be introduced at the age of six months to meet the evolving needs of the growing infant.

According Oddy W. H *et al* 2003, the first two years of life are critical stages for a child's growth and development and any damage caused by nutritional deficiencies during this period could lead to impaired cognitive development, compromised educational achievement and low

economic productivity. Poor breastfeeding and associated breast feeding practices prime proximate causes of malnutrition in the first two years of life.

Breastfeeding confers both short-term and long-term benefits to the child. It reduces infections and mortality among infants, improves mental and motor development, and protects against obesity and metabolic diseases later in the life course Arifeen S, (2001).

The WHO/UNICEF global strategy on infant and young child feeding practices aims to promote optimal breastfeeding since promoting optimal breastfeeding could prevent 13% (WHO, 2002). The study investigated breastfeeding practices among sugar cane growing households in relation to other households growing other food crops.

2.2.2 Duration of Breast feeding

Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with important implications for the health of mothers. Review of evidence has shown that, on a population basis, exclusive breastfeeding for 6 months is the optimal way of feeding infants. Thereafter infants should receive complementary foods with continued breastfeeding up to 2 years of age or beyond.

According to Dekock et al 2000, breastfeeding significantly improves child survival by protecting against diarrheal diseases, pneumonia and other potentially fatal infections, while also enhancing quality of life through its nutritional, psychosocial and other benefits.

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implications for the health of mothers. Review of evidence has shown that, on a population basis, exclusive breastfeeding for 6 months is the optimal way of feeding infants. Thereafter infants should receive complementary foods with continued breastfeeding up to 2 years of age or beyond (UNICEF, 2002).

According to Kramer M *et al* (2001), Breast milk is the natural first food for babies, it provides all the energy and nutrients that the infant needs for the first months of life, and it continues to provide up to half or more of a child's nutritional needs during the second half of the first year, and up to one-third during the second year of life. Breast milk promotes sensory and cognitive development, and protects the infant against infectious and chronic diseases. Exclusive breastfeeding reduces infant mortality due to common childhood illnesses such as diarrhea or pneumonia, and helps for a quicker recovery during illness.

It is thought that breastfeeding is a universal practice in Egypt, however, closer examination of Egypt Demographic Health Survey 2008 data reveals that breastfeeding practices are far from optimal. Exclusive breastfeeding in the first 6 months of life is a global recommendation, with initiation immediately after birth, and breastfeeding on demand, whenever the baby wants to feed.

A study carried out in Ethiopia by Tesfaye Setegn *et al* (2012), revealed a large proportion of infants are not exclusively breastfed during the first 6 months, despite what is recommended in the national and global infant and young child feeding (IYCF) guidelines. Employed mothers were less likely to practice exclusive breastfeeding, implying the need for promoting workplace breastfeeding practices and creating an enabling environment for exclusive breastfeeding.

A study was undertaken among sugar cane growing households to determine the duration of breast feeding.

2.2.3 Complementary foods available

Infants and young children are at an increased risk of malnutrition from six months of age onwards, when breast milk alone is no longer sufficient to meet all their nutritional requirements and complementary feeding should be started. The World Health Organization 2003, recommends gradual introduction of nutritionally adequate, safe, and appropriately complementary foods at the age of six months to meet the evolving needs of the growing infant. This is a stage when breast milk is no longer enough to meet the nutritional needs of the infant and thus complementary foods should be added to the diet of the child. The transition from exclusive breastfeeding to family foods, referred to as complementary feeding, typically covers the period from 6 to 18-24 months of age, and is a very vulnerable period. It is the time when malnutrition starts in many infants, contributing significantly to the high prevalence of malnutrition in children under five years of age world-wide.

Appropriate infant and young child feeding (IYCF) practices include timely initiation of feeding of solid and semi-solid foods from age 6 months and improving the quality of foods consumed as the child gets older, while maintaining breastfeeding (WHO, 2008). If complementary feeding is introduced too early or too late, and the foods usually given are nutritionally inadequate and unsafe, this could lead to malnutrition in children. In the transition to the family diet, in addition to breastfeeding, children age 6 months and older should be fed small quantities of solid and semi-solid foods frequently throughout the day.

According to Yang Z, and Huffman SL (2013), the following are practices support adequate complementary feeding in children from 6 months that is continuing breastfeeding on demand per day and night, gradually introduction of nutritious, mashed and semi-solid complementary foods, feeding at least 2 meals per day for the breastfed child, feeding from foods from at least 4 food groups and feeding a variety of energy and nutrient dense foods including vegetables and fruits, and sources of vitamin A, to ensure dietary diversity.

The WHO recommends that infants start receiving complementary foods at 6 months of age in addition to breast milk, initially 2-3 times a day between 6-8 months, increasing to 3-4 times daily between 9-11 months and 12-24 months with additional nutritious snacks offered 1-2 times per day, as desired.

According to the WHO/UNICEF global strategy on infant and young child feeding practices, promoting optimal complementary feeding could prevent another 6% of deaths in countries with high mortality rates like Uganda.The study investigated the complementary feeding practices predisposing children to malnutrition among families growing sugar cane and those growing other food groups and prevalence of malnutrition among these households.

2.2.3 Food types available

The commercialization of agriculture has been reported to be a cornerstone of economic development in many developing countries seen as a means of generating and increasing the incomes of the rural smallholder, providing employment for the landless and stimulating growth linkages with other segments of the economy, introduction. But critics have argued that not only have the economic benefits not materialized but in some cases, the transition to commercial agriculture has had a negative effect on staple food production and hence household-level food

security, and health and nutritional status. Many of the most contentious nutrition issues in the food crop/cash crop debate have revolved around the impact of commercial agriculture on women and preschoolers.

The immediate causes of malnutrition in children are often attributed to infrequent meals consisting mainly of starchy staples. The nutritional community is now generally in agreement that traditional diets, mainly including starchy staples, with small additions of pulses, vegetables, green leaves and oils, are sufficient to support child growth provided the meals are given frequently and in adequate quantities (Cameron and Hofvander, 2005). The optimal frequency of meals depends on the type of foods and whether or not the child is still breastfed. Three meals a day with snacks in between is often recommended for children of weaning age (Cameron and Hofvander, 2001; Woolfe *et al*, (2003).

2.2.5 Food preparation methods

Food preparation methods are an important determinant in the nutrition status of children below five years. According to the Infant and Young Child Feeding (IYCF) guidelines for Uganda 2010, the Ministry of health recommends the use of nutrient preserving cooking methods for children below five years to prevent malnutrition. The three cooking methods documented suitable for children include steaming and boiling. This study investigated the cooking methods in sugar cane growing household and those growing other foods to determine their contribution on the nutrition status of children below 5 years in Namutumba district.

2.2.6 Frequency of feeding children

The frequency of children varies from regions to cultural setting, working environment and this greatly impacts on the nutrition status of children in their early stage of life. The WHO 2004

recommends breast feeding at least 8 times a day in order to increase a mothers breast milk supply to meet the growing needs of an so as to experience a growth spurt around 10 days to 3 weeks, 6 weeks and 3 months. Thereafter during the introduction of complementary foods at 6 months children are fed at least five times a day. According to study done by Nair et al, they found out that mothers working environment and employment compromised infant feeding and care, and employment as disempowering. Mothers felt that the comprises to infant care and feeding due to long hours of work, lack of alternative adequate care arrangements, low wages and delayed payments outweighed the benefits from farming scheme. To compare the above study a study was carried out to investigate the sugar cane growing household and those growing other foods to determine their influence of frequency behavior for feeding children on 5 years in Namutumba district.

2.2.7 Cultural practices on feeding

Breast feeding and Weaning play a major role in determining the nutritional status of a child. Cultural practices in different region and setting affect breast feeding and weaning practices during infancy and early childhood. A study was carried out to explore and compare cultural practices in sugar cane growing household and those growing other foods to determine their influence of in Namutumba district.

2.3 Sugarcane farming practices and their influence on the nutrition status of children

According to a study carried out by Jin M and Lannotti (2011) to investigate livestock production, animal source food intake, and young child growth in Kenya, there was improvement in the nutrition status in children. In relation to above, a study was carried to investigate the influence of sugar cane farming practices on the nutrition status of children.

2.3.1 Time spent on the farms

To provide food to a household both women and men combine time and energy inputs with other resources essential for performing the different activities in the food chain. It is important for the nutritional outcome that there is a certain balance between these inputs. Imbalances upset the flow of food through the food chain and may lead to poor nutrition.

Developmental changes may alter the conditions for the amount of time and energy that men and women put into the different steps in the food chain. They may bring about imbalance in these efforts, thus affecting the food flow negatively.

According to William S (2008), the labor allocation among households involved in or surrounded by a sugar cane out grower's scheme in southwestern Kenya have had implications for preschooler feeding practices. Historically, sugar cane cultivation has had a bad reputation for bringing hunger and hardship to its workers and their families. The labour patterns of cane production have changed over time, from the use of slaves to the employment of rural proletarians, and, increasingly in Africa today, to the use of an out grower model in which an estate is supplied by contracted farmers.

According to Kennedy E. T. 2000, women's time-use by activity did not correlate with the lack of difference in children's nutrition status found in the survey. If women's time-use is a critical factor in children's health and nutrition status, greater differences in the anthropometric data and the levels of children's caloric intake would be expected.

Men and women, adults and children are being affected in different ways. The changes in time-use across and within agricultural households indicate that important shifts in production and

consumption practices are occurring in areas thus a study was conducted in household growing sugar to determine the time allocation for feeding and time spent on farms in relation to the nutrition status of children.

2.3.2 Distance from the farms

In study carried out in Guatemala to examine the association of land distribution and children's growth, deficits are observed among children living at altitudes above 1500 meters. This study was carried out to examine the relationship between of distance from the farm and nutrition status of children in Namutumba district among households carrying commercial sugarcane growing.

2.3.3 Land size cultivated with sugar cane

Sugar cane growing plays an important role in influencing the nutrition status of children in societies through consumption, and ability to raise incomes for household through its commercialization. Uganda has a total area of 241,038 sq. km, with a land area of about 236,000 sq. km comprising cultivated areas, arable but uncultivated land, rangelands, and mountain. Over 88% of Uganda’s population lives in rural areas and are engaged in agriculture (MAAIF, 1996). Excluding lakes, swamps and forest reserves, and more than 75% of the country (18 million Hectares) is available for cultivation, pasture or both.

According to the National sugar cane policy 2010, it is recommended Sugarcane growing areas be planned within a radius of 25 kilometers, new sugar mills shall not be licensed within 25 kilometers radius of an existing mill and 30% of the area to be used for cane growing and the remainder of the land to be reserved for food security and other activities. The study investigated

the influence of sugarcane growing on the nutrition status of children in relation to land available for sugar cane growing and other food crops in Namutumba district.

2.3.4 House hold members involved in farming

While the sugar cane scheme has resulted in higher aggregate household incomes for its participants, nutrition status has not improved measurably (Von Braun J, 1986). Men and women, adults and children are being affected in different ways. They make critical contributions to household production and consequently to household and national food security. Although the specific nature of their contribution varies among the various regions in the world, the majority of men and women take on an increasing share of household labor. Gender roles vary within and between countries determined by agro-ecological systems and crops grown, farming systems adopted, linkages with livestock and fish production and opportunities for off-farm occupations in the rural economy.

According to Pal 2001, participation in economic activities in Bangladesh varies considerably according to gender, the type of activity and the place of residence. Rural women traditionally have played an important role in a wide range of income-generating activities. These rural production activities include post-harvesting, agriculture, and sugar cane works. A significant number of rural women, particularly from extremely poor landless households, also engage in paid labor in construction, earthwork and field-based agricultural work, activities that traditionally have fallen within the male domain. The study investigated the role member play in sugar cane growing household and those growing other food crops.

2.3.5 Variety of food crops grown and consumed

According to Lutter CK et al 2011, feeding practices undermine efforts to combat unacceptably high rates of under nutrition among children in developing countries. Households in low economic strata are prone to food insecurity. Under such circumstance, poor households have limited choices for food with adequate nutritional values (Ivers LC and Cullen KA (2011). A study investigated the influence of sugar cane growing and growing a variety of foods.

2.4 Familial factors in household and their influence on the nutrition status of children

2.4.1 Age of child care taker

During the past two decades, the role of care as an input into child health and nutrition alongside with food security, availability of health services and healthy environment has been the focus of investigation. Nutritionally, care encompasses all behaviors and practices at the household level of those who give care to children (caregivers), translating available food and health care resources into a child's growth and development. Care is therefore manifested in the ways a child is fed, nurtured, taught and guided Engel *et al*, (2002). The significance of care in child nutrition has been articulated in the UNICEF's framework for analyzing the causes of malnutrition among young children in developing countries.

The framework suggested that not only were food security and health care services necessary for child survival, growth and development, but care for women and children was equally important (UNICEF, 1998). Research has shown that even when there is adequate food in the house and a family lives in a safe and healthful environment and has access to health services, children can still be malnourished Mackintosh *et al*, (2002).

2.4.2 Sex of the child

The relationship between sex of child and nutritional status of children is important in farming households. According to Maxwell et al (2001) in Uganda; Garrett and Ruel (2000) in Mozambique and Glick and Sahn (2000) in West Africa) it was found that female children were more exposed to malnutrition than the male. Study was undertaken to determine the influence of sugar cane growing in determining the nutrition status of children under five in respect to sex of a child.

2.4.3 Education Level of child care taker

Previous studies have shown an inconsistency in the association between maternal education and child nutritional status across socioeconomic levels. This may be because the beneficial effects of education are only significant when resources are sufficient but not abundant. Educational attainment of mothers did not exert any positive impact on childhood nutrition, contrary to numerous previous studies, when it was estimated together with education of fathers.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter documents the research design, study population, sampling frame, the sample size determination, sampling technique, quality control, data collection tools, data management and data analysis.

3.1 Research/Study design

A case-control study design was used to compare households growing sugar cane and how this is associated with malnutrition. The retrospective study assessed the practices in sugar cane growing households and those growing other foods and how these contribute to the malnutrition among children below 5 years, well enough to answer my research questions.

This study design above was thus chosen because it is comparatively quick, cost effective and thus appropriate to examine households growing sugar cane and households having different farming method in relation to the nutrition status of children below 5 years. The study design was also chosen because it was ethically appropriate to investigate the association between growing sugar cane and households having different farming method in relation to the nutrition status of children below 5 years.

3.2 Study Population

The study population was the children less than 5 years in Namutumba district found in the east central region (Busoga region) in Uganda. The study involved comparing the nutritional status of children less than five years from households growing sugar cane and households on subsistence farming that grow other foods other than sugar cane.

3.3 Inclusion and Exclusion

3.3.1 Inclusion of subjects

The following were included in the study: Households exclusively growing sugar cane and those growing other food crops with children less than 5 years in Namutumba district.

3.3.2 Exclusion of subjects

Households with children above 5years were not be included in the assessment.

3.4 Sampling frame and sample population

The Household was the sampling unit. The clusters were four sub counties (Nsinze, Magada, Ivukula and Kibaale) purposively selected due to their high levels of malnutrition and sugar cane growing as one of the key agricultural activities.

3.5 Sample size determination

We shall use the standard formula for calculating sample size in Case-Control Studies as detailed below;

$$n = \left(\frac{r+1}{r}\right)\frac{\sigma^2(Z_\beta + Z_{\alpha/2})^2}{(\mathrm{difference})^2}$$

Where;

N = required sample size

r = ratio of controls to cases

Z_β = Represents the desired power (typically .84 for 80% power).

σ^2 = Standard deviation of the outcome variable

difference = Effect Size (the difference in means)

$Z_{\alpha/2}$ = Represents the desired level of statistical significance confidence level at 95% (1.96)

For 80% power, Z_β =.84

For 0.05 significance level, Z_α=1.96

r=2 (un equal number of households growing sugar cane and those growing other food crops.

σ=10.0

Detecting a difference in your characteristic of 5.0 (one half standard deviation)

Um equal number of cases and controls (r=2)

$$n = (4)\frac{10^2(7.84)}{(5)^2} = (4)2^2(7.84) = 130$$

N = (4) $\underline{10^2\ (7.84)}$

$(5)^2$

(2) 2^2 (7.84) = 130

For 1:2 study (cases: control)

N = 130 * 2

N =260 controls

Thus there were 130 cases (households growing sugar cane) and 260 controls (households growing) other foods other than sugarcane farming interviewed

3.6 Sampling procedures / methods and techniques

A Multi-stage sampling method was used and the sub counties with high malnutrition levels according to a survey done by Action Against Hunger in Namutumba in 2011. The sub counties and parishes were priotised according to coverage of sugar cane growing households. 18 parishes were randomly selected and these included Bubago, Buwalira, Buwongo, Bukonte, Izirango, Kagulu, Kiwanyi, Kibaale, Kisega, Kisowozi, Lwatama, Lwugiro, Ivukula, Mazuba, Magada, Nabweyo, Nabinyonyi, and Nabitula. A list of the entire households growing sugarcane with mothers having children not exceeding 59 months was then generated at parish level. After defining the population and generating households with the target population, the next step was to randomly select the households and subjects to participate in the study using the list generated from the labeled houses. A total of 130 cases (sugar cane growing household) and 260 controls (non sugar cane growing households) were selected and participated in the study.

