A LOGISTIC REGRESSION ANALYSIS FOR THE RISK FACTORS ASSOCIATED WITH MALNUTRITION AMONG CHILDREN UNDER 5 YEARS IN UGANDA

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DECLARATION

I, Iradukunda Orly Davis, hereby declare that this thesis report has been carried out by me under the supervision of my university supervisor. It has not been presented for award of any degree in any institution. All sources of information are specifically acknowledged by means of reference.



30-10-2024

Signature **Date**

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APPROVAL

This is to certify that this thesis report has been developed under my supervision and it is now ready for further cross- examination.

Signature…… Date……..

Dr Teniola Bayowa Babalola

DEDICATION

I dedicate this research thesis to my lovely mother and father, and my siblings. God bless them all for their constant support.

LISTS OF ABBREVIATIONS AND ACRONYMS

AIDs	Acquired Immunodeficiency Syndrome
EAs	Enumeration Areas
EBF	Exclusive Breastfeeding
EMDHS	Ethiopian Mini Demographic and Health Survey
FAO	Food and Agricultural Organization
GDHS	Ghana Demographic and Health Survey
GSEM	Generalized Structural Equation Model
HIV	Human Immunodeficiency Virus
IYCE	Infant and Young Child Feeding
LMICS	Low-and-Middle-Income Countries
MIYCN	Maternal, Infant and Young Child Nutrition
MUAC	Mid Upper Arm Circumference
NPHC	Uganda National Population and Housing Census
ORS	Oral Rehydration Solution
PEM	Protein Energy Malnutrition
SPSS	Statistical Package for Social Sciences
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health Survey
UNHS	Uganda National Household Survey
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

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ABSTRACT

This study investigated the risk factors associated with malnutrition among children under 5 years in Uganda between 2006-2016. The study was guided by the following research objectives: i) to identify the demographic factors associated with malnutrition in children under 5 years in Uganda between 2006-2016; ii) to find out the socio-economic factors by fitting it into regression models, associated with malnutrition in children under 5 years in Uganda between 2006-2016; and iii) to establish the feeding practices associated with malnutrition in children under 5 years in Uganda between 2006-2016. The study adopted cross-sectional studies based on data from the Uganda Demographic and Health Surveys (UDHS) from 2006, 2011, and 2016. The study population was 10,152 participants. The study used multistage sampling technique. Data analysis was performed using binary and multivariate logistic regression. The demographic factors associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 included, age, sex, birth interval, size at birth, and residence. In addition, the study found that breastfeeding practices associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 is 'not breastfeeding'. The study concluded that the factors associated with malnutrition are: age, sex, birth interval, size at birth, residence, mother's nutritional status, mother's education, wealth quintile, and not exclusively breastfeeding a child. The study recommended among others that interventions should be focused on child health promotion and prevention, improvement of household wealth index and food security, including mother's awareness regarding health nutritional care of children <5 years in Uganda. New policies in nutritional intervention, particularly for mothers with low BMI and children who have smaller size at birth should be implemented by the government to improve health and nutritional status of children <5 years in Uganda.

CHAPTER ONE

1.1.1 Background of the study

Malnutrition, which comprises undernutrition and overnutrition, is one of the biggest health challenges for children particularly in low-and middle-income countries (World Health Organization [WHO], 2020). Almost half of all deaths in under-five children are linked to undernutrition (United Nations Children's Fund [UNICEF], 2020; Global Nutrition Report, 2021). In 2019, 144 million under-five children suffered from stunting, 47 million were short for their age, and 38.9 million suffered from overweight (UNICEF, 2020). It is true that malnutrition causes approximately half of all fatalities in under five years children, with low and middle income countries (LMICs) bearing a disproportionate share of the burden (Fanzo, Hawkes, & Udomkesmalee, 2018). Malnutrition exposes children to the risk of dying from common infections and also contributes to the increase in the frequency and severity of such infections (UNICEF, 2020). The phenomenon of undernutrition is more pronounced in some regions of the world than others.

In 2019, while three regions (South Asia, East and Southern Africa and West and Central Africa) had the highest prevalence of stunted children, South Asia and sub-Saharan Africa as a whole had more than half and one-quarter of the global wasted children, respectively (UNICEF, 2020). Its effects on future national economic productivity and child survival cannot be overstated (Ruia, Gupta, & Bandyopadhyay, 2018). To reach the 2025 target, there needs to be more improvement in the frequency of low birth weight, wasting, and the number of children under the age of five who are short for their age. While the prevalence of wasting will continue to be significantly over the 5% target, the number of stunted children is predicted to be 131 million by 2025 (Global Nutrition Report, 2021).

Malnutrition has a negative impact on people, households, and the larger community. Undernourished children are more likely to die young, develop illnesses as youngsters, have cognitive impairments, do poorly in school, have lower earning capacity, and are more prone to develop non-communicable diseases later in life (Hall, et al., 2020). Low birth weight kids, who have a higher chance of having subpar growth and development, are more likely to be born to undernourished mothers (Wu, Imhoff-Kunsch, & Girard, 2012). The WHO set objectives to

reduce the number of stunted children by 40% and also keep childhood wasting at less than 5% by 2025 in response to this evidence (WHO, 2021). The second Sustainable Development Goal has strengthened these objectives even more (UN, 2016). While there has been significant success in the Asia-Pacific area, where more than half of the world's hungry children reside, the rate of reduction in child malnutrition has slowed (FAO, UNICEF, & WFP, 2019). For instance, Papua New Guinea (PNG) has the highest (65%) frequency of combined stunting, wasting, and obesity (UNICEF, 2019). Due to war, interethnic strife, and rural areas where smallholder farming is still the primary means of subsistence, malnutrition continues to be a heavier burden in Myanmar, Yemen, and Syria.

In sub-Saharan Africa, a small amount of progress has been made toward attaining the nutrition goals. Twenty eight nations are on track to meet the global target for overweight among children under the age of five, 19 are on track for wasting among children under five years, and six are on track for stunting among children under the age of five (Global Nutrition Report, 2021). Africa still has a problem with malnutrition among young children, although doing pretty well compared to other regions. 5.3% is the average overweight prevalence, which is lower than the 5.7% global average. Stunting is more common than the 22.0% global average, occurring in 30.7% of children. In contrast, the prevalence of wasting is 6.0% in the Africa area, which is lower than the global average of 6.7% (Global Nutrition Report, 2021).

Malnutrition for under 5 children increased in Sub-Saharan Africa from 181 million in 2010 to 222 million in 2016 (FAO, UNICEF, & WFP, 2019). Despite a decrease in the frequency of stunted children between 2000 - 2017, the population expansion caused an increase in the number of children affected, from 50.6 to 58.7 million. Malnutrition is still a substantial public health issue in this part of the world as evidenced by the incidence of wasting in 2017, which was 13.8 million children, 4 million of whom were severely wasted. The number of overweight children under the age of five increased from 6.6 million in 2000 to 9.7 million in 2017 (UNICEF, 2019).

In Uganda, nearly one-third of under five years children have stunted growth. Stunting rises with age, reaching a peak of 37% in children between the ages of 18 and 35 months. With certain geographical variations, stunting is more prevalent among children in rural areas (30%) than in

urban areas (24%) (USAID, 2020). With higher levels of education for the mother, the prevalence of stunting declines. In comparison to children born to moms with more than a secondary education, four out of ten (37%) of children born to mothers with no education are stunted. The prevalence of stunting also declines with increasing wealth quintiles, from 32% among children in the lowest quintile to 17% among those in the wealthiest quintile (UBOS, 2018). While the nationwide prevalence of wasting (low weight-for-height) is 4%, it is 10% in the West Nile and Karamoja regions (UBOS, 2018).

To solve the issue of malnutrition, however, there have been efforts done on a worldwide scale. For instance, in 2016, the United Nations (UN) General Assembly proclaimed 2016–2025 the UN Decade of Action on Nutrition. This Action on Nutrition emphasizes policy action on the following areas: (i) creating sustainable and resilient food systems for healthy diets, (ii) providing social protection and nutrition related education for all, (iii) aligning health systems to nutrition needs and providing universal coverage of essential nutrition interventions, (iv) ensuring that trade and investment policies improve nutrition, (v) building safe and supportive environments for nutrition at all ages, and (vi) strengthening and promoting nutrition governance and accountability (WHO, 2020).

Despite these efforts, more children continue to suffer from stunting, wasting and underweight in most parts of the world, Uganda inclusive. Some factors influence this adverse nutritional status of children, and these have been identified in previous studies. For instance, while some studies attributed low household wealth, maternal education and the absence of antenatal care follow-up to the phenomenon (Amare et al., 2016), others identified family size, sex of child, immunization status, age of child and episode of diarrhoea as its determinants (Gebre et al., 2019). Other factors also highlighted in some studies include birth order, child's size at birth, breastfeeding, dietary diversity score, family income, and developmental delay (Kang & Kim, 2019; Nzefa et al., 2019; Omondi & Kirabira, 2016; Tette et al., 2015). Thus this study using a logistic regression analysis, looked into risk factors for malnutrition among children under the age of five in Uganda.

1.1.2 Theoretical Perspective

The 2020 UNICEF Conceptual Framework on Maternal and Child Nutrition served as the study's guidance. The 2020 Framework expands on UNICEF's conceptual work from 1990, recognises

the growing triple burden of malnutrition—undernutrition, micronutrient deficiencies, and overweight—and emphasises the relevance of meals and care as urgent factors affecting mother and child nutrition. In addition to providing conceptual clarity on the enabling, underlying, and immediate determinants of adequate nutrition, their vertical and horizontal interconnectedness, and the favourable survival, growth, development, learning, economic, and social outcomes resulting from improved maternal and child nutrition, the Framework employs a positive narrative about what contributes to good nutrition in children and women.

1.1.3 Conceptual Perspective

The pathological state known as malnutrition is brought on by a relative, absolute, or overabundance of one or more important nutrients. When the weight-for-age, height-for-age, and weight-for-height indices fall below a reference range which is -2 Z-scores set by the World Health Organization, it is a nutritional status (Taremwa & Ahabyoona, 2018). Malnutrition also results from a lack of proteins, energy, minerals, and vitamins, which causes the body to lose body fat and muscular tissue (Uganda Ministry of Health, 2010). The three main forms of malnutrition—stunting, wasting, and underweight—are made clear. A persistent lack of nutrient intake and assimilation is shown in stunting, a chronic form of malnutrition. It also serves as a general measure of socioeconomic situations in society. On the other hand, wasting is an acute form of malnutrition and a sign of a deficiency in body fat and tissue mass as a result of inadequate food intake during a brief period of time. It is frequently utilised as a best estimate of the overall population's health (UDHS, 2016). If a child's length/h ight-for-age and weight-for-height z-scores are, respectively, -2 standard deviations off the WHO Child Growth Standards median, they are deemed to be either stunted or wasting. Last but not least, underweight is a composite indicator of malnutrition that encompasses both wasting and stunting. Although it accounts for 95% of the variation in the weight-for-height index, it is less useful for detecting malnutrition (UDHS, 2016).

1.1.4 Contextual Perspective

With regard to maternity, infant, and young child nutrition (MIYCN), Uganda is "on track" to reach two goals (Global Nutrition Report, 2018). Stunting has been reduced in Uganda, although only 28.9% of children under the age of five are affected, which is lower than the average for the continent of Africa (30.7%). With 3.5% of children under the age of five affected, Uganda is "on

schedule" to meet the target for wasting, which is lower than the average for the continent of Africa (6.0%). 3.7% of children under the age of five are overweight, and Uganda is "on schedule" to stop the number from rising (Global Nutrition Report, 2018).

According to the Uganda Demographic Health Survey from 2006, 360,000 children (6% nationally) were projected to be acutely malnourished, and roughly 125,000 (2%) of these had extremely acute malnutrition. One of Uganda's largest public health issues is child malnutrition. It also showed that malnutrition is a direct factor in 35% of all under-five mortality, underscoring the need to prevent and treat the issue. Particularly in young under five years children, severe wasting is linked on a 9-fold higher risk of mortality than a healthy youngster (Taremwa & Ahabyoona, 2018).

1.2 Problem Statement

In Uganda, children under the age of five are suffering of severe malnutrition.. Over 500,000 young children are thought to have died between 2013 and 2015, and of those, roughly half were linked to hunger. Four out of every ten fatalities of children under five are caused by malnutrition (United Nations, 2012). In Uganda, the occurence of stunted children below the age of five (0-59 months) was 33% in 2011, and the incidence of underweight among children under the age of five (0-59 months) was 14% in 2011. It was observed that wasting affected 5% of children under 5 years old (0-59 months) in 2011 and 4% of them in 2016 (USAID, 2020).

Over the years, the Ugandan government implemented a number of programmes that sought to lower the malnutrition rate among children under the age of five. These programmes included the Uganda Nutrition Action Plan, Food and Nutrition Policy Draft, Integrated Management of Acute Malnutrition Guidelines, Policy Guidelines on Infant and Young Child Feeding (IYCF), National Nutrition Advocacy and Communication Strategy II, and Maternal Infant and Young Child and Adolescent Nutrition Guidelines. The most recent statistics on under-five malnutrition in Uganda reveals that in 2016, 29% of under-five children were stunted (above the global average of 22%). This is despite these credible policies. 11% of people were found to be underweight in the same year, which is higher than the 5.7% global average.

Several studies employing logistic regression have examined malnutrition among children under five years in Uganda. For instance, Kabugho (2021) focused on Kasese District, Nahalomo et al.

(2022) conducted research in Bududa District, and Habaasa (2015) explored the issue in Nakaseke and Nakasongola Districts. However, none of these studies provided a comprehensive analysis at the national level, leaving a contextual gap that this study aimed to address. Therefore, this research conducted a logistic regression analysis of the risk factors associated with malnutrition in children under five across Uganda, covering the period from 2006 to 2016.