At district level, purposive sampling method was used to identify key informant interviewers at the district level and health facility level and the focus group discussion participants at community level.

3.7 Study Variables

3.7.1 Dependent variables

The nutritional status (using Height for Age) of children less than five years in Namutumba district.

3.7.2 Independent variables

The independent variables for the study included the following

Feeding practices of children in households growing sugar cane and other food crops in Namutumba district. These included the following variables; Food types available, complementary foods available, duration of Breast feeding, food preparation methods, frequency of feeding children and cultural practices on feeding.

The familial factors which include the following variables; age of child care taker, sex of the child, education Level of child care taker, religion of child care taker, number of children in household.

The sugarcane farming practices which included the following variables; house hold members involved in farming, time spent on the farms, distance from the farms, farm/garden size, land size cultivated with sugar cane and land size cultivated with food crops.

The child caring practices which included prevention of illness/diseases, linkage with health structures and persons caring for children.

3.7.3 Confounding variables

The confounding variable for the research included the households growing sugar cane and animal husbandry.

3.8 Data sources

The primary data sources were the heads of households in the households growing sugar cane and those growing other food crops, mothers and fathers from both sets of households, Assistant District Health Officer Maternal and Child Health, Community development of officer, production and market officer, nutrition focal person at the district, District Health Educator,

health in-charges and health assistants from Ivukula HCIII, Nsinze HCIV, Magada and Kibaale HCIII.

The secondary data sources were guidelines, journals, reports from national surveys, organization reports from different scholars at international, regional (Africa) and Uganda level

3.9 Data collection techniques and Instruments

3.9.1 Data collection tools/instruments

3.9.1.1 Assessment Questionnaire:

The assessment questionnaire with both closed and open ended questions that are related to the independent and dependent variables were administered by well trained research assistants to collect information on anthropometric assessment, feeding practices of children in households growing sugar cane and other food crops in Namutumba district, demographic characteristics and information related to associated factors influencing nutrition status in sugar farming cane growing households and of households growing sugar cane and other food crops

The questionnaire had a separate introductory page attached to each questionnaire explaining the title and purpose of the study, requesting the informant's consent to be interviewed (voluntary) and assuring confidentiality, anonymity of the data obtained, benefits of the study, date and location of the interview and the name of the interviewer to facilitate quality control. It had an introductory section of what the assessment is about, including a consent form and other background information/data about the respondents including general features of the health facilities.

3.9.1.2 Focus Group discussion guide:

The Focused Group Discussions (FGDs) targeted women, men from sugar cane growing households. Eight FGDS were held at the community level in the four sub counties.

3.9.1.3 Key Informer guide:

Key Informant interviews were be held at the district and sub county level targeting Chief Administrative Officer, District Health Officer, Market and Production department, District Education Officer, Community Development Officer and nutritionist/nutrition focal person.

3.9.2 Data Collection procedure

After having ethical clearance and seeking permission from the relevant authorities and facilities, data was collected concerning the nutritional status of the children as well as the growing of sugarcanes in the households by interviewing the household heads. This was done through research assistants most of whom were health workers within Namutumba, trained them and pre-tested the tools with them prior to the data collection. To ensure the validity of the data, research assistants who included health workers with in Namutumba district were trained on the use and filling of data collection tools and sampling procedures. They varied from to be able to collect good quality data. The data collection instruments to be used were pre-tested from household in Iganga district which is a neighboring district with similar research environment by the technical experts and then pre-tested again at community level before actual research work. The tools were revised based on the pretest to collect consistent data.

3.11 Ethical Considerations

Study approval was obtained from International Health Science University. Permission to conduct the study was obtained from Namutumba District Health Office, the sub county, parish

and village chairpersons. Each selected study participant was informed about the purpose of the study, and participation to study was voluntary and a participant was free to withdraw at any time during the study. They were also told that they were free to refuse to answer any of the questions they felt uncomfortable with. A written informed consent (appendix 1) was obtained from all participants.

3.11.1 Consent form

Permission was obtained from the head of the household and the names of the household and other members of the household were not disclosed during data collection, interpretation and analysis. The head of the household had have liberty to participate or opt out of the research at any time during the research. At All stages, the research findings were treated with high levels of confidentiality in which each participant's tool were kept properly and safe from sight of unconcerned people. All participating caretakers were entitled to all the information related to research process, and data utilization. Malnourished children who were identified were referred to nearest health facility.

Participation in this study was voluntary and the Key Informant Interviews (KIIs), semi-structured interviews, and FGDSs were to be conducted to members who were willing to participate. All those that are willing to participate signed a consent form before the commencement of the discussions and interviews. There were minimal risks to all consenting participants study group and there was only inconvenience in setting apart to respond to the interview questions. The KIIs took 45 minutes while FGD took approximately 1-2 hours. This distraction from ongoing activities will be minimized by employing experienced and trained interviewers (research assistants).

There were not be any reimbursement or compensation to KIIs conducted at the district and the household heads. The compensation was only given to those involved in the Focused Group Discussions and was in the form of transport refunds of only three thousand Shillings Only (UGX SHS 3,000 /=).

3.12 Data Analysis

3.12.1 Quantitative Data Analysis

The data collected was processed by first cleaning and coding the data for analysis. The analysis was done using Statistical Package for Social Sciences (SPSS) and excel. Data collected from anthropometric measurements were be entered in the ENA for SMART (June 2012 version) to determine the nutrition indicator of Weight for Height (WFH) Z score, Weight for Age (WFA) Z score, Height for Age (HFA) Z score using WHO 2006 Growth standards.

Children with edema were be excluded from the WHZ and WAZ ENA for SMART data analysis

3.12.2 Qualitative Data Analysis

We analyzed the qualitative data that was collected from the Key Informer Interviews and from the Focus Group Discussions manually. Transcription of the recorded responses was done and manually analyzed the content with a Manifest Content Analysis and presented the data in verbatim with quotations as seen in chapter four.

3.13 Dissemination plan

A report was =submitted to the International Health Science University and Institute of Health Policy and Management. Copies of the report were to be submitted to District Health Office, and Market and Production department.

Findings of the study were also published in peer reviewed journals.

3.14 Limitations of the Study

We encountered a few limitations which included;

There were also challenges with bad weather especially when it rained some of the household were not easily accessible since the data collecting team used motorcycles to access the target households

Some respondents complained of the questionnaires being too long.

Some of the sampled households did not have mothers at the time of the visit; hence the enumerator had to make a return trip to interview them.

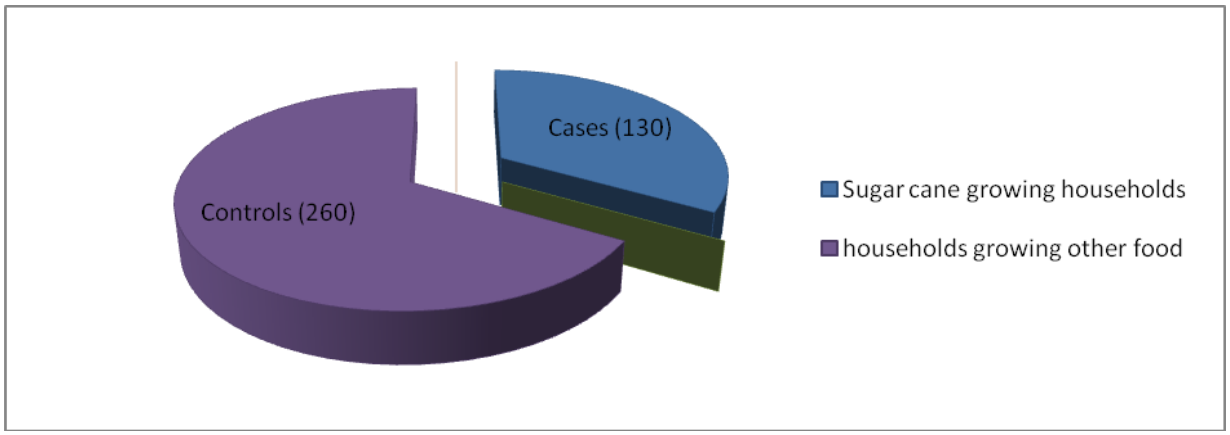
There was difficulty in terms of costs of retrieving household lists at village level thus mobilized key persons at that is chairpersons and Village Health teams to identify the target population.

CHAPTER FOUR: RESULTS

4.0 Introduction

The results are arranged in two parts that is the prevalence of malnutrition in the namutumba and the other factors that influence the nutrition status of children. The study sample comprised of 130 cases (households growing sugar cane) and 260control sample that were within the locality of sugar cane growing households thus faced the same environment and influences for children under the age of five years.

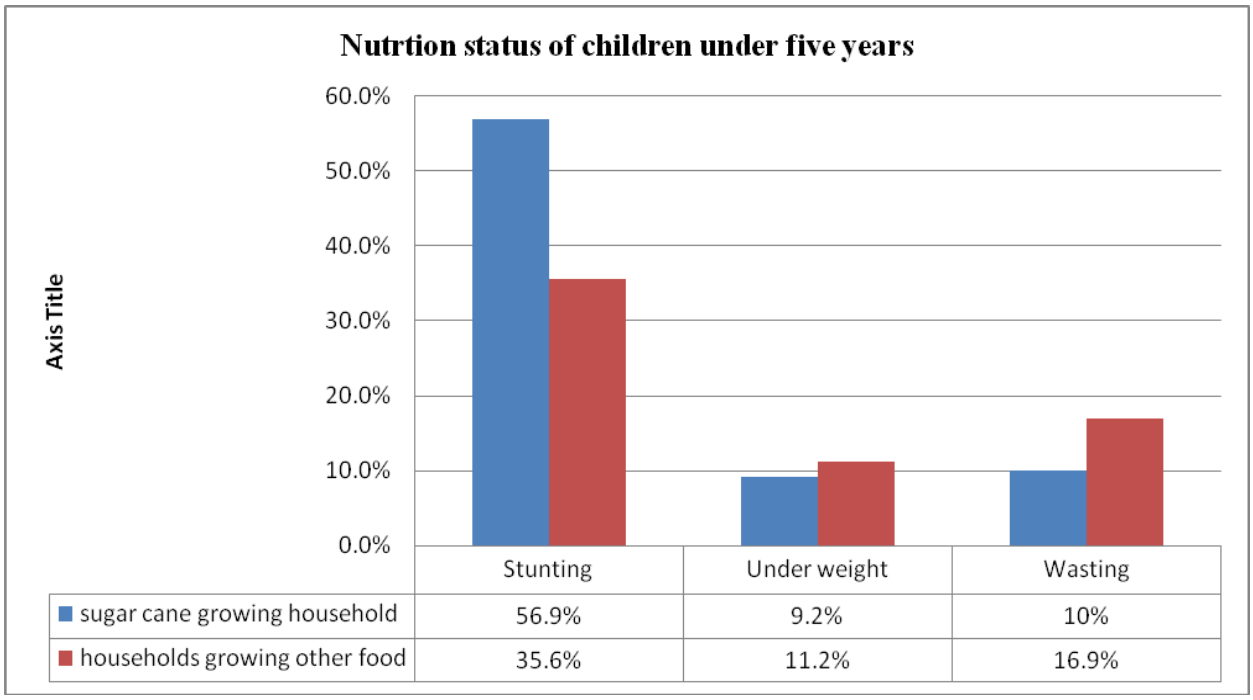
Figure 1 showing number of household's assessed



4.1 Prevalence of malnutrition in cases (sugar cane growing households)

The prevalence of stunting was highest (56.9%) in cases (households growing commercial sugar) cane compared to controls (household growing other foods) (35.6%). Underweight and wasting was highest in households growing other foods at 11.2% and 16.9 % compared to 9.2% in households growing sugar cane at 9.2 and 10% respectively.

Figure 2 showing the prevalence of malnutrition among cases and controls



The sub counties with the highest level of malnutrition was Kibaale that is (39/130 (30%)) stunting and 9.1/130 (7%) underweight among cases while among controls at 109/260 (42%) stunting and 26/260 (10%) underweight followed by Ivukula (28.6/130 (22%)) stunting and 5.2/130 (2%) among cases while among controls at 24% and 7%) followed by Magada (15.6/130(12%)) and 2.6 (2%) underweight among cases while among controls stunting was at 39/260 (15%) and underweight at 18.2/260 (7%). The least malnutrition was in Nsinze sub county 13/130 (10%) stunting and 1.3/130 (1%) underweight among cases while among controls 18.2/260 (7%) stunting and underweight 13/260 (5%). The prevalence of wasting was highest in Ivukula among controls at 26/260 (10 %) compared to 6.5/130 (5%) in cases followed by Kibaale and Magada that both had 6.5/130 (5%) in cases while in control at 18.2/260 (7%) and the least was Nsinze sub county with no case of wasting in cases while in control at 26/260 (10%).

4.2 Demographic characteristics

4.2.1Univariate analysis of demographic characteristics

Table 4.2 showing uunivariate analysis of demographic characteristics

	Cases		Controls	
	Sugar cane growing		**Non sugar cane growing**	
	Frequency	**Percent**	**Frequency**	**Percent**
Age categories for household heads				
Less than 14 years	0	0 %	2	0.8%
15-20 years	2	1.5%	7	2.7%
21-25 years	1	0.8%	4	1.5%
26-30 Years	14	10.8%	41	15.8%
31-35 years	8	6.2%	54	20.8%
36-40 years	38	29.2%	73	28.1%
41 years and above	53	40.8%	56	21.5%
Total	130	100.0%	260	100.0%
Household head				
Mother	11	8.5%	19	7.3%
Sister	0	0%	9	3.5%
Aunt	2	1.5%	6	2.3%
Grandmother	1	0.8%	6	2.3%
Father	114	87.7%	219	84.2%
Education level				
No formal education	38	29.2%	58	22.3%
Primary	53	40.8%	125	48.1%
Secondary	33	25.4%	64	24.6%
Tertiary	5	3.8%	10	3.8%
Total	130	100.0%	260	100.0%
Marital status				
Married monogamous	72	55.4%	146	56.2%
Married Polygamous	53	40.8%	93	35.8%
Cohabiting	3	2.3%	2	0.8%
Single	0	0%	6	2.3%
Widowed	2	1.5%	8	3.1%
Divorced	0	0%	5	1.9%
Total	130	100.0%	260	100.0%
Number of children below 0-59 months				
Only One	1	0.8%	1	0.4%
Between 2-3 children	59	45.4%	97	37.3%

Between 4-5 children	14	10.8%	15	5.8%
Between 6-7 children	56	43.1%	146	56.2%
Total	130	100.0%	260	100.0%
Age of children				
1- 3 months	7	4.3%	6	2.3%
4-6 months	8	6.2%	18	6.9%
7-9 months	10	7.7%	34	13.1%
10-12 months	10	7.7%	38	14.6%
13-24 months	25	19.2%	54	20.8%
≥25 months	70	53.8%	110	42.3%
Total	130	100.0%	260	100.0%
Sex of children				
Female	68	53.8%	131	50.4%
Male	60	46.2%	129	49.6%
Total	130	100.0%	260	100.0%

Age of household Head: According to table 4.2, the majority of the cases (households in sugarcane growing) were headed by persons with 41 years and above (40.8%) followed by those with 36-40 years (29.2%) then 26-30 years (10.8%) then 31-35 years (6.2%) then 21-25 years and there were no (0%) households headed with persons less than 14 years. Among the controls (non sugarcane growing households) the majority of the households were headed by persons with 36-40 years (28.1%) followed by persons with 41 years and above (21.5%) then 31-35 years (20.8%) then 26-30 years (15.8%) then 21-25 years (1.5%) and lastly were those with less than 14 years (0.8%).

Head of household: The majority of the households in table 4.2 were headed by fathers (87.7% of the cases and 84.2% of the controls) followed by mother headed household (8.5% and 7.3 %) then aunties (1.5%) and 2.3%)) then grandmothers (0.8% and 2.3% and the least) and the least were headed by the sisters 0% among the cases and 3.5% among the controls.

Level of education: Most respondents (40.8% among the cases and 48.1% among the controls) had received primary level education. 29 % of the cases had not received any formal compared to 22.3 %. 25.5 % had received education up to secondary among the cases had compared to 24.6 % among the controls and only 3.8% in cases and controls received tertiary education.

Marital Status: Among the cases the married monogamous were the majority (55.4%), followed by married polygamous (40.8%) then those cohabiting (2.3%) them widowed 3.1% there no singles and divorced. Among the controls, the married monogamous were the majority (56.2%), followed by married polygamous (35.8%) then widows (3.1 %) then the singles (2.3%) followed by the divorced (1.9%) and the least were those cohabiting.