1.3 Purpose of the study

To investigate the risk factors associated with malnutrition among children under 5 years in Uganda between 2006-2016.

1.4 Specific Objectives of the study

i. To identify the demographic factors associated with malnutrition in children under 5 years in Uganda between 2006-2016.
ii. To find out the significant socio-economic factors by fitting it into regression models, associated with malnutrition in children under 5 years in Uganda between 2006-2016.
iii. To establish the feeding practices associated with malnutrition in children under 5 years in Uganda between 2006-2016.

1.5 Hypotheses

i. Ho1: Demographic factors are not significantly associated with malnutrition in children under 5 years in Uganda between 2006-2016.
ii. Ho2: Socio-economic factors are not significantly associated with malnutrition in children under 5 years in Uganda between 2006-2016.
iii. Ho3: feeding practices are not significantly associated with malnutrition in children under 5 years in Uganda between 2006-2016.

1.6 Scope of the Study

1.6.1 Geographical scope

Uganda is the location of this investigation. Uganda is situated north of Tanzania, north of Rwanda, south of South Sudan, east of the Democratic Republic of the Congo, and west of Kenya in east Africa.

1.6.2 Content scope

The feeding practices, socioeconomic characteristics, and demographic aspects are all considered independent variables for this study. On the other hand, child malnutrition, as determined by stunting, wasting, and underweight, is the dependent variable of this study.

1.6.3 Time scope

The study's data set ranges from 2006 to 2016. These were the times when Uganda's national demographic and health surveys were conducted. The years 2006, 2011, and 2016 are specifically included. Therefore, this study used these times to look into the main causes of under-five malnutrition in the nation.

1.7 Significance of the study

The study will be very useful to policy makers in educating them about the prevalence of child malnutrition in the nation so that the health of Uganda's under-five population can be improved by developing policies and programmes that are specifically accountable for promoting child nutrition in the nation.

Additionally, by offering and making available healthy diets to those children within nation, the research findings would aid hospital institutions in Uganda with crucial information aimed at reducing the rate of child malnutrition.

1.8 Operational Definition of Key Terms

Demographic factors: refers to the characteristics of children under the age of five, including their age, sex, birth weight, birth order, birth interval, place of residence, and area.

Socio-economic factors: refers to a mother's social rank or class, including her age during her first birth, her education, her occupation, her marital status, her wealth quintile, her place of residence, and her geographic location.

Feeding practices: refers to a child's nursing habits, including whether they are solely breastfed, not breastfed at all, or fed supplemental nutrients.

Exclusive breast feeding: refers to a situation in which an infant only receives breast milk and no other food or drink, not even water.

Malnutrition: refers to a lack of proper nutrition brought on by inadequate dietary intake or insufficient consumption of the right foods, which results in stunting, wasting, or underweight.

Stunting: relates to how inadequate nutrition affects children's growth and development.

Wasting: refers to extreme weight loss in children under the age of five.

Underweight: refers to a child's weight being below the fifth percentile for their height.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter provides the theoretical review, conceptual framework, conceptual review of the main variables and the objectives of the study, empirical studies, and gaps identified in the literature.

2.1 Theoretical Review

The 2020 UNICEF Conceptual Framework on Maternal and Child Nutrition served as the study's guidance. The new WHO causal framework for stunting and this paradigm are compatible (WHO, 2016). The previous conceptual framework divided malnutrition causes into three levels, with repeated illnesses and insufficient nutritional intake being the primary causes at the person level. The primary factors at the household level are poor maternal and child care practises, limited access to healthcare, and an unhealthy living environment. Basic sociocultural elements that have an impact on these underlying causes include national resource control, political and ideological orientations, economic structure, the political economy, and the nation's resource potential (UNICEF, 2021).

The results imply that both short- and long-term improvements in women's and children's nutrition. Improvements in outcome during childhood and adolescence imply better survival, health, physical development, cognitive growth, school preparation, and academic success. The outcome suggests better adult survival, health, productivity, and income as well as better wealth and social cohesiveness for countries (UNICEF, 2021).

Diets and care, which have an impact on one another, are the immediate determinants of mother and child nutrition, according to the UNICEF framework. Diets are healthy diets that provide optimal nutrition for women and children by relying on adequate meals, feeding, and dietary behaviours. Care, namely good care supported by suitable resources to support women's and children's good nutrition (UNICEF, 2021).

The fundamental determinants of optimal nutrition are the foods, behaviours, and services that women and children have access to in their homes, communities, and environments. Food that

includes age-appropriate, nutrient-rich foods—including breast milk and complementary foods for infants during the first two years of life—as well as household food security throughout the year for all children and mothers. Age-appropriate feeding and nutritional practises, including breastfeeding, responsive complementary feeding, and early childhood stimulation, as well as suitable food preparation, food consumption, and hygiene habits for all children and women, are included in this category of practises. Services that provide all children and women with proper meals and physical activity, as well as adequate nutrition, health, sanitation, education, and social protection services, as well as healthy food and living surroundings that prevent disease (UNICEF, 2021).

The political, economic, social, cultural, and environmental factors that support women's and children's healthy nutrition are known as the enabling determinants. The enabling determinants are divided into three categories in the 2020 Conceptual Framework: a) Governance: Good governance refers to the political, financial, social, and public and private sector actions to enable children's and women's right to nutrition; b) Resources: Sufficient resources refers to the environmental, financial, social, and human resources required to enable children's and women's right to nutrition; and c) Norms: Positive norms refer to the gender, cultural, and societal expectations to enable children’s and women’s right to nutrition (UNICEF, 2021).

Figure 2.1 gives a pictorial representation of UNICEF Conceptual Framework on Maternal and Child Nutrition.

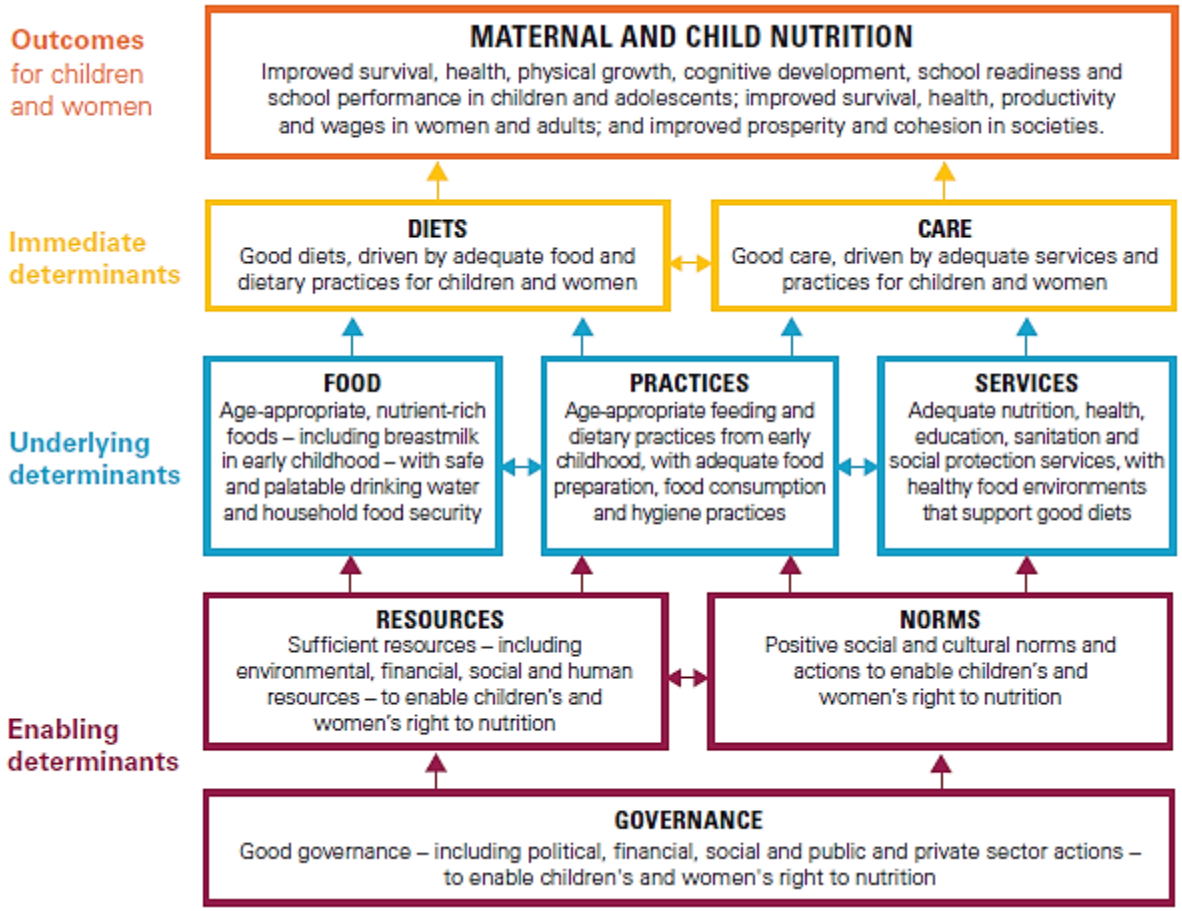

Figure 2.1: UNICEF (2021): Conceptual Framework on Maternal and Child Nutrition

2.2 Conceptual Framework

Independent Variables

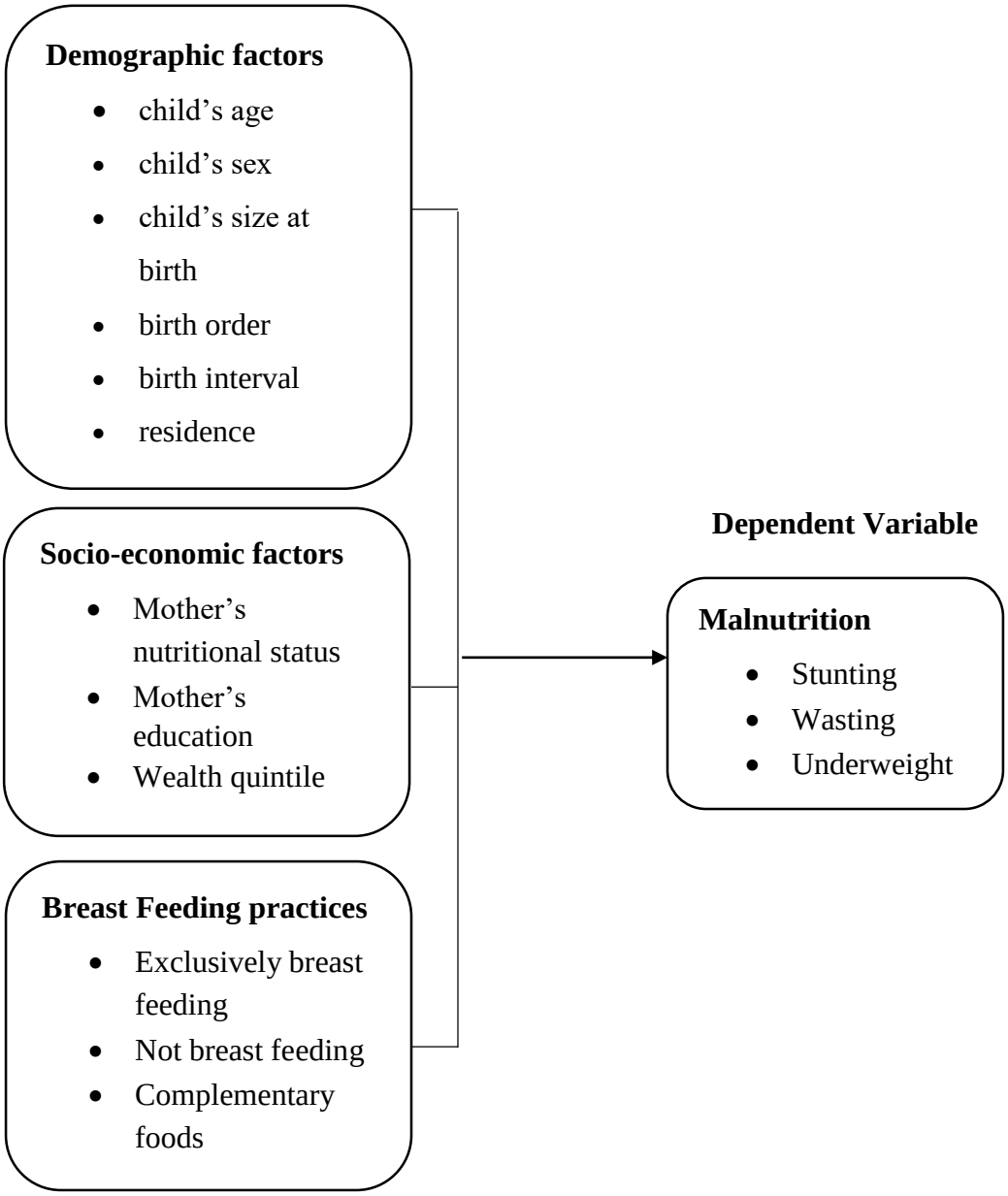

Figure 2.2: Conceptual framework showing the factors that are associated to malnutrition among under-five children

2.3 Conceptual Review

The greatest result of malnutrition is an increased chance of death. Poor nutrition during the first 1,000 days—from pregnancy through a child's second birthday—causes life-long and permanent damage, with repercussions at the individual, community, and national levels. Despite global progress being insufficient and millions of children still being at danger, the frequency within underweight, stun ing, and wast ng in children below 5 has declined since 1990. There are obvious risk factors for wasting and stunting everywhere in the world (UNICEF, 2012).

Black et al. (2008) identified the potential global and regional risk factors for wasting and stunting within U5 children in LMCIS in two systemic analyses for the Lancet series on maternal and child nutrition. Stunting is a risk factor for a variety of causes, from societal ones like political setting and socioeconomic situation to personal ones like poor diet and infections. A significant distal risk factor for stunting is low socioeconomic status (Black et al., 2008).