Number of children in the household: The majority of the cases and controls were between 6-7 children (43.1% and 56.2%), followed by those having children between 2-3(45.4% and 37.3%) then between 4-5 children (10.8% and 5.8%) and the least were the household having only one child (0.8% and 0.4%).

Age of children: The majority of the children assessed from cases, was those aged 25 months and above (53.8%) followed by 13-24 moths (19.2%), then 10-12 months (7.7%), and then 7-9 months (7.7%) then 4- months (6.2%) and least were those less than 3 months (4.3%). And among the controls the majority of the children assessed from controls, were those aged 25 months and above (42.3%) followed by 13-24 moths (20.8%), then 10-12 months (14.6%), then 7-9 months (13.1%) then 4- months (6.9%) and least were those less than 3 months (423%).

Sex for the children: The majority of the children assessed from the cases and controls were female (53.8% and 50.4%) and males were 46.2% and 49.6%.

4.2.2 Bivariate analysis of demographic characteristics and nutrition status

Table 4.2.2 bivariate analysis of demographic characteristics and nutrition status

Cases (sugar cane growing households)				Controls (non sugar cane growing households)		
Nutrition status (stunting) (%)		**P Value**	**OR**	**Nutrition status (stunting)%**	**P Value**	**OR**
Head of household						
Mother	4 (3.1%)	0.099	0.376	5(2%)	0.567	0.734
Grandmother	0 (0%)	0.703	0.677	4(1.5%)	0.975	1.028
Father	3 (2.3%)	0.873	1.129	2(1%)	0.107	4.111
Age of household head						
≤14 years	0 (0%)	0.528	0.869	1(1%)	0.577	2.500
15-20 years	8(6.1%)	0.617	1.767	5(1.9%)	0.579	1.875
26-30 Years	6(4.6%)	0.794	0.786	11(4.2%)	0.924	0.917
31-35 years	4(3.1%)	0.455	0.644	17(11%)	0.894	1.125
36-40 years	26(20%)	0.075	2.075	28(10.8%)	0.642	1.500
≥41 years and	28(21.5%)	0.043*	2.175	25(10%)	0.049*	1.040
Education level						
No formal	19 (14.6%)	0.023*	0.202	18 (7%)	0.014*	0.014
Primary	33(25.3%)	0.034*	0.224	40(15.3%)	0.037*	0.123
Secondary	17(13.1%)	0.357	0.311	24(9.2%)	0.465	0.270
Tertiary	4(3.1%)	0.293	0.224	3(1%)	0.375	0.189
Marital status						
Married monogamous	39 (30%)	0.286	0.295	47(18.1%)	0.291	0.174
Married Polygamous	31 (24%)	0.365	0.352	30(12%)	0.951	1.112
Number of children in household						
Only One	3 (2.3%)	0.833	1.250	4(2%)	0.722	0.637
between 2-3	34 (26.2%)	0.023*	1.932	42(16%)	0.044*	0.306
between 4-5	33 (25.4%)	0.522	1.587	37(14.2%)	0.411	0.514
Age of children						
≤3 months	4(3.1%)	0.936	1.121	0.4(9.6%)	0.534	1.340
4-6 months	5(3.8%)	0.582	1.682	6(2.3%)	0.730	0.680
7-9 months	8(6.2%)	0.416	1.869	14(5.4%)	0.334	1.700
10-12 months	2(0.8%)	0.069	4.485	9(3.5%)	0.037	2.380
13-24 months	22(17%)	0.124	0.280	32(12.3%	0.904	1.055
≥25 months	33(25.4%)	0.001*	8.222	25 (9.6%)	0.049*	4.945
Sex of children						
Male	40 (30.8)	0.042	0.510	45(17.3%	0.759	1.084

** Statistically significant variables*

Household head and nutrition status: From the table 4.2.2 above, the households among cases that were headed by the father were 1.129 times likely to have stunted children compared to the mothers and grandmothers, whoever among the controls stunting was more likely to be in household headed by the father 4.11 times compared to the grandmothers 1.028 times. Other factors were not statistically significant.

Age of the household head and nutrition status: Households where the head of the household among cases was above 41 years were 2.175 times more likely to have stunted children than those aged 36-40 years with 2.075 time, 15-20 years with 1.767 times whoever among the control where the head of the household among was above 41 years was less likely to have stunted children (1.040 times).

Education level of household members and nutrition status: Households in both cases and controls where the household members had no formal education ($p<0.023$ and $p<0.014$) and those that obtained only primary level ($p<0.034$ and $p<0.037$) were more likely to have stunted children compared to those who obtained secondary and tertiary level of education since they are not statistically significant.

Marital status and nutrition status: Households among the married monogamous and married polygamous were not statistically significant.

Number of children and nutrition status: Households among the cases that had 2-3 children were 1.932 times more likely to be stunted ($p<0.023$) compared to households with 4-5 children and one child whoever among the control households with 2-3 children were less 0.036 less likely to be stunted (($p<0.044$)). The others households with different number of children were not statistically significant.

Age of children in the household: Among the cases, as the children grew older they were more likely to be stunted that is households with children who are aged 25 months and above were 8.22times more likely to be stunted and this was statistically significant (p< 0.001)compared to those aged 10-12 months (4.485 times) and 7-9 months (1.869 times), 4-6 months(1.682 times) and those less than 3 months (1.1.21 times) whoever among the controls children aged 25 months and above were less likely to be stunted 4.945 times although they were statically significant (p<0.049).

Sex of children in the household: Children among the controls who were male were 1.084 times more likely to stunted compared to the children among households from the cases who were 0.510 times by statically significant (p<0.042)

4.2.3 Qualitative analysis for demographic characteristics

The nutrition status of children is affected by the education level of the house hold members especially the head of the household as reported by one of the members of the district leadership. He said that:

> *Most of the cases (farmers growing sugarcane s) are those that are below 0-level and most of the farmers are in primary level and they do not have adequate knowledge on feeding children although many have been reached thought accessing services at the health facility behaviors on frequency of feeding not followed.“The farmers who are able to obtain knowledge feeding their knowledge obtain it from grandmothers or those who access the health facility obtain it from health workers.” [**KII, In-charge Nsinze Health Centre III].***

The above finding was also emphasized by one of the fathers in a focused group discussion who said that:

> *"Majority of farmers in the community did not obtain any formal education by those who obtained any form of education stopped in primary to 0-level and thus do not have adequate knowledge on feeding children as recommended by used knowledge obtained by the grand mothers and the environment to feed the children. Since most of us spend most of the time in the garden we do not meet the health workers in the community unless when the children are sick to share knowledge on how children are fed. [**Male FGD member, Magada sub county]***

4.3 Familial factors

4.3.1Univariate analysis of familial factors

Table 4.3 Univariate analysis of familial factors

	Cases		Controls	
	Sugar cane growing		Non sugar cane growing	
	Frequency	Percent	Frequency	Percent
Primary caregivers				
Mother	211	81.2%	107%	82.3%
Father	5	1.9%	6%	4.6%
Grandmother	25	9.6%	10%	7.7%
Older sibling (under the age of 10 years)	6	2.3%	1%	0.8%
Older sibling (Over the age of 10 years)	7	2.7%	2%	1.5%
Auntie	4	1.5%	3%	2.3%
Uncle	2	0.8%	1%	0.8%
Total	260	100.0%	130	100.0%
Food choices by household members				
Husband	7	5.4%	21	8.1%
Mother in Law	1	0.8%	29	11.2%
Mother	122	93.8%	209	80.7%
Total	130	100.0%	260	100.0%
Cultural Practices				
Yes	11	8.5%	19	7.3%
No	119	91.5%	241	92.7%
Total	130	100.0%	260	100.0%

Primary caregivers of children under five: In sugar cane growing households the mothers were the majority care givers for children under the age of five years (81.2%) followed by grandmothers (9.6%) then older sibling over the age of 10 years (2.7%) followed by siblings under the age of 10 years (2.3%) then fathers (1.9%), aunties(1.5%) and least were the uncles (0.8%). In non sugar cane growing households the mother were the majority care givers (82.3%) followed by grandmothers (7.7%), then fathers (4.6), then aunties (2.3%) then older sibling over the age of 10 years (1.5%), the least were siblings under the age of 10 years and uncles at 0.8%.

Food choices by household members: Among the sugar cane growing households, the majority of food choices were done by mothers (93.8%) followed by husbands (5.4%) and least choices were done by mothers in law (0.8%). While in non sugar cane growing households the majority of food choices were done by mothers (80.7%) followed by mothers in law (11.2%) and least were choices were done by husbands (8.1%).

Cultural practices: The majority of households did not have cultural practices (91.5% in sugar cane growing households and 92.7% in non sugar cane growing households) while only 8.5% and 7.35% had cultural practices that influenced the children's feeding practices.

4.3.2 Bivariate analysis of familial factors and nutrition status

Table 4.3.2 Bivariate analysis of familial factors and nutrition status

	Cases (sugar cane growing households)			Controls (non sugar cane growing households)		
	Nutrition status (stunting) (%)	P Value	OR	Nutrition status (stunting) (%)	P Value	OR
Person responsible in influencing of food choices						
Father	5(3.8%)	0.072	0.677	7 (2.6%)	0.776	0.768
Mother in Law	1(0.8%)	0.116	3.593	5(1.9%)	0.245	0.423
Mother	66 (50.7%	0.040*	6.288	64 (24.6%	0.276	0.394
Cultural practices						
No	7 (5.4%)	0.772	1.224	5 (1.9%)	0.597	0.750
Primary caregivers for children under five						
Mother	62(47.7%	0.822	1.378	72 (27.7%)	0.705	1.554
Father	4(3.1%)	0.676	0.130	1(0.8%)	0.528	0.869
Grand mother	4(3.1%)	0.794	0.667	8 (3.1%)	0.690	1.615
Sibling (<10 years	1(1%)	0.675	0.756	2 (0.8%)	0.452	0.329
Sibling >10 years	1(1%)	0.711	2.000	2(0.8%)	0.617	0.659

** Statistically significant variables*

Food choices by household members and nutrition status: The person majorly responsible for influencing food choices among the case was the mother and was 6.288 times more likely to have stunted children and this is statistically significant compared to the mother in law (3.593 times) and the fathers (0.677 times) whoever among the controls the mothers, mother in law and fathers were less likely to have stunted children since no statistical significance.

Cultural practices and nutrition status: Household members where that reported to have cultural influences among cases were 1.224 times likely to stunted children compared to those with among control who were 0.759 times although this was not statically significant.

Persons caring for the children and nutrition status: Households among cases where children were left in the hands of siblings aged more than 10 years were 2.000 times more likely to have

stunted children compared to those with mothers (0.822) whoever households among the control where children were left in the hands of grandmothers 1.615 times and the mothers 1.554 times. The other factors were not statistically significant.

4.3.3 Qualitative analysis for familial factors

Cultural factors affected the feeding practices and thus that of children. One of the members of the District Health Management Team said that:

*"Cultural practices passed from previous generations like the grand mothers have predisposed children to malnutrition among the case include cultural practices that limit practices early initiation of breastfeeding with in the first hour and exclusive breast feeding as recommended by the Ministry of Health because. Some the cultural practices include first expressing off the first milk because it's believed to be harmful to the baby, some stop breastfeeding after becoming pregnant no matter how old the child is because they think the breast milk will be spoilt." [**KIIs, Namutumba District Assistant District Health Officer Maternal and Child Health].***

The above finding was also emphasized by one of the focused group's members who said that *"Mothers give their children mushroom, water with sugar or glucose since they believe the breast milk is not enough after delivery to satisfy the baby. The other response was toward Colostrum which mothers believe is not good for the babies." [**Female FGD member, Ivukula sub county]***

This means cultural practices have a significant role in affecting the initiation of breast feeding and exclusive breast feeding practices.

4.4 Feeding practices

4.4.1Univariate analysis of f feeding practices

Table 4.4 showing univariate analysis of feeding practices

	Cases		Controls	
	Sugar cane growing		Non sugar cane growing	
	Frequency	Percent	Frequency	Percent
Ever breast fed				
Yes	122	93.8 %	246	94.6%
No	8	6.2%	14	5.4%
Total	130	100.0%	260	100.0%
Initiation of breastfeeding				
Did not Breastfeed	3	2.3%	7	2.7%
Within the first hour	109	83.8%	199	76.5%
2-3 hours	4	3.1%	14	5.4%
3-24 hours	5	3.8%	31	11.9%
25-48 hours	3	2.3%	2	0.8%
Don't remember	6	4.6%	6	2.3%
Total	130	100.0%	260	100.0%
Exclusive breastfeeding				
Less than 6 months	5	3.8%	56	21.5%
6 months	12	9.2%	138	53.1%
7 months	15	11.5%	37	14.2%
8 months	91	70.0%	23	8.8%
9 months	3	2.3%	1	0.4%
Still breastfeeding only	4	3.1%	5	1.9%
Total	130	100.0%	260	100.0
Frequency of breastfeeding				
Once	0	0%	6	2.3%
2-3 times	22	16.9%	61	23.5%
4-6 times	29	22.3%	46	15.0%
6-7 times	52	40.0%	105	41.9%
≥ 8 times	27	20.8%	45	17.3%
Total	130	100.0%	260	100.0%
Breast milk substitutes				
Yes	26	18.2%	60	22.3%
No	105	80.8%	200	77.7%
Total	130	100.0%	260	100.0%

Exclusive breastfeeding				
Less than 6 months	22	16.9%	56	21.5%
6 months	71	54.6%	138	53.1%
7 months	26	20.0%	37	14.2%
8 months	8	6.2%	23	8.8%
≥9 months	0	0%	1	0.4%
Still breast feeding	3	2.3%	5	1.9%
Total	130	100.0%	260	100.0%
Frequency of feeding				
Once	4	3.1%	18	6.9%
2 times	27	20.8%	62	23.9%
3 times	68	52.3%	144	55.4%
4 times	27	20.8%	30	11.5%
≥ 5 times	4	3.1%	6	2.3%
Method of food preparation				
Steaming	15	11.5%	22	8.5%
Boiling	76	58.5%	139	53.5%
Frying	3	2.3%	2	0.8%
Steaming and boiling	27	20.8%	75	28.8%
Steaming, boiling and frying	6	4.6%	14	5.4%
Frying and boiling	5	3.8%	8	3.1%
Food consumed in households				
Porridge, rice, bread, millet, maize and other foods from Grains				
Yes	115	88.5%	238	91.5%
No	15	11.5%	21	8.5%
Foods rich in vitamin A (orange flesh sweet potatoes, carrots, pumpkin)				
Yes	42	32.3%	158	60.8%
No	88	67.7%	101	39.3%
Matooke including plantains like gonja, ndiizi and bogoya				
Yes	81	62.3%	178	68.5%
No	49	37.7%	81	31.6%
Irish potatoes, sweet potatoes, yams, cassava and any root tubers				
Yes	83	63.8%	184	70.8%
No	47	36.2%	76	29.3%
Vegetables				
Yes	66	50.8%	153	58.8%
No	61	46.9%	107	41.2%
Fruits				
Yes	49	37.7%	147	56.5%
No	81	62.3%	113	43.5%

Children who have ever breast fed: Majority of the respondent reported to have breast fed their children in both cases and controls (93.8% and 94.6% respectively) and only 6.2% among the cases and 5.4% from controls reported not to have ever breast fed their children.

Initiation of breast feeding: Initiation of breast feeding was reported highest with the first hour after birth in cases and controls (83.8% and 76.5%) followed by initiation of breast feeding within 3-24 hours (3.8% and 11.9%) then 2-3 hours (3.1% and 5.4%), then 25-28 hours (2.3% and 2%). The respondent that did not remember the time that they did breast feed included 4.6% among the cases and 2.3% among the controls.

Exclusive breastfeeding: Among the cases, exclusive breastfeeding was carried the most for 8 months (70%), followed by a period of 7 months (11.5%), then 6 months (9.2%), followed by a period of less than 6 months (3.8%) then 9 months and there were only 3.1 of the children still breast feeding. Among the controls, exclusive breastfeeding was carried the most for 6 months (53.1%), followed by a period of less than 6 months (21.5%), then 7 months (14.2%), and the least was for 9 months. There was only1.9% of the children still breast feeding among the controls.

Breast feeding during the 24 hour recall: Among the cases, the majority of mothers breast fed at least 6-7 times a day (40%) followed by 4-6 times (22.3%) then 8 and greater than 8 (20.8%) times a day followed by 2-3 times (16%). Non breast fed once in a day. Among the controls, , the majority of mothers breast fed for at least 6-7 times a day (41.9%) followed by 2-3 times (23.5%), then 4-6 times (23.5%) the 8 and greater than 8 times a day (17.3%), followed by 4-6 times (15%)and the least was once a day (2.3%).