Poor child-care practises related to nutrition, health, and access to current nutrition and health interventions, in particular, exacerbate other correlates of stunting such as limited maternal opportunity to earn and limited health knowledge resulting from lack of or limited formal education as opposed to paternal education (Taremwa & Ahabyoona, 2018).

The malnutrition-infection cycle is a process whereby repeated infections such the measles, malaria, pneumonia, and meningitis interact with low nutritional intake to cause stunting in underdeveloped countries, as previously mentioned. Although there is a little difference, the risk factors for stunting and wasting are the same (UNICEF, 2021).

In recent times, Sub-Saharan Africa (SSA) has had so much to grapple with in terms of the malnutrition burden. In 2015, SSA accounted for more than 30% of global underweight children (Doctor & Nkhana-Salimu, 2017). Additionally, in 2018, despite a worldwide decline in childhood stunting, the African region witnessed a rise in the relative figure from 50.3 million to 58.8 million children (WHO, 2021). Interestingly, the 7.1% prevalence of children under five wasting in Africa is lower than the global rate of 7.3% (Fanzo et al., 2019). Within the SSA region, sub-regional variations in malnutrition are reported in the literature. Akombi et al., (2017) concluded in their study that countries in East and West Africa bore the greatest burden of malnutrition in the SSA region. Malnutrition is expressed through either undernutrition (the most

common in less developed countries), a situation of low protein-energy intake (Akombi et al., 2017) (which usually manifests at different anthropometric indices in stunting, wasting and underweight), and/or overnutrition, which is commonly associated with too great an intake of protein-energy (a situation widely associated with developed society, but of less concern in the developing countries (McKenna et al., 2019), perhaps a dangerous position to assume especially in Africa.

Beside the SSA region, malnutrition has posed some serious public health challenges in other regions of the world. For instance, in Asia, though considerable steps have made towards the global

target, there are lapses in achieving the targets that still exist. The region has experienced a prevalence of overweight among children under five years, which is less than the global average, but it also experienced more than the global average in stunting and wasting, which stood at 22.7% and 9.4%, respectively (Micha et al., 2020). Similarly, the Latin American region has in the last three decades been working to deal with the burden of malnutrition, and is yet to achieve significant progress in some parts of the region.

UNICEF's 2019 report states that almost 20% of children under five in Latin America and the Caribbean were either suffering from any of the indices of malnutrition or overlapping in any two of them (UNICEF, 2019). Galasco and Wagstaff stated that by 2030, and with the current space for an annual reduction rate in stunting, Brazil, Costa Rica, the Dominican Republic and Mexico are on course to reduce the stunting rate by 50% (Amalia, 2020). Overnutrition is a burden in most developed regions of the world. In 2017, more than a quarter of children in more than 80% of the states in America were either overweight or obese due to inconsistent access to good food. The public health outcomes of malnutrition, manifesting in stunting, wasting, underweight, marasmus, kwashiorkor, edema and perhaps death, are functions of macronutrients and micronutrients missing from the child's meal (UNCHR, 2020). Generally, malnutrition can lead to cognitive and physical impairment in children, especially those under five years old, with a high rate of morbidity and mortality (Akombi et al., 2017). A child's fundamental right to a higher level of physical and mental health development worldwide is boosted with access to good nutrition (Amalia, 2020).

The consequences of malnutrition are many and have been extensively documented (Black et al., 2010; UNICEF & WHO, 2013; Lu et al., 2016, Georgiadis & Penny, 2017). It includes increased risk of infection, death, and delayed cognitive development, leading to low adult incomes, poor economic growth and intergenerational transmission of poverty (Grantham-McGregor et al., 2007). Children with malnutrition have reduced ability to fight contagion which exposes them to death by usual diseases like malaria, respiratory infections and diarrhoeal diseases (Beser et al., 2018). Children who are born with low birth weight and have intrauterine growth retardation, are on a high level risk of illness and death, as well as other forms of malnutrition compared to healthy infants. They also tend to develop non-communicable diseases such as diabetes and hypertension in adult life (Forero-Ramirez et al., 2014). Interventions for reducing malnutrition must therefore begin before birth.

Reproductive Health Services provide the settings for political strategies that can reduce low birth weight by enhancing birth spacing and reducing teenage pregnancy (Bhutta et al., 2013; Desyibelew & Dadi, 2019). Maternal malnutrition, low gestational weight gain, weight loss due to illness, medical conditions during pregnancy such as malaria, hypertension, smoking, drug and alcohol use, increase the risk of low birth weight (Forero-Ramirez et al., 2014). Antenatal care provides the setting to identify and treat such high-risk pregnancies and it offers nutritional and educational interventions which can promote healthy eating habits, hygienic practices and lifestyle changes to reduce low birth weight (Forero-Ramirez et al., 2014). Thus low birth weight can be a measure of success in preventing malnutrition during pregnancy through antenatal care.

Furthermore, encouraging breastfeeding, suitable additional nourishment, supplementing with vitamin A and effectively handling malnutrition cases are most effective at preventing malnutrition or its effects (Bhutta et al., 2013; Keats et al., 2021). De-worming programmes and conditional cash transfer have been reported to be effective only in specific situational context, while there is little evidence for the effectiveness of interventions such as growth monitoring. Intervention such as immunization and education on clean hygienic practices and nutritional counselling at post-natal and child welfare clinics can also prevent malnutrition (Kumari, 2017).

Continuous bouts of diarrhea and infections can result in weight loss and deteriorate a child's nourishment condition (Kumari, 2017; Sulaiman et al., 2018). This subsequently leaves the child susceptible to illnesses and additional weight reduction, culminating in extreme undernourishment unless the cycle is interrupted.

Thus recurrent diarrhoea and sickness episodes reflect the effectiveness of health interventions to prevent and manage diarrhea and infections, and hence prevent malnutrition.

2.3.1 The Demographic Factors Associated with Malnutrition in Children Under 5 Years

The nutritional status in children under five is negatively impacted by a number of child characteristics, including sex, age, illnesses, nursing, and child position in a family. Protein energy malnutrition (PEM) was observed in 58.3% of male children and 68.6% of female youngsters in a Varanasi urban slum area, according to an epidemiological investigation (Baranwal, Gupta, Mishra, Prakashs, & Pandey, 2010). PEM was shown to be higher in the third year of life and lowest in the second year of life in the same study. In their study, Nyaruhucha et al. (2006) discovered that children under the age of a year were less likely to have undernutrition than those between the ages of 24-35 months. Stunting has been found to have a strong independent relationship with children's weight and sex (Nyaruhucha, Msuya, Mamiro, & Kerengi, 2006).

Research to ascertain the relationship between a child's nutritional health and birth weight have been reported in Sub-Saharan Africa, however few studies have documented gender differences in undernutrition in children below five years (Wamani, Astrom, Peterson, Tumwine, & Tylleskar, 2007; Hien & Kam, 2008). According to an Indian study, stunting (81.8%) and underweight (45.5%) were more prevalent in children 13 to 24 months old, while wasting (18.2%) was most prevalent in children 37 to 48 months old (Kumar, Goel, Mittal, & Misra, 2006). This demonstrates unequivocally that malnutrition is more likely to affect children older than one year old than younger ones.

According to Olack et al. (2011), moderate wasting was most prevalent in infants aged 6 to 11 months (4.1%) and least prevalent in infants 48 to 59 months (1.1%). More than half of girls (65.7%) were found to be more wasted than their male counterparts in the same survey. In the

same age group, girls wasted substantially more than boys. The study also noted that a number of illnesses, including tuberculosis (TB), diarrhoea, measles, etc., can make malnutrition in children worse and that a confluence of these illnesses can impair the immune system (Olack, et al., 2011).

In their study, Maniragaba, Leonard, and Rutayisire (2022) looked into the causative mechanisms by which the undernutrition is impacted by the risk factors for malnutrition in children below the age of 5 within Uganda. Based on the UNICEF 1991 conceptual framework for child malnutrition and the multidimensional character of the risk factors, a generalised structural equation model (GSEM) was estimated. The analysis made use of the Uganda Demographic and Health Survey (UDHS-KR) dataset. Stunting, underweight, and body wasting were three anthropometric variables from which an index of malnutrition was generated; this index served as the overall response variable in the GSEM model. According to the results, the variables that had a direct and significant impact on undernutrition included the child's sex, age, perceived size at birth, weight at birth, and length of breastfeeding (Maniragaba, Leonard, & Rutayisire, 2022).

A study was undertaken by Gudu et al., (2020) to determine the causes of malnutrition of U5 children in Western Kenya. From December 2016 to March 2017, an unmatched case-control research took place at a hospital. 6 to 59 months aged children who had a z-score of -2SD or +2SD for weight-for-height, -2SD or +2SD for weight-for-age, or -2SD for height-for-age were considered cases. Children with age-appropriate anthropometric measurements between 6 and 59 months served as controls. While three controls were chosen using systematic random sampling, cases were sequentially recruited. Using Epi-Info, unconstrained logistic regression with backward elimination was utilised to find independent association components. According to the study's findings, undernutrition was linked to pre-lacteal feeding (OR=1.8; 95% CI: 1.1-3.0) and low birth weight (AOR=3.3; 95% CI: 1.4-7.6) (Gudu et al., 2020).

The occurrence of malnutrition in children between the ages of 6 and 59 months and its associated socio-demographic characteristics were evaluated by Chaudhari and Agrawal (2019) in their study. In a slum region of Jaipur city, Rajasthan, a cross-sectional investigation was conducted within a community during the years of 2016 and 2017. A total of 2007 kids between

the ages of 6 and 59 months were chosen through a multistage sampling process and screened using anthropometric parameters such height, weight, and the circumference of the middle of the upper arm (MUAC). The study identified a correlation between malnutrition and age, family type, birth weight, and birth order (Chaudhari & Agrawal, 2019).

Mawa and Lawoko (2018) looked at Uganda's general population's 6-59-month-old children's risk factors for wasting and stunting. The 2011 Uganda Demographic and Health Survey's secondary data were used. 2214 kids made up the sample that was examined. The relationship between risk variables and childhood stunting and wasting was examined using bivariate analysis and multivariate conditional logistic regression. The findings were, 35% kids were stunted. Stunting risk variables included a kid very small size at birth; OR (2.59; 1.58-4.27); a child's gender; OR (1.5; 1.12 -2.18); and a child's age between 24 and 35 months; OR (1.17-3.23) (Mawa & Lawoko, 2018).

Anthropometric failure (CIAF) was used in a study by Endris, Asefa, and Dube (2017) to estimate the incidence of malnutrition among infants and toddlers in rural Ethiopia. The 2014 Ethiopian Mini Demographic and Health Survey provided the used information (EMDHS). 3095 kids in total were examined for the analysis. The nourishment condition of the kids was assessed utilizing the composite indicator anthropometric failure (CIAF). Using STATA 13, a logistic regression model was developed to identify the reasons behind child malnutrition in rural areas of Ethiopia. Results showed that 48.5% of youngsters in Ethiopia's rural areas were malnourished. Age of the children, the time between pregnancies, the mother's educational level, her financial situation, and the geography were all individually linked to the nutritional quality of children in rural Ethiopia (Endris et al., 2017).

To gain a deeper insight into the commonness and reasons of undernourishment in Ghanaian children below five years old, Aheto et al. (2015) undertook a study. The 2008 Ghana Demographic and Health Survey data were utilized in the study (GDHS). Multilevel regression analysis was used to conduct analyses on 2,083 young children under the age of five who were nestled within 1,641 families that had the necessary anthropometric measurements. According to the findings, numerous pregnancies, being small at birth, and prolonged breastfeeding are all linked to a higher risk of malnutrition (Aheto et al., 2015).

A multivariate generalised linear mixed model was employed to concurrently ascertain the factors causing malnutrition in children below the age of five in Rwanda using height-for-age, weight-for-age, and weight-for-height data. Additionally, Habyarimana (2016) based his study on data from the Rwanda Demographic and Health Survey. The crucial aspects of undernourishment in Rwandan children below five years old included child's age, gender, birth weight, birth order, and frequency of recent fever, according to the study (Habyarimana, 2016).

Poda et al., (2017) conducted a study evaluating factors linked to malnutrition in children under five years old in Burkina Faso. It utilized secondary analysis of population-based, cross-sectional data obtained from the Burkina Faso Demographic Health Surveys 2010. The study involved 6337 children under 5 years old and their mothers. Data related to demographic features, child health and nutrition, along with information about the mothers and households were gathered. SAS procedures specific to this survey were implemented for weighting, clustering and stratification in the survey's structure. An analysis was performed on the array of nutritional conditions, such as being underweight, stunted growth, and wasting, as well as the impact of risk factors on malnutrition. The research showed that among 6337 children under the age of 5, slightly over half (51.0%) were boys and 57.8% had a typical birth size. Recent instances of diarrhea, fever, and acute respiratory infection were reported in 15.6%, 21.5% and 10.6% of the children, respectively. Crucial factors like the child's sex, age, birth size, health conditions, along with the mother's education, her body mass index, and the family's wealth index, had a notable correlation with undernutrition in children below 5 years in Burkina Faso.