Breast milk substitutes: The majority of the respondents from both cases and controls did not use breast milk substitutes (80.8% and 77.7%) while breast feeding while 18.2% and 22.3% used breast milk substitutes.

Complementary feeding: Among the cases, the majority of respondents interviewed initiated complementary feeding at 6 months (54.6%) followed at 7 months (20.0%), then less than 6 months (16.9%) then at 8 months (8.2%) while 2.3% of respondent had children still breast feeding. While in controls, the majority of respondent initiated complementary feeding at 6 months (53.1%), then less than 6 months (21.5%), followed at 7 months (14.2%), then at 8 months (8.8%) and least at 9 months (1.9%) while 1.9% of respondents had children still breast feeding.

Frequency of feeding in a day (24 hours): Among the cases, majority of respondents feed their children 3 times a day (52.3%), followed by 2 times and 4 times (20.8% and 20.8%) and least is once and more than 5 times a day (3.1% and 3.1%). While among the controls, majority of respondents feed their children 3 times a day (55.4%), followed by 2 times (23.9%), then 4 times (11.5%) and least once a day (6.9%) and more than 5 times a day (2.3%).

Method of food preparation: The commonest method of food preparation among cases was boiling (58.5%) followed by steaming and boiling (20.8%), and then steaming (11.5%), followed by steaming, boiling and frying (4.6%) and the least was frying (2.3%). While the commonest method of food preparation among the controls was boiling (53.5%) followed by steaming and boiling (28.8%), and then steaming (8.5%), followed by steaming, boiling and frying (3.1%) and the least is frying (0.8%).

Foods consumed in the households: The major foods consumed among the cases included porridge, rice, bread, millet, maize and other foods from grains (88.5%) followed by irish potatoes, sweet potatoes, yams, cassava and any root tubers (63.8%) and then matooke including plantains like gonja, ndiizi and bogoya (63.8%) then vegetables (50.8%) and the least were Foods rich in vitamin A (32.3%) then fruits (37%). While the major foods consumed among the controls included porridge, rice, bread, millet, maize and other foods from grains (99.5%) followed by irish potatoes, sweet potatoes, yams, cassava and any root tubers (70.8%) then matooke including plantains like gonja, ndiizi and bogoya (68.5%) then foods rich in vitamin A (32.3%) and the least were vegetables then (58.8%) fruits (56.5%).

4.4.2 Bivariate analysis of feeding practices and nutrition status

Table 4.4.2 bivariate analysis of feeding practices and nutrition status

	Cases			Controls		
	Nutrition status (stunting) (%)	P Value	OR	Nutrition status (stunting) (%)	P Value	OR
Ever breastfed	70 (53.8%)	0.281	4.418	82(31.5%)	0.674	1.404
Initiation of breast feeding						
Within the 1st hour	65 (50%)	0.224	6.000	66 (25.4%	0.076	1.499
2-3 hours	3 (2.3%)	0.041*	4.333	7 (2.8%)	0.040*	1.278
3-24 hours	2 (1.5%)	0.020*	9.000	8(3.1%)	0.032*	2.923
25-48 hours	0 (%)	0.571	2.000	1(0.3%)	0.887	0.800
Exclusive breastfeeding						
3 months	7 (5.4%)	0.872	1.389	9(3.6%)	0.705	0.546
4-5 months	8 (6.2%)	0.849	0.694	14(5.4%)	0.810	1.454
6 months	54 (41.5%)	0.552	1.222	57(21.9%)	0.718	0.583
6-8 months	1 (1%)	0.754	0.524	3(1.2%)	0.789	1.537
Breast milk substitutes						
Yes	12(9.2%	0.737	0.585	16(%)	0.878	1.200
No	58(44.6%)	0.570	0.412	69(6.2%)	0.685	1.605
Frequency of breast feeding						
Once	0(0%)	0.736	1.443	16(6.1%	0.177	0.048
2-3 times	3(2.4%)	0.049*	2.590	46(17.7%	0.561	0.047
4-6 times	16(12.3%)	0.113	0.334	11(4.2%)	0.967	0.976
6-7 times	26(20%)	0.182	0.433	3(1.1%)	0.149	0.467
≥8 times	19(14.6%)	0.243	0.518	19(7.3%)	0.939	0.969
Complementary feeding						
≤6months	13 (0.1%)	0.788	1.261	19(%)	0.540	0.508
6 months	41(31.5%)	0.662	1.399	46(17.7%	0.372	0.384
7 months	15 (11.5%)	0.048*	1.422	10(3.8%)	0.330	0.033
Frequency of feeding						
Once	3 (2.3%)	0.578	1.986	8(3.1%)	0.975	0.975
2 times	17(13.1%)	0.928	1.052	16(6.1%)	0.590	0.689
3 times	36(27.7%)	0.338	0.642	46(17.7%	0.402	0.582
Method of food preparation						
Steaming	9 (6.9%)	0.611	0.643	10 (3.8%	0.116	2.147
Boiling	43 (33.1%)	0.423	0.558	48 (18.5%	0.310	1.344

Frying	13 (0.1%)	0.244	0.398	1 (0.4%)	0.151	3.865
Types of food provided						
Foods from grains (porridge, bread, rice, millet, maize)						
Yes	64 (49.2%)	0.040*	0.541	77(29.6%	0.046	1.582
Food rich in Vitamin A (carrots, Orange fleshed sweet potatoes and pumpkin)						
	28(21.5%)	0.123	1.826	50(19.2%	0.958	1.016
Matooke and Plantain (bogoya, ndiizi and gonja)						
Yes	43(33.1%)	0.100	0.505	59(22.7%	0.487	1.239
Root tubers (Irish potatoes, cassava and yams)						
Yes	46 (35.4%)	0.702	0.851	43(16.5%	0.315	0.740
Vegetables (dark green leafy vegetables like Nakati, dodo, ggobe)						
No	38(29.2%	0.264	5.099	43(16.5%	0.004	0.621
Fruits						
No	29 (22.3%)	0.571	1.274	41(15.7%	0.317	0.725

** Statistically significant variables*

The relationship between breast feeding and nutrition status: Children among the controls who have ever been breastfed were 1.404 times more likely to have a poor nutrition status (stunting) than those among cases although it is not statistically significant.

Initiation of breast feeding and nutrition status: Using bivariate analysis of logistic regression, households where mothers reported to have initially started breast feeding 3-24 hour were 9.000 times ($p<0.020$) more likely to have a poor nutrition status (stunting) than those who breast fed for 2-3 hours (0.041times ($p<0.041$)) and this was statistically significant whoever among the controls children who were initiated on breast feeding 3-24 hours were 2.923 times ($p<0.040$) less likely to have a poor nutrition status (stunting) compared to those who initiated 2-3 hours ($p<0.032$)and were statistically significant. The other factors were not statistically significant.

Exclusive breast feeding and nutrition status: Children who breast fed for 6-8 months were 1.537 times more likely to have a poor nutrition status than those who exclusively breast fed for 4-5 months whoever children who were exclusively breast fed for 6 months among the cases were 1.222 times 1.222 less likely to have a poor nutrition status (stunting) compared to children who breast fed for 3 months (1.389 times). This was not statistically significant.

Breast milk substitutes and nutrition status: Using bivariate analysis using logistic regression, children among the controls who never used breast milk substitutes were 1.605 times more likely to have poor nutrition status (stunting) compared to those who used them (1.200 times) whoever those among the case, there was no statistical significance.

Frequency of breast feeding and nutrition status: Children who breast fed 2-3 times were statistically significant among cases. According to the table above households among cases where children were breast fed 2-3 times in a day were 2.590 times more likely to have a poor nutrition status than those who were fed once in a day (1.443 times). The other factors including those in the controls were not statically significant.

Complementary feeding and nutrition status: As presented in the above table children who were imitated on complementary foods at 7 months among cases was significant relation with the nutrition status. When children were imitated on complementary foods at 7 months, they were 1.422 times more likely to be stunted compared to the other age categories and children among controls where there is no statistical significance.

Frequency of complementary feeding and nutrition status: Using bivariate analysis of logistical regression, children who fed once a day among the cases were 1.986 times more likely

to be stunted compared to those who fed 2 times a day (1.052 times). While among the controls there was no significance o frequency of feeding a child and the nutrition status.

Food preparation methods and nutrition status: Households that preferred frying among the controls was 3.865 times more likely to have a poor nutrition status (stunting) compared those that preferred steaming (2.147 times) and boiling (1.258 times). While among the cases there was no significance on the method of food preparation for children and the nutrition status.

Types of food consumed: Feeding on vegetable and porridge, bread, rice, millet, maize and other grains ($p<0.04$) has significance relation with the nutrition status of children under five years in both cases and controls. Children among cases that consumed vegetables including dark green leafy vegetables like Nakati, dodo, ggobe among cases were 5.099 times more likely to have poor nutrition status (stunting) compared to those that consumed foods porridge, bread, rice, millet, maize and other grains and foods rich in vitamin A (1.826 times). Whoever among controls households that fed on porridge, bread, rice, millet, maize and other grains were 1.582 times less likely to have a poor nutrition status (stunted) compared children that consumed matooke including plantain like bogoya, ndiizi and gonja among controls were (1.239 times) and foods rich in vitamin A (1.016) like carrots, Orange fleshed sweet potatoes and pumpkin.

4.4.3 Qualitative analysis for feeding practices

One of the members of the District Health Management Team said that:

"Some feeding practices like frequency of feeding both during exclusive breast feeding and complementary feeding have limited children from getting the recommended dietary intake due to limited awareness on how frequent feeds should be given but it think the frequency has of feeding has been majorly affected by the time mothers and care takers have for their children

*because the mothers the major care takers are involved sugar cane growing and growing other foods so they end up leaving their children with the younger sibling or maids who may not give attention to the children as expected." [**KII, Namutumba District Assistant District Health Office Maternal and Child Health].***

The above finding is emphasized by one of the focused group discussion member who said that

> *"The number of times children feed is often 1-2 times a day and this is influenced by time spent in the garden and thus we do not have a lot of time designated to children to feed more than 2 times a day since we go the garden in the morning at around 7:oo am before even taking breast fast and come back at 2-3 pm then go back to gardens and back at some times 6:00pm and this is when we prepare something to eat again for the children. **[Female FGD member, Ivukula sub county].***

This means that the frequency of feeding in both cases and controls had a significant role in affecting nutrition status

4.5 Farming practices

4.5.1Univariate analysis of f arming practices characteristics

Table 4.5 showing univariate analysis of farming practices

	Cases		Controls	
	Sugar cane growing		Non sugar cane growing	
	Frequency	Percent	Frequency	Percent
Acreage for sugarcane and food production				
Less than 1 acre	6	4.6%	15	5.8%
One acre	25	19.2	107	41.2%
2-3 acres	61	46.9	90	34.6%
4-5 acres	31	23.8	5	1.9%
≥6 acres	6	4.6	2	0.8%
None	1	0.8	41	15.8%
Total	130	100.0	260	100.0%
Household members involved in sugarcane and food production				
Father	3	2.3%	21	8.1%
Mother	7	5.4%	8	3.1%
Children	2	1.5%	6	2.3%
father and mother	26	20.0%	74	28.5%
Father, mother and children	57	43.8%	106	40.8%
Father and children	1	0.8%	5	2.3%
Mother and children	32	24.6%	33	12.7%
None	2	1.6%	7	2.7%
Total	130	100.0%	260	100.0%
Availability of livestock in households				
Yes	108	83.1%	202	77.7%
No	22	16.9%	58	22.3%
Total	130	100.0%	260	100
Distance to the farm/gardens				
less than 10 minutes	7	5.4%	29	11.2%
10-30 minutes	64	49.2%	150	57.7%
31-59 minutes	47	36.2%	50	19.2%
More than 60 minutes	12	9.3%	31	11.9%
Total	130	100.0%	260	100.0%
Time spent in the farm/gardens				
Less than an hour	2	1.5%	7	2.7%
1-2 hours	19	14.6%	71	27.3%
3-5 hours	78	60.0%	122	46.9%

More than 5 hours in garden	31	23.8%	60	23.0%
Total	130	100.0%	260	100.0%
Where food is obtained				
Own production	116	89.2%	224	86.2%
Hunting fishing and gathering	0	0%	3	1.2%
Exchange labor and food items	3	2.3%	10	3.8%
Borrowed	0	0%	1	0.4%
Purchased	6	4.6%	13	5.0%
Gifts in form of food	0	0%	2	0.8%
Own production and purchase	4	3.1%	7	2.7%
Total	130	100%	260	100.0%

Acreage for food production: Among the cases sugarcane is mostly grown on 2-3 acres (46.9%), followed by 4-5 acres (23.8%), then one acre (19.2%) and least on greater than 6 and less than one acre (4.65% and 4.6%). Food crops are mostly grown on one acre (41.2%), followed by 2-3 acres (34.6%), then less than one acre (5.8%), then 4-5 acres (1.9%) and least 6 acres at 0.8%. 15.8% do not have own land where food is grown.

Household members involved in food production: Among the cases the major household members involved in food production are fathers, mothers and children (43.8%), followed by mothers and children (24.6%), followed by fathers and mothers (20.0%), then mothers (5.4%), then fathers (21%) then children (1.5%) and least are fathers and children (0.8%). Among the controls, the major household members involved in food production are the father, mother and children (40.8%), followed by fathers and mothers (28.5%), followed by mothers and children (12.7%), then fathers (8.1%) then mothers (3.1%), then children (2.3%).

Availability of livestock in households: Majority of the respondent kept animals in both cases (83.1%) and controls (77.7%) and there were only 16.9% and 22.3% respectively who did not keep animals.

Distance to the farm/garden: Majority of the respondents spend in both cases and controls spend 10-30 minutes to their farms (49.2% and 57.7%) followed by 31-59 minutes (36.2% and 19.2%), and the least time spent to the garden/farm is more than 60 minutes (9.3% and 11,9%) but is not statistically significant ($p>0.05$).

Time spent in the garden/farm: Among cases, the majority of respondents spend 3-5 hours on the farm (60%) then more than 5 hours, (60%) then 1-2 hours (14.6%) and the least time spent on the farm in less than 1 hour (1.5%). While in controls, the majority of respondents spend 3-5 hours on the farm (46.9%), then 1-2 hours (27.3%) then more than 5 hours, (23.0%) and the least time spent on the farm in less than 1 hour (2.7%).

4.5.2 Bivariate analysis of farming practices and nutrition status

Table 4.5.2 bivariate analysis of farming practices and nutrition status

	Cases			Controls		
	Nutrition status (stunting) (%)	**P Value**	**OR**	**Nutrition status (stunting) (%)**	**P Value**	**OR**
Acreage						
≤ one acre	4(3.1%)	0.096	2.667	6(2.3%)	0.037*	1.241
one acre	19(14.6%)	0.008*	4.222	35(13.4%	0.038	0.883
2-3 acres	33(25.1%)	0.575	1.571	29(11.1%	0.796	0.881
4-5 acres	15(11.5%)	0.792	1.250	1(0.4%)	0.340	0.303
Time spent gardens/farms						
≤1hour	1(0.8%)	0.665	0.494	2(0.8%)	0.924	1.141
1-2 hours	12(9.2%)	0.968	0.030	25(9.6%	0.346	2.072
3-5 hours	42(32.3%)	0.035*	1.727	42(16.2%	0.037	2.447
Distance to farms						
<10 km	4(3.1%)	0.792	0.727	2(0.8%)	0.597	2.003
10-30 km	38(29.2%)	0.861	0.874	29(11%)	0.842	1.281
31-59km	25(19.2%)	0.762	0.780	53(20.4%	0.732	0.646
Category household members involved in gardening						
Father	2(1.5%)	0.909	1.158	9(3.5%)	0.548	1.393
Mother	5(3.8%)	0.965	0.965	0(0%)	0.656	0.840
Children	0(0%)	0.176	0.193	3(1.2%)	0.482	1.857
Father & mother	15(11.5%)	0.551	0.724	24(9.2%	0.857	0.929
Father and children	32(24.6%)	0.518	0.741	33(12.7%	0.153	5.571
Where food is obtained						
Own production	68(52.3%	0.212	4.312	75(28.8%	0.787	1.258
Purchase	2 (1.5%	0.027*	6.000	3 (1.2%)	0.029*	1.667
Own production & purchase	1 (0.8%)	0.779	1.500	2(0.8%)	0.787	0.750

** Statistically significant variables*

Acreage and nutrition status: Households among the cases that owned lees than an acre of land were 4.222 more likely to have stunted children and this is statistically significant (p<0.008)

compared to households that owned less than an acre with 2.667 times whoever among the control households with less than an acre were 1.241 times less likely to have stunted children ($p<0.037$). The other factors were not statistically significant.

Distance to the farms/garden and nutrition status: The distance traveled by household members to the farms/gardens did not have statically significance on the nutrition status of the children.

Time spent in the garden/farms and nutrition status: Household members among the cases that spend 3-5 hours in the farms/garden were 1.727 times ($p<0.035$) likely to be stunted compared to households where the members spent less than an hour and 1-2 hours an this was statically significant whoever among the controls household that spent 3-5 hours were 2.447 times ($p<0.037$) more likely to have stunted children than those that spent 1-2 hours (2.072 times and 1.141 times) and less than an hour.

Category of house members involved in growing of sugarcane and other foods and nutrition status: Among the cases, households where father were majorly involved in sugarcane farming were 1.158 times more likely to be stunted compared households where the mothers and children were involved whoever households among the controls where the children were involved in growing other foods, there were 5.571 more likely to have stunted children compared to those with children (1.857) and fathers (1.393 time). The other factors were not statistically significant.

Location of obtaining food and nutrition status: Using bivariate analysis of logistical regression, households among the cases that purchased food were 6.000 times ($p<0.027$) more likely to be stunted compared to households that grew this own food and those that both grew

food for consumption and purchased food whoever among the controls, households that purchased food were 1.667 times ($p<0.029$) less likely to be stunted compared to those that grew their own food for consumption (1.258) or both grew this own food for consumption. Households that grew their food and purchased were not statistically significant.

4.5.3 Qualitative analysis for farming practices

One of the health facility in-charges said that;"*The malnutrition situation in the district has been put at risk with increasing sugarcane growing with farmers spending about 60-80% of the day on sugarcane farms and between 10-20 percent on other farms that is morning to midday at sugarcane and evening on other farms. Sugar cane is mostly grown 5-10 acres while other foods are grown on 1/4 acres on other farms especially in household growing sugar cane. Most farmers have no formal education but those who have were in tertiary institutions. [**KII, Namutumba District Community Development Officer].***

This finding was also emphasized by one of the in-charges where sugarcane is mostly who said that: *"Farmers in sugar cane growing households spend 4-6 hours on sugarcane gardens, and then 4 hours on other farms in cases practicing subsistence farming and such households have 2 to 7 acres for sugarcane and less than one acre designated for other foods." [**KII, In-charge Ivukula Health Centre III].*** This means that the time farmers spend in their field and sizes of their field/gardens have a significant role in affecting the nutrition status of children in the household.

4.6.1 Child caring practices

4.6.1Univariate analysis of child caring practices

Table 4.6 showing uunivariate analysis of Child caring practices

	Cases		Controls	
	Sugar cane growing		Non sugar cane growing	
	Frequency	Percentage	Frequency	Percentage
Common diseases in households				
Malaria	83	63.8%	158	60.8%
Measles	4	3.1%	2	0.8
Diarrhea	16	12.0%	39	15.0%
Fast breathing	7	5.4%	19	7.3%
Skin diseases	6	4.6%	13	5.0%
Eye diseases	5	3.8%	6	2.3%
No disease	9	6.9%	23	8.8%
Total	130	100.0%	260	100.0%
Sleeping under a mosquito net				
Yes	115	88.5%	241	92.7%
No	15	11.6%	19	7.3%
Total	130	100.0%	260	100.0%
DPT-HepB+Hib3 coverage				
Yes with card	73	56.2%	139	53.5%
Yes with no card	42	32.3%	90	34.6%
No with card	7	5.4%	20	7.7%
No without card	5	3.8%	9	3.5%
Not eligible DPT3	3	2.3%	2	0.8%
Total	130	100.0%	260	100.0%
Measles Vaccination				
Yes with card	62	47.7%	127	48.8%
Yes with no card	43	33.1%	85	32.7%
No with card	15	11.5%	29	11.2%
No without card	8	6.1%	19	8.5%
Not eligible	2	1.5%	0	0%
Total	130	100%	260	100.0%
Vitamin A supplementation				
Yes with card	61	46.9%	126	48.5%
Yes with no card	46	35.4%	91	35.0%
No with card	15	11.5%	31	11.9%

No without card	6	3.8%	9	3.5%
Not eligible	2	2.4%	2	0.8%
Total	130	100.0%	260	100.0%
Deworming				
Yes with card	50	38.5%	109	41.9%
Yes with no card	52	40.0%	95	36.5%
No with card	20	15.4%	41	15.8%
No without card	5	3.8%	12	4.6%
Not eligible	3	2.3%	3	0.8%
Total	130	100.0%	260	100.0%
Treatment site for household members				
VHT	17	13.1%	43	16.5%
Drug shop or clinic	22	16.9%	57	21.9%
Neighbor	1	0.8%	0	0%
Traditional healer	3	1.8%	2	0.8%
Health centre	87	66.9%	158	60.8
Total	130	100.0%	260	100.0%
Time spent to access a health facility				
less than 10 minutes	26	20.0%	54	20.0%
10-30 minutes	40	30.8%	86	33.1%
31-60 minutes	46	34.6%	92	35.0%
over 60 minutes	18	13.1%	28	10.8%
Total	130	100.0%	260	100.0%

Disease prevalence: The most common disease that the children under five years suffered a month before the study was Malaria in both households (63.8% among cases and 60.8% among controls). Among the cases, diarrhea was second (12 %), followed by eye infections (3.8%), fast breathing, skin diseases (5.4%), measles (3.1%) and 6.9 % of children did not suffer from any of the diseases. Among the controls, the diarrhea was second (15 %), then fast breathing, skin diseases (7.3%), then skin diseases (5%), followed by eye infections (2.3%), measles (0.8%) and 8.8 % of children did not suffer from any of the diseases.

Sleeping under a LLTIN: According to the above table, the majority of the children and household members slept under a LLIN among the cases (88.5%) and controls (92.7%) while 11.5% of the cases and 7.3% of the controls did not sleep under a LLTIN.

DPT-HepB+Hib3 coverage: From the table above, the majority of the children who received DPT-HepB+Hib3 had records in both cases (56.2%) and controls (53.2%) while the children that received DPT-HepB+Hib3 and had no documentation were 32.3% and 34.6% respectively. There were 5.4% and 7.7 % children who did not to receive DPT-HepB+Hib3 with documentation and 2.3% and 0.8% had no documentation in cases and controls.

Measles Vaccination: The majority of the children who received measles had records among cases (47.7%) and control (48.8%) while the children that received measles and had no documentation were 33.1% and 32.7% respectively. There were 11.5% and 11.2% of the children under five who did not to receive measles with documentation and 6.1% and 8.5% had no documentation among cases and controls. There were only 1.5% of the children not eligible for measles vaccination.

Vitamin A supplementation: The majority of the children who received vitamin A supplementation had records showing they given in the month of October 2014 (46.9% among cases and 48.5 % among controls) and only 35.4% and 35.0% reported to have received vitamin A with no documentation. Those who did not receive vitamin A supplementation and had not documentation included 11.5 % among cases and 11.9 % among controls while 3.8% and 3.5% had no documentation and there were 2.4% who were not eligible for Vitamin A supplementation among cases and 0.8% among controls.

Deworming: The majority of the children who received deworming had no records for deworming (40.0%) among cases while 38.5% were dewormed and had documentation. The children that did not receive deworming among cases were 15.4% with documentation while 3.8% had no documentation and only 2.3 % were not eligible for deworming. Among the controls, the majority of the children who received deworming had records for deworming (41.9%) while 36.5% were dewormed and had no records. The children that did not receive deworming in non sugar cane growing households were 15.8% with documentation while 4.6% had no documentation and only 0.8 % was not eligible for deworming.

Treatment site: Majority of the cases and controls visited a health centre (66.9% and 60.8%) followed by drug shops/clinics (16.9% and 21.9%), followed by a VHT (13.1% and 16.5%), then traditional healers (1.8% and 0.8%) and the least visited was the neighbor (0.8% and 0%).

Distance to health facility: The majority of the respondents spent 31-60 minutes to reach a nearby health facility in both cases (34.6%) and controls (35.0%) followed by 10-30 minutes (30.8% and 33.1%). The respondents that spent less than 10 minutes were 20.0% in both sets of household and the respondents that spent over 60 minutes (1 hour) were13.1% and 10.8% from cases and controls.

4.6.2 Bivariate analysis of child caring practices

Table 4.6 showing bi-variate analysis of child caring practices

	Cases			Controls		
Nutrition status (stunting) (%)		**P Value**	**OR**	**Nutrition status (stunting) (%)**	**P Value**	**OR**
Common diseases in the household						
Malaria	47 (36.2%)	0.565	0.653	58 (22.3%)	0.931	0.877
Measles	3(2.3%)	0.035*	1.500	1(0.3%)	0.034*	1.331
Diarrhea	6(4.6%)	0.169	0.300	6(4.6%)	0.431	0.291
Fast breathing	4(3.1%)	0.697	0.667	4(1.5%)	0.543	0.378
Skin diseases	5(3.8%)	0.042*	2.500	8(3.1%)	0.047*	2.908
Eye diseases	3(2.3%)	0.803	0.750	1(0.4%)	0.774	1.676
Sleeping under a LLIN						
Yes	65(50%)	0.557	0.708	80(30.7%)	0.732	1.207
DPT3 coverage						
Yes with card	40(30.8%)	0.678	0.727	47(18.1%)	0.718	0.676
yes with card	26(20%)	0.975	0.975	28(10.8%)	0.420	0.448
No with card	3(2.3%)	0.450	0.450	7(2.7%)	0.509	0.455
Measles vaccination						
Yes with card	31(23.8%)	0.561	0.639	40(15.4%)	0.938	1.078
Yes & no card	25(19.2%)	0.818	0.833	27(10.4%)	0.693	1.395
No with card	11(8.5%)	0.592	1.040	12(4.6%)	0.061	2.494
Vitamin A supplementation						
Yes with card	34(26.2%)	0.717	0.756	40(15.4%)	0.172	4.911
Yes & no card	27(20.8%)	0.789	0.810	30(11.5%)	0.167	4.441
No with card	8(6.2%)	0.806	0.800	12(4.6%)	0.499	2.157
Deworming						
Yes with card	23(17.7%)	0.392	0.511	32(12.3%)	0.086	0.200
Yes & no card	33(25.4%)	0.958	1.042	30(11.5%)	0.052	0.192
No with card	13(10%)	0.021*	1.114	18(6.9%)	0.080	0.609
Treatment site						
VHT	11(8.5%)	0.034*	1.140	18 (6.9%)	0.044*	2.183
Health facility	1(1%)	0.094	0.605	21(8.1%)	0.041*	1.871
Time to the health facility						
≤ 10 minutes	17(13.1%)	0.609	1.374	24(18.5%)	0.136	2.100
10-30 minutes	24(18.5%)	0.878	1.091	25(9.6%)	0.879	1.076
31-60 minutes	22(16.9%)	0.511	0.696	30(11.5%)	0.588	1.291

** Statistically significant variables*

The relationship between common diseases and nutrition status: Children among the cases that were affected with skin diseases were statistically significant ($p<0.042$) and were 2.5 times more likely to be stunted compared to those with measles 1.5 times. Child with measles were statistically significant ($p<0.035$) whoever among the controls the children with skin diseases were 2.908 times ($p<0.047$) more likely to stunted compared to those with eye diseases 1.676 times and measles (1.331 times). The other diseases were not statistically significant.

Sleeping under a LLITN and nutrition status: Children who did not sleep under a mosquito net in the controls were 1.207 times more likely to be stunted than among the cases although this is not statistically significant.

DPT3 and nutrition status: There were no statistical significance among children in both cases and controls although majority of the children reported to have received DPT-Hep B+ Hib 3 among cases the prevalence of stunting 30.8% and among controls was 18.1% while those with evidence of cards the prevalence was 20% among cases and 10.8% without evidence with cards. Stunting is also present among children that did not receive DPT-Hep B+ Hib 3 vaccine in both cases (2.3%) and controls (2.7%) with evidence of cards and 3.1% among cases and 0.7% among controls without evidence with cards.

Measles and nutrition status: Households who had their children without measles vaccination among cases were 1.040 times likely to be stunted whoever among the controls, children without measles vaccination were 2.494 more likely to be stunted compared to those who received the measles vaccination without cards (1.395) and those without cards (1.078).

Vitamin A and nutrition status: Children among the controls that received vitamin A and had evidence with cards were 4.911 times more likely to be stunted compared to those with no card

(4.441) and children with no cards (2.157 times) however there was no statistical significance on vitamin A supplementation among cases.

Deworming and nutrition status: Children among the cases that were not dewormed were 1.144 times more likely to stunted and statistically significant ($p<0.021$) compared to those that received deworming with no documentation (1.042) whoever among the controls there was statistical significance.

Access to treatment sites and nutrition status: Children that received treatment from the VHTs among the cases were 1.14 times likely to stunted and statistically significant ($p<0.034$) compared to the those that received treatment from the health facility whoever children among the controls that received treatment from the VHTs were 2.183 times were more to get stunted at ($p<0.044$) than those that received treatment from the health facility (1.871times).

Time spent to the health facility and nutrition status: Households among the control that spent less than 10 minutes to reach the health facility were 2.100 times likely to stunted compared to those that spent 31 to 60 minutes (1.076) and 10-30 minutes (1.076 times) whoever among the cases there was no statistical significance.

4.6.3 Qualitative analysis for child caring practices

The nutrition services provided in the communities include deworming and vitamin A. the in-charge of one of the facilities where the KIIs was held said that:

"Health workers have been equipped with the knowledge of organizing outreached and we work with the VHT to mobilize the community for above nutrition services but unfortunately these are not accessed by the community since they may not and when they are the gardens. This has

*limited communities from getting the services intended for them. The only time we may met them with the children is when they come to the facility." [**KII, In-charge Nsinze Health Centre III]***

This finding was also emphasized by one of the focus group discussion members in same sub county who said that;

*There were not aware of nutrition services provided but when they take their children for immunization health workers give their children all that is required and this is done usually up to when they get an injection of measles at the facility from then they have limited time to go to the facility since they are digging in the garden and rarely get communication to receives other services unless when their children are very sick and the VHT refer them to the health facility which are very far away from our homes.[**Female FGD member, Nsinze sub county kivule village].***

This means that the nutrition services like vitamin A supplementation and deworming have a significant role in affecting the nutrition status of children in the household.

4.7 Multivariate analysis results for Logistic Regression Analysis of Predictor Factors

4.7.1 Table showing multivariate analysis among cases (Sugar cane growing)

	Wald	P Value	OR
Demographic characteristics			
Age of children in household			
≤3 months	0.119	0.731	0.550
4-6 months	0.005	0.946	0.901
7-9 months	2.260	0.133	0.086
10-12 months	1.961	0.161	1.957
13-24 months	1.756	0.185	0.209
≥25 months	6.116	0.013*	2.356
Age of household Head			
15-20 yrs	0.038	0.846	1.236
21-25	3.438	0.064	0.010
31-35 years	0.141	0.707	0.672
36-40 years	0.523	0.470	2.088
≥41 years	4.231	0.040	3.878
Feeding practices			
Frequency of Breast feeding			
Once	0.024	0.046*	1.167
2-3 times	0.237	0.627	0.486
4-6 times	0.588	0.443	0.468
6-7 times	0.138	0.710	0.738
≥ 8 times	0.080	0.702	0.676
Frequency of feeding complementary foods			
Once	0.005	0.941	1.226

2 times	2.422	0.120	0.200
3 times	4.190	0.041*	0.160
4 times	1.141	0.285	0.456
Food consumed during complementary feeding			
Plantain	6.279	0.012*	1.282
Pumpkins	8.493	0.004*	0.065
Farming practices			
Acres where food and sugar cane are grown			
≤ one acre	1.917	0.166	1.402
one acre	6.957	0.008*	1.522
2-3 acres	4.457	0.035*	2.367
4-5 acres	3.680	0.055	0.716
Child caring practices			
Common diseases			
Malaria	0.003	0.956	0.941
Measles	0.254	0.014*	2.103
Skin diseases	0.423	0.006*	3.608
Deworming			
Yes with card	1.826	0.177	0.122
No with card	0.004	0.041*	1.104
Treatment site			
VHT	0.613	0.434	0.459
Health worker	4.093	0.043*	0.149

* *Statistically significant variables*

From further analysis with logistic regression of the variables that were significant at bivariate analysis, the predictor variables found to have statistically significant association with the nutrition status of children among cases were age of the head of the household ($p<0.040$),

children above 25 months ($p<0.013$) frequency of breast feeding ($p<0.013$), frequency of complementary feeding ($p<0.046$), land size by acreage (less than one acre with $p<0.008$ with and (with 2-3 acres 0.035 with $p<0.035$ and common diseases like measles ($p<0.014$), and skin diseases ($p<0.006$) and where households where accessing the health facilities ($p<0.043$). The common staples associated with poor nutrition status included matooke and plantain like bogoya, ndiizi and gonja (<0.012) and porridge, bread, rice, millet, maize and other grains ($p<0.004$.)