Modjadji and Mashishi (2020) conducted a cross-sectional research in the South African province of Limpopo to identify the incidence of malnutrition and related variables in 404 young children under the age of five who were being cared for by their mothers. We gathered obstetric history, sociodemographic information, and anthropometric data. Stunting, underweight, and wasting in children are identified using the z-scores for height-for-age, weight-for-age, and body mass index-for-age. Causes of malnutrition were detected through logistic regression analysis. Besides the general rates of underweight (29.0%) and wasting (12.6%), stunting (45.3%) is the most common form of malnutrition in children under 5 years old, affecting There are more boys (51.7%) than girls (38.8%). %), and more children aged 12 to 23 months (62.4%) than children 11 months old (40.1%). Boys were more likely to be stunted than girls (adjusted odds ratio,

AOR = 2.07, 95% confidence interval: 1.26-3.41, p = 0.004) and underweight (AOR = 2.17, 95% confidence interval: 1.32-3.57, p = 0.002). Stunting (AOR = 5.77, 95% CI: 2.63-12.64, p 0.0001) and underweight (AOR = 2.05, 95% CI: 1.08-3.89, p = 0.028), risk was increased by delay in introducing solid foods. Compared with children with low birth weight, children with normal birth weight were less likely to be thin (AOR = 0.42, 95% CI: 0.19-0.92, p = 0.029) and underweight (AOR = 0.34, 95% CI: 0.17-0.68, p = 0.003). Compared with children whose mothers only completed primary school, children whose mothers completed secondary school (AOR = 0.39, 95% CI: 0.16-0.97, p = 0.044), as well as education level of grade 12 or higher (AOR = 0.32, 95% CI: 0.12-0.83, p = 0.020) are less susceptible to stunting.

Liu et al., (2021) to better understand the causes of stunting in children aged 6 to 23 months in poor rural areas of central China, researchers studied malnutrition rates. 2019 saw the implementation of the Project for Improving Child Nutrition in China's Poor Areas in 56 poor counties nationwide in 7 provinces. Multivariable binary logistic regression analysis was used in this study to identify factors contributing to stunting. In the cross-sectional survey, 17,193 babies were enrolled. Stunting has the highest prevalence (3.9%), followed by obesity (0.5%), underweight (3.0%), underweight (2.0%), 1%) , wasted (2.0%), and overweight (3.0%). Stunting was less common in girls [OR = 0.55, 95% CI (0.46, 0.65)], who ate the fewest foods [OR = 0.81, 95% CI (0.67; 0.98) and mothers who had at least middle-school or high-school education. Infants with diarrhea in the previous two weeks had a higher risk of developmental delay (OR = 1.26, 95% CI (0.98, 1.62)).

Furthermore, several studies reported that the educated mother utilized the health care facilities and they followed the instructions given by health providers about feeding and caring practices (Desyibelew & Dadi, 2019; Katoch 2022). The mother's illiteracy was significantly associated with the risk to poor nutrition in under five years children. Hundred millions children in less developed countries suffer from poor health and nutrition due to low literacy of mothers (Maniragaba, et al., 2020).

Habimana and Biracyaza (2019) conducted a study aimed at determining the risk factors for stunting in children below 5 within the Eastern and Western provinces of Rwanda. Cross-sectional study using secondary data from Rwanda Demographic Health Survey 2014/2015. The

study revealed that stunting was highly prevalent in eastern province compared to Western province. It was also highly prevalent in rural area in both provinces. Furthermore, results indicated a significant association between maternal education and stunting (x2=6.868; p=0.001), maternal age group (x2=15.44; p=0.017), maternal occupation (x2=30.012; p=0.000), wealth index (x2=14.327; p=0.006), sex of child (x2=2.91; p=0.008) and giving child fortified food (x2=4.256; p=0.039).

Degarege et al., (2015) assessed the incidence of malnutrition and its related factors in youngsters living in Addis Ababa, Ethiopia. The cross-sectional community study has been done in 459 school age children and their parents or caregivers living in Lideta sub-city, Addis Ababa, Ethiopia. Participants were selected utilizing a multi-stage simple random sampling technique. Height, weight of children was measured and their parents or care givers were interviewed for factors associated with undernutrition. About 31% (n = 141) of the children were undernourished (19.6% stunted, 15.9% underweight). Being male, higher birth order (>2), larger family size (6–8), low meal frequency (≤3 times) in a day prior to the survey and mud floor house were significantly associated with undernutrition. Similarly, the risk of underweight increased significantly with an increase in age, birth order, family size and also the absence of hand washing facilities.

Li et al., (2022) conducted a community-based cross-sectional study to establish the occurence and related factors o stunting, underw ight and wasting in children (age < 6) within rural Hunan Province, China. Totally 5529 yougnsters between 0 to 71 months with respective caregivers had been randomly chosen by multistage stratified cluster sampling from 72 villages from rural Hunan, which were distributed in 24 towns of 12 counties. Data about the children and their mothers, caregivers and family conditions was acquired using unified questionnaire, and the length/height and weight of each child were measured using unified instruments. The prevalence of undernutrition among children was evaluated using the length/height for age scores, weight for age, weight for length/height, and body mass index for age z scores, calculated following the 2006 and 2007 WHO Child Growth Standards. The prevalence of stunting, underweight, and wasting in the 5529 children was 4.4% (241), 3.9% (217), 4.0% (221), consecutively. The significant associated factors on higher risks of undernutrition in the children were low birth weight, maternal gestational weight gain <10 kg (stunting); low birth weight, maternal

gestational weight gain <10 kg, ethnicity of caregivers being minority, large family size (underweight); low birth weight, ethnicity of caregivers being minority, large family size (wasting).

Mukabutera et al., (2016) conducted a study in Rwanda to identify risk factors connected to underweight in young children. Using 2010 RDHS data on 4,177 children under 5 years old whose weight and height were measured, the study conducted a cross-sectional study. Children were classified as underweight if their weight-for-age Z-score (WAZs) was 2 standard deviations (SD) from the reference population mean and severely underweight if the WAZs was 3 SD. To determine the child, maternal, and household characteristics linked to underweight, a multivariable logistic regression model was used. According to the study, 2.2% (90) of the 4,177 children sampled were severely underweight and 11.0% (469) were underweight. The study found that after adjusting for confounders, children were more likely to be underweight if they were male (OR = 1.42, 95% confidence interval (CI): 1.12, 1.79); had a fever in the two weeks before taking the survey (OR = 1.45, 95% CI: 1.07, 1.97); or not being an only child compared to a first child (OR = 4.04, 95% CI: 2.12, 7.71). Mothers were more likely to have low birth weight babies if they were over 35 years old compared to those aged 17 to 24 (OR = 1.67, 95% CI: 1.04, 2.70); having a BMI <18.5 compared with a BMI between 18.5 and 24.9 (OR = 2.62, 95% CI: 1.70, 4.04), no education or only primary education (OR = 3.56, 95% CI: 1.83, 6.95; OR = 3.49, 95% CI: 1.87, 6.51, respectively) compared with high school education or higher and nulliparous individuals cared for by a skilled provider (OR = 1.33, 95% CI: 1.04, 1.72).

Ma'alin et al., (2016) undertook a research to determine the extent and causes of malnutrition in children in the Ethiopian Somali regional state of Shinille Woreda, aged 6-59 months. In Shinile Woreda, a multistage selection procedure was used to choose 694 research participants for a community-based cross-sectional survey that was performed in February and March 2014. Anthropometric assessment and structured questionnaires were used to collect data. ENA software for SMART 2011 was used to construct anthropometric indices and SPSS V.16 was used to analyze the data. P-values less than 0.05 were considered statistically significant when calculating the association using OR and 95% CI. Stunting, underweight and wasting occur in 33.4%, 24.5% and 20% of children, respectively. Household size and child gender are two

significant risk factors for stunting and wasting. Stunting is 3.8 times more common in households with many children. Wasted children are 1.5 times more likely to be girls than boys.