4.7.2 Table showing multivariate analysis among controls (non Sugar cane growing)

	Wald	P Value	OR
Demographic characteristics			
Age of children in household			
≤3 months	0.181	0.670	0.563
4-6 months	0.319	0.572	0.651
7-9 months	0.238	0.626	0.372
10-12 months	0.156	0.693	1.248
13-24 months	0.707	0.456	0.248
≥25 months	18.109	0.040*	1.244
Age of household head			
15-20 yrs	0.607	0.436	4.406
21-25	0.001	0.976	1.046
31-35 years	0.098	0.754	0.691
36-40 years	0.271	0.603	0.569
≥41 years	0.070	0.983	0.977
Frequency of Breast feeding			
Once	5.210	0.022*	0.160
2-3 times	0.001	0.971	0.958
4-6 times	0.018	0.894	0.913
6-7 times	1.783	0.182	0.436
≥ 8 times	0.015	0.902	0.942
Frequency of feeding complementary foods			
Once	0.245	0.621	0.609
2 times	1.141	0.285	0.376
3 times	3.368	0.066	0.194

4 times	1.864	0.172	0.261
Food consumed during complementary feeding			
Plantain	0.064	0.800	1.109
Pumpkins	0.555	0.456	1.351
Farming practices			
Acres where food and sugar cane are grown			
≤ one acre	0.454	0.500	0.550
one acre	3.376	0.066	0.419
2-3 acres	5.383	0.020*	0.299
4-5 acres	2.058	0.151	0.151
Child caring practices			
Common diseases			
Malaria	0.099	0.753	0.551
Measles	0.809	0.068	0.100
Diarrhea	1.177	0.278	0.119
Fast breathing	0.160	0.689	0.457
Skin diseases	0.308	0.079	2.022
Deworming			
Yes with card	1.331	0.249	0.403
No with card	0.057	0.811	0.825
Treatment site			
VHT	1.314	0.252	1.785
Health worker	0.540	0.062	1.470

* *Statistically significant variables*

From the logistic regression, predictor variables found to have statistically significant association with the nutrition status of children among the controls were frequency of breast feeding (breastfed only once a day with $p<0.022$) and land size (2-3 acres $p<0.020$).

CHAPTER FIVE: DISCUSSIONS OF STUDY RESULTS

5.0 Introduction

This chapter discuses research findings from the results of case control study on the influence of household commercial sugar cane growing on the nutrition status of children less than five years in Namutumba district in relation to the problem statement, literature review of studies conducted elsewhere with and in line with the specific study objectives. It also explains the results obtained from the study.

5.1 The prevalence of malnutrition

The study findings showed that the prevalence of stunting was highest (56.9%) among cases (households growing commercial sugar) cane compared to controls (household growing other foods) (35.6%). This is in relation to a study carried by Mbagaya G.M, et al 2004 that found stunting rates high in households growing sugar cane at 44.7% and above the national prevalence of stunting of 47% according to the UDHS 2011 thus increasing sugar cane growing predisposes household to malnutrition. Sugar cane growing significantly affected the nutrition status of children less than five years.

5.2 Demographic characteristic of respondents

Age of the household head: The majority of the cases were headed by persons with 41 years and above (40.8%). Among the controls the majority of the households were headed by persons with 36-40 years (28.1%) followed by persons with 41 years and above (21.5%). However at bivariate analysis the study results indicated the households among cases that were headed by the father were 1.129 times likely to have stunted children compared to the mothers and grandmothers, whoever among the controls stunting was more likely to be in household headed

by the father 4.11 times compared to the grandmothers 1.028 times. A local study in Ethiopia also showed that household members in the in the oldest age group surveyed (40-49) are the most affected by malnutrition (Teller and Yimar, 2000). The older house head were among the greater children nutrition status was affected.

Household head and nutrition status; The majority of the households were headed by fathers (87.7% of the cases and 84.2% of the controls) followed by mother headed household (8.5% and 7.3 %) this is in contrast to the UDHS 2011 where the about three in ten households are headed by a woman the same proportion as in the 2006 UDHS and this is consistent between rural and urban residence.. However at bivariate analysis stunting was highest among cases that were headed by the father were 1.129 times likely to have stunted children whoever among the controls stunting was more likely to be in household headed by the father 4.11 times compared to the grandmothers 1.028 times. This is not in line to study where children living in households headed by women are more likely to be undernourished as such households have limited access to resources and health services (Louat et al., 2000) and often earned little income due to less favorable labor market conditions being affected by her triple roles of production, reproduction, and care. However the study findings were in line with Thompson et al., 2001; and Schiller, 2005 who found out that fathers currently invest their time and resources on income generating activities and this account for much of the disadvantage of children from these households

Level of education: The study findings showed that most of the respondents (40.8% among the cases and 48.1% among the controls) had received primary level education. 29 % of the cases had not received any formal compared to 22.3 % of the controls. This was in relation to the recent released UDHS 2011 where 13%of women and 4%of men age 15-49 have no education. However at bivariate analysis Households in both cases and controls where the household

members had no formal education ($p<0.023$ and $p<0.014$) and those that obtained only primary level ($p<0.034$ and $p<0.037$) were more likely to have stunted children compared to those who obtained secondary and tertiary level of education. Household members who receive a minimal education are generally more aware than those who have no education of how to utilize available resources for the improvement of their own nutritional status and that of their families. Education may enable women to make independent decisions, to be accepted by other household members, and to have greater access to household resources that are important to nutritional status (Loaiza, 1997). A comparative study on maternal malnutrition in ten sub-Saharan African countries (Loaiza, 1997) and a study in Ethiopia (Teller and Yimar, 2000) showed that the higher the level of education, the lower the proportion of undernourished women. The study is also in relation UDHS 2011 where the mother's level of education generally was an inverse relationship with stunting levels where children of mothers with secondary or higher education are the least likely to be stunted(25%), while children whose mothers have no education are the most likely to be stunted (42%).

Marital Status: Among the cases, the married monogamous were the majority (55.4%), followed by married polygamous (40.8%) then those cohabiting (2.3%) and among the controls, the married monogamous were the majority (56.2%), and followed by married polygamous (35.8%) then widows (3.1 %). However at bivariate analysis, stunting was highest in married monogamous (30%) among the cases, while among the controls, stunting in married polygamous families were 1.112 times likely to stunted but this was not statistically significant ($p>0.05$). Marital status of the women is associated with household headship and other social and economic status of the women that affects their nutritional status. Nutritional and social security's could be endangered by a negative change in marital status. A study carried out in

Ethiopia showed that children's nutrition status is significantly associated with marital status indicating that compared to married women, the nutrition status of children is negatively affected among unmarried rural and divorced/separated urban women compared to married ones (Teller and Yimar, 2000).

Number of children in the household: The majority of the cases and controls household had children between 6-7 children (43.1% and 56.2%) but these had the least stunting (3.1%). Although at bivariate analysis, households among the cases that had 2-3 children were 1.932 times more likely to be stunted ($p<0.023$) compared to households with 4-5 children and one child whoever among the control households with 2-3 children were less 0.036 less likely to be stunted (($p<0.044$)). The number siblings in a household could affect the nutritional status of children. The presence of more than one child in the household usually results in not only resource constraints but also in competition among the siblings that would result in unequal child nutritional outcomes. Households with more children accrue fewer resources to each of the siblings. Blake (1981), for example, argued that parental expenditure per child is inversely associated with sibling size. Supporting this argument, empirical findings from Jamaica, Trinidad and Tobago, and three other Latin American countries (Brazil, Colombia and the Dominican Republic) revealed that large sibling size reduces the likelihood that children will be well-nourished (Desai, 1992; Bronte-Tinkew and De Jong, 2005).

Age of children: The majority of the children assessed from cases and controls, were those aged 25 months and above (53.8%) and (42.3%). At bivariate analysis a Among the cases, as the children grew older they were more likely to be stunted that is households with children who are aged 25 months and above were 8.22times more likely to be stunted and this was statistically significant ($p< 0.001$)compared to those aged 10-12 months (4.485 times) and 7-9 months (1.869

times), 4-6 months(1.682 times) and those less than 3 months (1.1.21 times) whoever among the controls children aged 25 months and above were less likely to be stunted 4.945 times although they were statically significant ($p<0.049$). A cumulative indicator of growth retardation (height-for-age) in children is positively associated with age (Anderson, 2002 as cited in Aschalew, 2003). Local and regional studies in Ethiopia have also shown an increase in malnutrition with increase in age of the child (Yimer, 2000; Genebo et al., 2004 Samson and Lakech, 2000). And according to UDHS 2011 the prevalence of stunting increased as the age of the child increased, with the highest prevalence of chronic malnutrition found in children age 24-35 months (43%) and lowest in children 6-8 months (12%). Thus there was a positive association as the child grew older and increased the chances of becoming stunted.

Sex for the children: The majority of the children assessed among the cases and controls were female (53.8% and 50.4%) and males were 46.2% and 49.6%. At bivariate analysis a children among the controls who were male were 1.084 times more likely to stunted compared to the children among households from the cases who were 0.510 times by statically significant ($p<0.042$). This is in relation to study to findings nationally where male children are more likely to be stunted than female children (37 and 30 percent, respectively). The studies above although were not in relation to a study where analyzing parental investment bias showed that female children are often deprived of access to resources due to socio-cultural settings favoring male heirs (Gibson, 2002). Thus sex composition of the siblings in controls may also have important implications for the resources available to children.

5.3 Familial factors

Food choices by household members: Doan & Bisharat (1990) found in Jordan that children of female heads or co-heads (those women who made decisions jointly with their husbands) in nuclear or laterally extended households had better nutritional status than those with mothers who were lived with their parents in-law in hierarchically extended households. In this study, among the cases and controls, the majority of food choices were done by mothers (93.8% and 80.7%) and least choices were done by mothers in law (0.8%). At bivariate analysis, the person who majorly was responsible for influencing food choices among the case was the mother and was 6.288 times more likely to have stunted children and this is statistically significant compared to the mother in law (3.593 times) and the fathers (0.677 times) whoever among the controls the mothers, mother in law and fathers were less likely to have stunted children. This is related to knowledge gap that some mothers may have that influence decisions making process. This is in relation to a study carried out in Senegal found that the inclusion of grandmothers in participatory learning activities on child nutrition and healthcare, led to significant gains in women's nutrition practices in feeding practices of newborns and these improvements were linked to the positive roles played by grandmothers in encouraging women to eat 'special' foods, to decrease their workload and to exclusively breastfeed their children Aubel, *et al*, (2004). Therefore decisions made by mothers do not affect nutrition status of children among cases.

Cultural practices: The majority of households did not have cultural practices (91.5% among cases and 92.7% in among controls), at bivariate analysis, household members where that reported to have cultural influences among cases were 1.224 times likely to stunted children compared to those with among control who were 0.759 times although this was not statically significant. Cultural practices usually influence the type of food to eaten and quantities a child

should have to a study done in Nigeria by Esimai O.A in 2001where food taboo and other cultural practices had no significant influence on the child's nutritional status.

5.4 Feeding practices

Children who have ever breast fed: Majority of the respondent reported to have breast fed their children in both cases and controls (93.8% and 94.6% respectively) but below national data where 98% of children are breastfed for some period of time (UDHS 2011). Whoever at bivariate analysis, Children among the controls who have ever been breastfed was 1.404 times more likely to have a poor nutrition status (stunting) than those among cases. The results do not differ much from those of general population in Uganda where 98% (UDHS 2011) of the child had ever breast fed although this still predisposed children to malnutrition. This is because most of the children are delivered in the same hospitals as the general population thus subjected to the same health services.

Initiation of breast feeding: Breastfeeding can enable physical closeness and emotional bonding and is essential for optimal child growth and development (WHO, 2010). Early initiation of breastfeeding serves as the starting point for the continuum of care for the mother and the new born that can have long-lasting effects on health and development (AED et al., 2010). According to the study findings, Initiation of breast feeding was reported highest with the first hour after birth in cases and controls (83.8% and 76.5%). However at bivariate analysis, households where mothers reported to have initially started breast feeding 3-24 hour were 9.000 times ($p<0.020$) more likely to have a poor nutrition status (stunting) than those who breast fed for 2-3 hours (0.041times ($p<0.041$)) and this was statistically significant whoever among the controls children who were initiated on breast feeding 3-24 hours were 2.923 times ($p<0.040$)

less likely to have a poor nutrition status (stunting) compared to those who initiated 2-3 hours ($p<0.032$)and were statistically significant. The study is in relation to study carried out by EN Muchina, and PM Waithak in 2010 that found out that there was a significant association between delay in time of breastfeeding initiation after childbirth and stunting $P\leq.05$ (odds ratio 2), discontinuation of breastfeeding and underweight $P\leq.05$ (odds ratio 4.5) and the reasons for late initiation of breastfeeding after childbirth such as inability of the child to suck, insufficient or no breast milk production among others revealed lack of awareness of the rationale behind early initiation of breastfeeding.

Exclusive breastfeeding: Exclusive breastfeeding is recommended by the WHO and includes initiation of breastfeeding within the first hour of life, allowing only breast milk without any other food or drink (not even water) with an exception of required vitamins and medicines. According to the study findings, among the cases, exclusive breastfeeding for 8 months was carried the most (70%), and among the controls, exclusive breastfeeding was carried the most for 6 months (53.1%), followed by a period of less than 6 months (21.5%). The exclusive breast feeding rates were above the national where More than six in ten children (63 percent) younger than 6 months are exclusively breastfed (UDHS 2011). At bivariate analysis children who breast fed for 6-8 months were 1.537 times more likely to have a poor nutrition status than those who exclusively breast fed for 4-5 months whoever children who were exclusively breast fed for 6 months among the cases were 1.222 times 1.222 less likely to have a poor nutrition status (stunting) compared to children who breast fed for 3 months (1.389 times). These findings compare with numerous other studies that have documented that early introduction of complementary feeds before the age of six months is a persistent negative practice regardless of the efforts similarly, a study in the Central region of South Africa, indicated that exclusive

breastfeeding during the first three months was uncommon as mothers tended to introduce complementary feeds at an early age, with 56% of the infants receiving some form of supplement by the end of the first month (Mamabolo RL 2004). A two-year prospective study in Nairobi's Kangemi established that by one month 75% infants had received complementary fluids and feeds and by the fourth month 94% had received complementary feed. (Mukuria AG, 1999). Besides, in a comparative study between a World Vision project and non-project areas in Makueni district indicated that 37.5% and 68.3% in the project and non-project areas respectively, introduced complementary feeds within the first three months (Kumar D, Goel, 2006).

Breast feeding during the 24 hour recall: The WHO 2004 recommends breast feeding at least 8 times a day in order to increase a mothers breast milk supply to meet the growing needs of an so as to experience a growth spurt around 10 days to 3 weeks, 6 weeks and 3 months. Among the cases, the majority of mothers breast fed at least 6-7 times a day (40%) followed by 4-6 times (22.3%) then 8 and greater than 8 (20.8%) times a day followed by 2-3 times (16%). Non breast fed once in a day. Among the controls, , the majority of mothers breast fed for at least 6-7 times a day (41.9%) followed by 2-3 times (23.5%), then 4-6 times (23.5%) the 8 and greater than 8 times a day (17.3%), followed by 4-6 times (15%)and the least was once a day (2.3%). However at bivariate analysis, children who breast fed 2-3 times were statistically significant among cases that is households among cases where children were breast fed 2-3 times in a day were 2.590 times more likely to have a poor nutrition status than those who were fed once in a day (1.443 times). According to study done by Nair et al 2003, they found out that mothers working environment and employment compromised infant feeding and care, and employment as disempowering. Mothers felt that the comprises to infant care and feeding due to long hours of

work, lack of alternative adequate care arrangements, low wages and delayed payments outweighed the benefits from farming scheme.

Breast milk substitutes: Generally breast milk substitutes are known to interfere with early attachment of the child to the breast. The majority of the 18.2%respondents among cases and 22.3% among controls used breast milk substitutes. At bivariate analysis using logistic regression, children among the controls who never used breast milk substitutes were 1.605 times more likely to have poor nutrition status (stunting) compared to those who used them (1.200 times) whoever those among the case. These findings differ from UDHS 2011 in which a significantly higher proportion of children in Uganda (41%).

Complementary feeding: According to WHO (2002), children are supposed to be breastfed exclusively for the first six months before starting on complementary feeding. Those who are not need to be informed and educated on the benefits of timely complementary feeding since the time of introducing complementary foods places most children at risk of being malnourished, because they are fed inadequate and unsafe foods. Among the cases, the majority of respondents reported to have initiated complementary feeding at 6 months (54.6%) while in controls, the majority of respondent initiated complementary feeding at 6 months (53.1%) this is in contrast to the national data where complementary foods are not introduced timely at 6-9 months, fewer than seven in ten children (68 percent) receive complementary foods and Overall, only 6 percent of children age 6-23 months are fed appropriately, based on the recommended infant and young child feeding (IYCF) practices (UDHS 2011).At bivariate analysis children who were imitated on complementary foods at 7 months among cases was significant relation with the nutrition status. When children were imitated on complementary foods at 7 months, they were 1.422 times more likely to be stunted compared to the other age categories and children among controls.

Most of the children had been introduced to solid and semi-solids foods by the age of 6 months as per the recommendations by WHO and UNICEF (2010). And in comparison to WHO, 2006, delaying the introduction of complementary feeds is likely to affect the nutrition status since breast-milk alone at six months is not adequate to maintain an infant in the right nutrition status.

Frequency of feeding in a day (24 hours): According to the Infant and Young Child Feeding Guidelines for Uganda 2010, breastfed Infants between 6-8 months should also receive 4 or more food groups, at least twice a day Breastfed Infants 9-23 months should also receive 4 or more food groups at least 3 times a day. Non-breastfed children should receive milk or milk products, in addition to 4 or more food groups, 4 times a day or more. Among the cases, majority of respondents in both control and cases feed their children 3 times a day (52.3% and 5.4%) and at bivariate analysis of logistical regression, children who fed once a day among the cases were 1.986 times more likely to be stunted compared to those who fed 2 times a day (1.052 times). While among the controls there was no significance o frequency of feeding a child and the nutrition status the study finding show that the households are not feeding their children to the recommended national guidelines on IYCF 2010.

Method of food preparation: The commonest method of food preparation in both cases and controls was boiling (58.5% and 53.5%). However at bivariate analysis Households that preferred frying among the controls were 3.865 times more likely to have a poor nutrition status (stunting) compared those that preferred steaming (2.147 times) and boiling (1.258 times). While among the cases there was no significance on the method of food preparation for children and the nutrition status. The above finding show that households do not practice the recommended methods of food preparation (IYCF guidelines, 2010) for children include steaming and boiling

as they preserve the nutrient which are beneficial for child growth although this was not statistically significant.

Foods consumed in the households: According to WHO guidelines, breastfed children aged 6-23 months should receive animal-source foods and vitamin A-rich fruits and vegetables daily (WHO, 2003), the above recommendation is not in agreement with the finding where the major foods consumed among the cases and controls included porridge, rice, bread, millet, maize and other foods from grains (88.5% and 99.5%) and At bivariate analysis feeding on vegetable and porridge, bread, rice, millet, maize and other grains ($p<0.04$) had significance relation with the nutrition status of children under five years in both cases and controls. Children among cases that consumed vegetables including dark green leafy vegetables like Nakati, dodo, ggobe among cases were 5.099 times more likely to have poor nutrition status (stunting) compared to those that consumed foods porridge, bread, rice, millet, maize and other grains and foods rich in vitamin A (1.826). Whoever among controls households that fed on porridge, bread, rice, millet, maize and other grains were 1.582 times less likely to have a poor nutrition status (stunted) compared children that consumed matooke including plantain like bogoya, ndiizi and gonja among controls were (1.239 times) and foods rich in vitamin A (1.016) like carrots, Orange fleshed sweet potatoes and pumpkin. The minimum acceptable number of food groups for breastfed infants is four food groups (Arimond and Ruel, 2003). In this study, most mothers get food from 2-3 food groups, followed by those who get food from two food groups.

The study findings are also in line with UDHS 2011 where children age 6-23 months, foods made from grains is consumed more often than foods from any other food group.

5.4 Farming practices

Acreage for food production: Sugar cane is mostly grown on 2-3 acres (46.9%), followed by 4-5 acres (23.8%), while Food crops are mostly grown on one acre (41.2%). At bivariate analysis households among the cases that owned lees than an acre of land were 4.222 more likely to have stunted children and this is statistically significant ($p<0.008$) compared to households that owned less than an acre with 2.667 times whoever among the control households with less than an acre were 1.241 times less likely to have stunted children ($p<0.037$). . However, as shown in this study, there was a negative relationship between farm size and children's nutrition; a possible explanation could be that with increase in farm size, there was the tendency for mothers to spend more time in sugar cane and agricultural activities that would eventually leave less time for adequate child feeding and care. According to (Hoorweg, J , Ed (1993), the households with the largest farms are most involved in sugar cane growing and agriculture but still have sizable incomes from employment and they succeed in achieving the highest incomes. Regrettably, this does not translate into evident increases in food consumption and better nutritional status because of the counteracting influences of family size and changes in household economy which result in lower incomes of women from casual labour, usually the main income used for food purchases.

Household members involved in food production:

Among the cases the major household members involved in sugar cane growing and food production are fathers, mothers and children (43.8% and 40.8%). At bivariate analysis Among the cases, households where father were majorly involved in sugarcane farming were 1.158 times more likely to be stunted compared households where the mothers and children were involved whoever households among the controls where the children were involved in growing other

foods, there were 5.571 more likely to have stunted children compared to those with children (1.857) and fathers (1.393 time). The study is relation to, a qualitative study carried out in rural Gambia, where women perceived that their heavy workload, involving the sole care of the child as well as the responsibility for other farm work, prevented them from always practicing that they knew in relation to child care (Mwangome et al. 2010). Further a longitudinal study of breastfeeding and women's work in the Brazilian found that the child's weight decreased as the time spent on subsistence work increased (Piperata & Mattern 2011). Household member involved in farming practices affect the nutrition status of children significantly.

Time spent in the garden

Among cases, the majority of respondents spend 3-5 hours on the farm (60%) while in controls, the majority of respondents spend 3-5 hours on the farm (46.9%). At bivariate analysis household members among the cases that spend 3-5 hours in the farms/garden were 1.727 times ($p<0.035$) likely to be stunted compared to households where the members spent less than an hour and 1-2 hours and this was statically significant whoever among the controls household that spent 3-5 hours were 2.447 times ($p<0.037$) more likely to have stunted children than those that spent 1-2 hours (2.072 times and 1.141 times) and less than an hour. Although women's employment enhances the household's accessibility to income, it may also have negative effects on the nutritional status of children, as it reduces a mother's time for childcare. Some studies have revealed that mothers of the most malnourished children work outside their home (Popkin, 2000; Abbi *et al*. 2001). Another study argued that there is no association between maternal employment and children's nutritional status (Leslie, 1988). This study finding show an association between the times spent on the farms growing sugarcane and nutrition status of

children whereby the time household members spent on the farms the likelihood of having a stunted child increased.

Location of obtaining food and nutrition status: Using bivariate analysis of logistical regression, households among the cases that purchased food were 6.000 times ($p<0.027$) more likely to be stunted compared to households that grew this own food and those that both grew food for consumption and purchased food whoever among the controls, households that purchased food were 1.667 times ($p<0.029$) less likely to be stunted compared to those that grew their own food for consumption (1.258) or both grew this own food for consumption. Households that grew their food and purchased were not statistically significant Households those are able to obtain their own food help in saving incomes instead of purchasing the food. In a study by Beaulac et al., 2009 and Larson et al., 2009, Low-income neighborhoods frequently practiced subsistence production and mothers obtained food in these farms to feed their children who improved nutrition status of children compared to households where mothers frequently purchased food from groceries and these had low incomes.

5.5 Child caring practices

Disease prevalence: The most common disease that the children under five years suffered a month before the study was malaria in both households (63.8% among cases and 60.8% among controls). Among the cases, diarrhea was second (12 %). The diarrhea prevalence is below the national prevalence that is according to UDHS 2011 nearly one quarter (23 percent) of all children under five had diarrhoea, while 4 percent had diarrhoea with blood. At bivariate analysis, Children among the cases that were affected with skin diseases were statistically significant ($p<0.042$) and were 2.5 times more likely to be stunted compared to those with

measles 1.5 times. Children with measles were statistically significant ($p<0.035$) whoever among the controls the children with skin diseases were 2.908 times ($p<0.047$) more likely to stunted compared to those with eye diseases 1.676 times and measles (1.331 times). According to WHO 2012, children who are malnourished are nine times more likely to die from infectious diseases such as, diarrhoea, malaria and measles. A comparative study on children's nutritional status (Sommerfelt et al., 1994) indicated that stunting was highest among children with recent diarrhea. This is in relation to the study findings which indicated statistical significance of children with diarrheal diseases among cases at risk of having a poor nutrition status and according to Guerrant RL at al., 2013, a child coping with such diseases will find it difficult to retain essential nutrients, thus putting that child at risk of falling into a dangerous state of malnutrition. Diseases like malaria, diarrhea and other infectious diseases usually manifest in the form of fever affect both dietary intake and utilization, which may have a negative effect on improved child nutritional status.

Sleeping under a LLTIN: The majority of the children and household members slept under a LLIN among the cases (88.5%) and controls (92.7%) while 11.5% of the cases and 7.3% of the controls did not sleep under a LLTIN. Although the majority of children slept under a LLITN, stunting was highest among the case and controls. Stunting was present in households where children did not sleep under a mosquito net in both sugar cane and non sugar cane households (6.9% and 1.9%). However at bivariate analysis children who did not sleep under a mosquito net among the controls were 1.207 time more likely to be stunted than among the cases although this is not statistically significant. This is in relation to study carried by Oyekale A.S. and T.O. Oyek, 2000 where children that were sleeping under mosquito nets had significantly lower probability of stunting. Children who do not sleep under LLINs are exposed to diseases like malaria;

diarrhea and measles thus show a positive association with stunting in both sets of household although this was not statistically significant.

DPT-HepB+Hib3 coverage: The majority of the children who received pentavalent DPT-HepB+Hib3 had records in both cases (56.2%) and controls (53.2%) while the children that received DPT-HepB+Hib3 and had no documentation were 32.3% and 34.6% respectively. There were 5.4% and 7.7 % children who did not to receive DPT-HepB+Hib3 with documentation and 2.3% and 0.8% had no documentation in cases and controls. The findings in coverage for children who received DPT-HepB+Hib3 are in approximately below the national coverage of 68% (UDHS, 2011). At bivariate analysis, there were no statistical significance among children in both cases and controls although majority of the children reported to have received DPT-Hep B+ Hib 3 among cases the prevalence of stunting 30.8% and among controls was 18.1% while those with evidence of cards the prevalence was 20% among cases and 10.8% without evidence with cards. Although this was not in line with study published in 2012, children in India with up-to-date vaccines against tuberculosis, diphtheria, tetanus, pertussis, measles and polio were less likely to show signs of stunting (Anekwe, T.D 2012).

Measles Vaccination: Immunization is an integral part of a primary healthcare platform reaching children multiple times in their first years of life, thus providing the opportunity to reach children with other critical health interventions. For populations living in rural areas, immunization services are often the first point of contact with the national health system. According to the study, the majority of the children who received measles had records among cases (47.7%) and control (48.8%) while the children that received measles and had no documentation were 33.1% and 32.7% respectively. There were 11.5% and 11.2% of the children under five who did not to receive measles with documentation and 6.1% and 8.5% had

no documentation among cases and controls. The coverage for vaccination is still a challenge in relation to the UDHS where half of children age 12-23 months (52%) were fully vaccinated at the time of the survey, an increase from the level of 46% reported in the 2006 UDHS. At bivariate analysis, Households who had their children without measles vaccination among cases were 1.040 times likely to be stunted whoever among the controls, children without measles vaccination were 2.494 more likely to be stunted compared to those who received the measles vaccination without cards (1.395) and those without cards (1.078). This is in relation to a study conducted by Anekwe, T.D et al, 2012 that suggests that children in India with up-to-date vaccines against tuberculosis, diphtheria, tetanus, pertussis, measles and polio were less likely to show signs of poor nutrition status like stunting (Anekwe, T.D et al, 2012).

Vitamin A supplementation: The majority of the children who received vitamin A supplementation had records showing they given in the month of October 2014 (46.9% among cases and 48.5 % among controls) and only 35.4% and 35.0% reported to have received vitamin A with no documentation. Those who did not receive vitamin A supplementation and had not documentation included 11.5 % among cases and 11.9 % among controls while 3.8% and 3.5% had no documentation among cases and 0.8% among controls. However at bivariate analysis Children among the controls that received vitamin A and had evidence with cards were 4.911 times more likely to be stunted compared to those with no card (4.441) and children with no cards (2.157 times) however there was no statistical significance on vitamin A supplementation among cases. According to Elizabeth W. Kimani 2012, receiving vitamin A supplement was significantly negatively associated with stunting and underweight status, adjusting for other co-risk factors and the odds of stunting were 50% higher (p=0.038), among children who did not

receive Vitamin A supplement compared with those who did. Although this study relates to the finding vitamin A supplementation is not statistically significant among the cases.

Deworming: The majority of the children who received deworming had no records for deworming (40.0%) among cases while 38.5% were dewormed and had documentation. Among the controls, the majority of the children who received deworming had records for deworming (41.9%) while 36.5% were dewormed and had no records. The children that did not receive deworming among the controls were 15.8% with documentation while 4.6% had no documentation and only 0.8 % was not eligible for deworming. At bivariate analysis, children among the cases that were not dewormed were 1.144 times more likely to stunted and statistically significant ($p<0.021$) compared to those that received deworming with no documentation (1.042) whoever among the controls there was statistical significance. In study to determine the effect of periodic deworming on nutritional status by Mahesh C. Ad Gupta in 1977, they found out that the nutritional status remained unaltered in the controls but improved strikingly in the treated children 8 and 12 months after the start of the study.

Treatment site: The majority of the cases and controls visited a health centre (66.9% and 60.8%) followed by drug shops/clinics (16.9% and 21.9%), followed by a VHT (13.1% and 16.5%), then traditional healers (1.8% and 0.8%) and the least visited was the neighbor (0.8% and 0%). Using bivariate analysis, children that received treatment from the VHTs among the cases were 1.14 times likely to stunted and statistically significant ($p<0.034$) compared to the those that received treatment from the health facility whoever children among the controls that received treatment from the VHTs were 2.183 times were more to get stunted at ($p<0.044$) than those that received treatment from the health facility (1.871). This not in agreement with a study

conducted by Maseta et al. (2008), which also noted an association between access to health services and the nutritional status of children although it is not statistically significant.

Distance to health facility: Access to health services is the main determinant of whether the public is going to utilize the services. However, one also has to consider the quality and prices associated with the service, although they obviously have little relevance If access is limited (MoFED, 2002a; 2002b). Access to Health services is expected to Influence nutritional status, as children without access to such services are more likely to be malnourished, reflected through weight loss which is associated with untreated diarrhoea and other infectious diseases. According to the study findings, the majority of the respondents spent 31-60 minutes to reach a nearby health facility in both cases (34.6%) and controls (35.0%) followed by 10-30 minutes (30.8% and 33.1%). Using bivariate analysis, households among the control that spent less than 10 minutes to reach the health facility were 2.100 times likely to stunted compared to those that spent 31 to 60 minutes (1.076) and 10-30 minutes (1.076 times) whoever among the cases there was no statistical significance. Christiansen and Alderman (2004) found that after controlling for a number of other determinants of child malnutrition, distance to the nearest health centre is not a significant determinant. The lack of explanatory power of the distance variable might be explained by the fact that the proxy for access to health centre does not capture the quality of healthcare provided, which is as important as distance. And this was in relation to study finding where by even if they were household members near and with access to the health facility there was stunting.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter deals with the brief summary of the steps taken in the study, conclusions, study findings and implications to District management and recommendations.

6.1 Conclusions

From the study findings, the following conclusions can be deduced;

The prevalence of malnutrition: The study finding showed that the prevalence of stunting was critically high (56.9%) among the cases greater than the WHO recommended levels of stunting of 20% and these level are classified as high very high above the WHO classification of 40%.

Demographic factors: From further analysis with logistic regression of the variables that were significant at bivariate analysis, the predictor variables found to have statistically significant association with the nutrition status of children among cases were age of the head of the household ($p<0.040$), children above 25 months ($p<0.013$)

Familial factors: There were familial factors that significantly influenced the nutrition status of children less than five years in study. Therefore the children nutrition status was not affected by cultural practices, food choices and primary caregivers of the children.

Feeding practices: The frequency of breast feeding ($p<0.013$), frequency of complementary feeding ($p<0.046$). The common staples associated with poor nutrition status included matooke and plantain like bogoya, ndiizi and gonja (<0.012) and porridge, bread, rice, millet, maize and other grains ($p<0.004$.)

Farming practices: the land size by acreage (less than one acre with $p<0.008$ with and (with 2-3 acres 0.035 with $p<0.035$ significantly influenced the nutrition status of children.

Child caring practices: the common diseases the influenced the nutrition status of children were measles ($p<0.014$), and skin diseases ($p<0.006$). The other factors included households accessing the health facilities ($p<0.043$).

6.2 Recommendations

From the findings of the study, we therefore recommend the following;

To the district leadership

The district leaders should enforce bi-laws that limit sugar cane growing in relation to the size of land household member have.

To the District Health Office

Train health workers on nutrition interventions to support households make informed decisions.

Support mothers with complementary feeding practices especially from 6 months since stunting increased as children grew older.

Sensitize household on the importance of diet diversification and importance of including foods from protein sources and animal food to support in adequate growth.

Strengthen the control and coverage for malaria, measles, diarrhea, skin diseases and deworming that predispose children to poor nutrition status.

To the production and market department

Support farmers with knowledge of growing variety of food and control commercialization of foods grown at household level

To the government

Develop policies, regulation and standards regulating sugar cane growing at household level.

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APPENDICES

Appendix 1: Consent form for respondents

A. Introduction: Adequate nutrition is essential in early childhood especially among children under five to ensure healthy growth, proper organ formation and function, a strong immune system, and cognitive development. This can lead reduction of child morbidity and mortality as a result of adequate feeding, child caring, familial and food growing practices. In Eastern Uganda, Namutumba district, there has been an increase in households involved in commercial sugar cane growing and this impact to the nutrition status of children.

B. Study Purpose: The purpose of the study is a case control study on the influence of household commercial sugarcane growing on the nutrition status of children under five years in Namutumba district to be submitted to the Institute of Health And Policy Management for partial fulfillment of the requirement for the award of a master's of science degree in public health.

C. Study Procedures: If you agree to participate in this study, the interviews will last for about 30 minutes and questions will deal with identifying feeding, child caring, sugar cane growing and familial practices and how they are related to nutrition status of children less than five years..

D. Risks of Study Participation: There are minimal risks to you or your department in this study and there will only be inconvenience in setting apart to respond to the interview questions.

E. Benefits of Study Participation: Your participation in this study or participation by your department may lead to the understanding of child caring, sugar cane growing and familial practices in households carrying out commercial sugar cane growing.

F. Reimbursements and Compensations: there will not be any reimbursement or compensation to Key Informant Interviews conducted at the district and those targeting household heads. The

compensation will only be given to those involved in the FGDs and this will be in the form of transport refunds of only Five Thousand Shillings Only (UGX SHS 5,000 /=).

G. Alternatives to Study Participation: Your participation in this study will not prevent you from participating in other similar studies now or in future.

H. Research Related Injury: There is minimal anticipated research-related injury that could occur in your participation in this study. We anticipate distraction from your scheduled activities for thirty (30 minutes) to respond to the interview questions. This distraction will be minimized by employing experienced and trained interviewers (research assistants). If you experience emotional or physical injury as a result of participating in this research study, contact Mr. Odyek Joseph on 078-2351-856.

I. **Voluntary Nature of the Study:** Participation in this study is voluntary. If you decide to participate, you are free to withdraw at any time without affecting those relationships. At any time you can refuse to answer certain questions, discuss certain topics or even put an end to the interview without prejudice to yourself. Refusing to participate will not alter your usual relations, involve any penalty or loss of benefits to which you are otherwise entitled.

J. Confidentiality: The records of this study will be kept private. In any publications or presentations, we will not include any information that will make it possible to identify you as a participant. No names will be mentioned and the information will be coded.

K. Participant rights

If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher(s), you are encouraged to contact MR. Odyek Joseph from the International Health Science University Institute of Policy and Management. You will be given a

copy of this form to keep for your records. A copy of this consent form will be given to you if you wish. If you wish to participate in this study, please sign below.

The consent form has been explained to me and I agree for me to take part in the study. I am free to choose for myself to be in this study. Signing this consent form indicates that I have been informed about the research study in which I am voluntarily agreeing to participate. I will be given a copy of this form for my records.

Name of Participant:…….

Signature:…… Date/Time:……

Name of Person Administering Consent Form…….

Signature of Person Administering Consent Form Date/Time

*If the participant is unable to read and/or write, a witness should be present during the informed consent discussion. After the written informed consent form is read and explained to the participant, and after he/she has orally consented to participation in the study, and have either signed the consent form or provided their fingerprint, the witness should sign and date the consent form. By signing the consent form, the witness attests that the information in the consent form and any other written information were explained to and understood by the participant and that informed consent was freely given by the participant.

Name of Person Witnessing Consent (printed)

Signature of Person Witnessing Consent Date/Time

Appendix 2: Questionnaire for Household Head

Location			
Date of survey: _____/_____/_____ *(MM/DD/YYYY)*	Supervisor	Sub-County:	
Parish Name:	Village:	HH#:	
SECTION 1: HOUSEHOLD INFORMATION			
1. Age of House hold head ___	2.House hold head is 1=Mother of the index child 2=Sister 3=Aunt 4=Grandmother 5=Others specify		3. Educational level of HH head: 1= No formal education 2= Primary 3= Secondary 4= Tertiary
4. House hold head marital status 1=married, monogamous; 2=married, polygamous 3=cohabiting 4=single 5=widowed 6=divorced 7=separated	5. Number of children below 0-59months (5year):		
SECTION 2: FEEDING PRACTICES IN HOUSEHOLD			
Ask head of house hold mothers/caregiver with children between 0-59 months of age.			
a. Duration of Breast feeding			
6. Has this child ever been breastfed?	1=Yes 0=No *If no skip to 2.6*		
7. If yes, how long after birth did you start breastfeeding (first to put on the breast)?	1= within first 1 hr 2= After 1 hr 3=Did not breastfeed at all 88= Don't remember		
8. Did you give any other liquid (e.g. water, liquid, herb or syrup feed) to the child before breast milk	1=Yes 0=No		
9. How long after birth was the child given only breast milk (exclusive breast feeding)?	1= 3 months 2= 5 months 3= 6 months 4= Did not breastfeed at all		
b. Complementary foods			
10. At what age did you start giving other food other than breast milk?			
11. What foods did you give your child at 6 MONTHS?	Energy giving foods (carbohydrates)	Body building foods (proteins)	Protective foods
c. **Frequency of feeding children**			
12. How many times did you breast feed your child from the time you woke up yesterday until the time you woke up this morning?	_____times		
13. How many times in a day do you feed your children feed	1= 2 times 2= 3 times 3=4 times		

	4= more than 5 times		
d. **Food types available at home**			
14. Where do you get the food you feed your children	1 = Own production (crops, animals), direct or indirect-sale or exchange 2 = Hunting, fishing, gathering 3 = Exchange labour/items for food 4 = Borrowed 5 = Purchased 6 = Gift (food) from family/relatives 7 = Food aid (NGO's) 8=sale of household non-productive item 9=sale of household productive item		
15. Who majorly influences the food choices that you make and prepare for your children?	1 = Husband 2 = Mother-in-law 3 = Mother 4 = Nobody influences me, only I make the decision 5 = Other _____		
e. Food preparation methods			
16. How do you prepare foods for the children probe for cooking methods being used?	**Children (6-24months)** 1= steaming 2= Boiling 3=frying 4= 1and 2 Specify any other……		**Household members** 1= steaming 2= Boiling 3=frying 4= 1and 2 Specify any other……
f. Cultural practices on feeding			
17. Do you have any cultural practices in this community that influence how you feed your children?	1 yes 2 N		
18. If yes what do you give children other than breast milk when a mother has just delivered (within 48 hours after delivery)?			
19. Please specify other cultural practices that influence the feeding of children in this community.	_____ _____		
SECTION 3: Sugarcane farming practices in household			
g. Time spent on the farms			
20. How long do you spend when in the sugar cane farm/garden	1 = 2 hours 2 = 5 hours 3 = more than 5 hours 4 other specify = ...		
21. How long do you spend when on the other garden (not on sugar cane garden)	1 = 2 hours 2 = 5 hours 3 = more than 5 hours 4 other specify = ...		
h. Distance from the farms			
22. How long do you take to reach your garden where sugar cane is grown	1 = less than 10 mins 2 = 30 mins 3 = more than 1 hour 4 other specify = ...		

23. How long do you take to reach your garden where other foods are grown other than sugar cane	1 = less than 10 mins 2 = 30 mins 3 = more than 1 hour 4 other specify = ...		
i. Variety of food crops grown			
24. Do you grow sugar cane?	1 yes 2 No		
25. What others foods are grown at home other than sugar cane?	Energy giving foods (carbohydrates)	Protective foods	
26. Do you have animal/poultry at home?	1 yes 2 No		
27. If yes specify the types and number o animals being kept at home?	……. No _____		
j. Farm/garden size			
28. What is the size of your garden/farm			
k. Land size cultivated with sugar cane			
29. How many acres is sugar cane grown on this farm?	1 = one acre 2 = 3acres 3 = 4 acres 4 = .more than 5 acres		
l. Land size cultivated with food crops			
30. How many acres are occupied by other foods other than sugar cane?	1 = one acre 2 = 3acres 3 = 4 acres 4 = .more than 5 acres 5 =Other (please specify).....		
m. House hold members involved in farming			
31. How many household members are involved in sugar cane growing	1= one 2 = two 3 = three 4 = .more than 5 persons 5 =Other (please specify).....		
32. Please specify the type of household members involved in the growing of sugar cane	1= only father 2 = only Mother 3 = only Children 4 = .only father and mother 5= only father, mother and children 6= only father and children 7= only mother and children 8 =Other (please specify).....		
33. How many household members are involved growing of other food groups other than sugar cane	1= one 2 = two 3 = three 4 = .more than 5 persons 5 =Other (please specify).....		
34. Please specify the type of household members involved other foods other than sugar cane	1= only father 2 = only Mother 3 = only Children 4 = .only father and mother		

	5= only father, mother and children 6= only father and children 7= only mother and children 8 =Other (please specify).....	
SECTION 4: CHILD CARING PRACTICES		
n. Prevention of illness diseases		
35. Mention the diseases your children have suffered in the last 2 weeks	1 = Fever/malaria 2 = measles 3 = diarrhea 4 = Fast breathing /cough 5 = skin diseases 6 = Eye disease 7 = other (specify) 8 = No Illness	
36. Did the child sleep under a Long Last Insecticide Net (LLIN) mosquito net yesterday?	1= Yes 0= No	
37. Has the child been taken for BCG immunization?	1=Yes with card 2=Yes with no card 3=No with card 4=No without card	
38. Has the child been taken for DPT-3 immunization?	1=Yes with card 2=Yes with no card 3=No with card 4=No without card	
39. Has the child been taken for Measles immunization? *(Indicate only for children above 9 months of age)*	1=Yes with card 2=Yes with no card 3=No with card 4=No without card	
40. In the last 6 months, did the child receive Vitamin A supplementation? *(Indicate only for children above 6 months of age)*	1=Yes with card 2=Yes with no card 3=No with card 4=No without card	
41. In the last 6 months, did the child receive de-worming tablet? *(Indicate only for children above 6 months of age)*	1=Yes with card 2=Yes with no card 3=No with card 4=No without card	
o. Linkage with health structures		
42. When someone is sick in the household where do you first go for treatment?	1= VHT 2= Drug shop or clinic 3= Traditional healer 4= Neighbor 5= Relatives 6= Health center 7= Others (Specify)	
43. How long does it take you to reach the public/private health centre?		
p. Persons caring for children		
44. Who takes care of the children most of the time in the day?	1 = Mother 2 = Father 3 = Grandmother 4 = Older sibling (under the age of 10) 5 = Older sibling (over the age of 10)	

	6 = Auntie 7 = Other (Specify):_____	
Childs nutrition status (the last born in the household)		
43. Weight of the child	……Kg	
44.edema	1=Yes 2= No	
45. MUAC	1=Red 2= Yellow 3=Green	
46. Age of child		
47. Sex of child		
Length/Height		

Appendix 3: Key Informant Guide

Targeting Chief Administrative Officer, District Health Team, Market and Production, District Education Officer, Community Development Officer

1) In your capacity as _____, what is your role in promoting nutrition practices and better nutrition status in communities where sugar cane s grown?
2) What are the perceptions of women and men towards breast feeding in sugar cane growing households? Probe for early initiation of breast feeding (with n the first hour), How children should be exclusively breast fed? Feeds are usually given to children before breast milk in this community are given?
3) Are there women in sugar cane growing areas who do not breast feed in this community? What keeps women away from breastfeeding in the community? Are there women who breast feed children for 6 months without giving any other drinks? If yes what make this possible?
4) What cultural beliefs and practices have you heard that influence breast feeding in sugar cane growing households? What cultural beliefs and practices influence feeding of children on other family foods other than breast milk?
5) What are the farming practices being carried in this community? (Probe whether households are growing only sugar cane, growing sugar cane and other food crops and types of food grown?)
6) How long do farmers spend on the while on sugarcane farms? How long do farmers spend in garden growing other foods other than sugar cane?
7) What is the land size on which sugar cane is grown? What is the land size on which other foods are grown is grown?

8) What is the education of farmers growing sugar cane? (Probe for primary, secondary (O and A level, University and tertiary institutions)? How many children do they have?
9) Where do members in sugar cane growing get health and nutrition services?
10) What health and nutrition services are provided to women and their children in this community? (Probe for sleeping under mosquito nets, provision of Vitamin A for children above 6 moths, deworming, immunization services/vaccines given to children)
11) Who gives support mothers/advice/information about breastfeeding and feeding of children in this community?

Appendix 4: Focused Group Discussion guide

Targeting women men from sugar cane growing households and other households

Feeding Practice in the household

1) What are children fed on immediately they are delivered? How long does it take for children to be given breast milk in this community?

2) What feeds are usually given to children before breast milk in this community? What could be some of the reasons why mothers give other fluids first other than breast milk to the baby?

3) How long should children be given only breast milky (exclusive breast feeding)? How many times a day should a mother breast feed a baby?

4) Are there women in this community who do not breast feed in this community? What keeps women away from breastfeeding in the community? Are there women who breast feed children for 6 months without giving any other drinks? If yes what make this possible?

5) When do you start feeding children other foods other than breast milk in this community?

6) What are first food and drinks given to children when they stop breastfeeding? How do you prepare the first food given to a baby?

7) What cultural beliefs and practices in your area influence breast feeding? What cultural beliefs and practices in your area influence feeding of children on other family foods?

Sugar cane farming practices

8) What are the food crops grown in this community? What animals are reared in this community?
9) What is the farming practices being carried in this community? (Probe whether households are growing only sugar cane, growing sugar cane and other food crops)Households
10) How long do farmers spend on the while on sugarcane farms? How long do farmers spend in garden growing other foods other than sugar cane?
11) What is the land size on which sugar cane is grown? What is the land size on which other foods are grown is grown?

Familial factors of the households

12) What is the education of farmers growing sugar cane? (probe for primary, secondary (O and A level, University and tertiary institutions)
13) How many children do you have?

Child caring practices

14) Where do you for health and nutrition services in this community:
15) What health and nutrition services are provided to women and their children in this community? (Probe for sleeping under mosquito nets, provision of Vitamin A for children above 6 moths, deworming)
16) What vaccines are given to children in this community? (Probe for vaccines given after delivery and before discharge, administration of measles vaccine)
17) Who gives support mothers/advice/information about breast feeding in this community?

Appendix 5: Research Work plan

Time table for the case control study on the influence of household commercial sugarcane growing on the nutrition status of children under five years in namutumba district from April to December 2014

NO:	Activities	Time-line																								Responsible Person (s)
		May/April				Jun/Jul				Aug				October				November				December				
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
1	Research Proposal Writing																									Researcher/student
2	Presentation of Proposal & Approval by institution																									Researcher/student and Supervisor
3	Training of Research Assistants																									Researcher/student
4	Pretesting Study tools																									Researcher/student and Research Assistants
5	Data Collection, Entry & Cleaning																									Researcher/student and Research Assistants
6	Data Analysis and Interpretation																									Researcher/student
7	Writing Dissertation																									Researcher/student
8	Defending of the Dissertation to the school																									Researcher/student
9	Marking of dissertation and External Supervision																									Supervisor

Appendix 6: letter of Introduction

IHSU INTERNATIONAL HEALTH SCIENCES UNIVERSITY

PART OF INTERNATIONAL MEDICAL GROUP

Office of the Dean, Institute of Health Policy & Management

Kampala, 2nd October 2014

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Dear Sir/ Madam,

RE: ASSISTANCE FOR RESEARCH

Greetings from International Health Sciences University.

District Health O
NAMUTUMBA DIS

This is to introduce to you **Odyek Joseph, Reg. No. 2012-MPH-PT-031** who is a student of our University. As part of the requirements for the award of a Masters Degree of Public Health of our University, the student is required to carry out field research for the submission of a Research Dissertation

Odyek would like to carry out research on issues related to: **A Case Control Study on the Influence of Household Commercial Sugarcane Growing on the Nutrition status of Children under five(5) years in Namutumba District**

I therefore request you to render the student such assistance as may be necessary for his research.

I, and indeed the entire University are thanking you in anticipation for the assistance you will render to the student.

INSTITUTE OF HEALTH POLICY AND MANAGEMENT

Sincerely Yours,

Prof. David Ndungutse Majwejwe
Dean, Institute of Health Policy & Management

Turnitin Originality Report

A CASE CONTROL STUDY ON THE INFLUENCE OF HOUSEHOLD COMMERCIAL SUGARCANE GROWING ON THE NUTRITION STATUS OF CHILDREN UNDER FIVE YEARS IN NAMUTUMBA DISTRICT by Odyek Joseph

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