Tekile, Woya and& Basha (2019) conducted a study which aimed at assessing factors contributing to malnutrition in Ethiopian children aged 0-59 months. EDHS 2016 provided data for the analysis, which looked at 9,495 children under 5 years old. SPSS version 23.0 was used to extract, modify, and analyze data. To determine the causes of malnutrition in children, binary logistic regression models with both bivariate and multiple variables were used. According to the study, the rates of stunting, wasting and underweight children are 38.3%, 10.1% and 23.3%, respectively. Only 3.87% of children have all three disorders above, while only 19.47% of children have slow growth and are underweight. Child's age, mother's BMI, child's gender, family size and mother's education level were significant predictors of malnutrition in Ethiopia among the factors studied considered in this study.

2.3.2 The Socio-Economic Factors Associated with Malnutrition in Children Under 5 Years

Incidence and prevalence of malnutrition are significantly influenced by socioeconomic factors (Boah, M et al., 2019). In many developing and undeveloped nations, socioeconomic issues such as gender inequality, education, poverty, access to good water and sanitation, and sanitation standards are important in determining health outcomes (Asim & Nawaz, 2018). Low socioeconomic household status children are 2.5 times more likely to suffer from malnutrition compared to children from middle- or upper-class households (Ahmad et al., 2020).

Children's malnutrition has a variety of causes, according to UNICEF (2013). Malnutrition has two immediate causes: a lack of food intake and illnesses. Dietary variety has a positive relationship with children's nutrient intake and nutritional health (Nti, 2011). Household food insecurity, inadequate child care and feeding practices, and toxic home environments, and a lack of health services have been highlighted as the root reasons (UNICEF, 2013). For instance, children's diarrhoea, respiratory illnesses, and parasite infections were all substantially correlated with household food insecurity in Colombia (Hackett, Melgar-Quiñonez, & Álvarez, 2009). Resources in terms of people, money, and organisations are some of the more fundamental factors. For instance, it has been demonstrated that women in Ethiopia and China who are less educated and have lower household incomes give their kids less dietary variety (Solomon,

Aderaw, & Tegegne, 2017). In Bangladesh, Ethiopia, and Vietnam, these characteristics and family food insecurity were linked to malnutrition, whereas a research in Colombia showed that malaria, food insecurity, and poor socioeconomic level all contributed to child malnutrition (Uscátegui et al., 2009).

In a study published in 2022, Maniragaba, Leonard, and Rutayisire looked into the causative mechanisms by which malnutrition risk factors affect undernutrition in Ugandan children under the age of five. Based on the UNICEF 1991 conceptual framework for child malnutrition and the multidimensional character of the risk factors, a generalised structural equation model (GSEM) was estimated. The analysis made use of the Uganda Demographic and Health Survey (UDHS-KR) dataset. The results showed that the factors with a direct and significant impact on undernutrition were mothers' BMI, their degree of education, their employment position, and the household's wealth quintile (Maniragaba, Leonard, & Rutayisire, 2022).

Nahalomo et al., (2022) conducted a study on the prevalence of malnutrition and the impact of seasonal variations and associated factors among children aged 6–59 month within the landslide-affected households in Bududa District, eastern Uganda. A prospective cohort study using a 2-stage simple random technique was applied to select 422 households including 392 children during May–August (food-plenty season) 2019. Socioeconomic and demographic data were collected using structured questionnaires. Factors associated with malnutrition outcomes were identified by bivariate and multivariate logistic regression. Stunting, underweight, wasting, and overweight prevalences were 37.7%, 13.3%, 3.6%, and 4.3%, respectively, in the food-plenty season and 42.6%, 14.2%, 2.1%, and 2.7%, respectively, in the food-poor season. Residing in the landslide-affected sub-county increased the odds for stunting [adjusted OR (aOR): 1.68; 95% CI: 1.08, 2.59; P = 0.025] and underweight (aOR = 4.25; 95% CI: 1.10, 15.36; P = 0.032) for children in the food-plenty season. Child age, sex, breastfeeding status, a nonimproved drinking water source, migration of any household member, and parents' education were significant risk factors in the food-plenty season. In the food-poor season, parents' education status, loss of any household member, child sex, and child age were significant risk factors.

Because the cost of nutritous food is closely related to purchasing power, studies confirm that households with lower socioeconomic level are more vulnerable to food insecurity (Akombi, B J

et al., 2019). Households with poor food intake, sickness scenarios, inadequate sanitation, pitiful hygiene practises, and insufficient access to potable water are most likely experiencing problems with physical growth (Fagbamigbe, A F et al., 2020). By increasing awareness of healthy eating habits, sanitation practises, and the best use of resources for children, higher maternal education can lower child malnutrition (Ravaoarisoa et al., 2018). Due to a stable income and wise use of resources, paternal education has a substantial impact on providing family members with adequate nourishment, housing, and sanitation (Qureshi, 2019).

Furthermore, researchers found a strong significant association among chronic malnutrition in children and household income disparities, the findings of the study showed that children of poorest household had highest risk at late of 62% of being chronically nourished than the children of wealthiest households (Akombi et al., 2017; Desyibelew & Dadi, 2019). It has been suggested that the actions that reduce the poverty and to make services more available to the poor households for the improvement in overall childhood health and nutritional status in the world (Menalu et al., 2021; Katoch, 2022). Poverty is an established cause of malnutrition; the studies have reported the under nutrition is highly prevalent in the places where 64% the people from low and middle income countries are struggling with severe poverty (Fagbamigbe et al., 2020; Imam et al., 2020; Mwene-Batu et al., 2021). Additionally, a number of studies suggest that factors such as lack of knowledge about recommended infant and child feeding, unemployment, and health related factors are predictors of malnutrition among the under five children (Dodos et al., 2018; Schwinger et al., 2019; Fagbamigbe et al., 2020).

In the Ngorongoro area of the Arusha region, Mdimu et al. (2017) conducted a study to identify risk variables linked to undernutrition in children under the age of five. A mismatched case-control research was conducted at a health institution with 400 kids (300 controls and 100 cases) between the ages of 6 and 59 months. Demographic information, child health and care practises, and environmental factors were gathered using a questionnaire. We measured the subjects' height, weight, and Mid Upper Arm Circumference (MUAC) according to accepted methods. The study used logistic regression analysis to pinpoint important undernutrition risk factors. According to the findings, undernutrition was linked to young mothers' and caregivers' ages (adjusted Odds Ratio (aOR) =38.8, 95% Confidence Interval: 15.38-59.03); large families' sizes

(aOR=6.1, 95% Confidence Interval: 2.16-16.90); and wells as drinking water source (aOR=16.3, 95%: CI: 1.81-147.05) (Mdimu, E L et al., 2020).

Demissie and Worku (2013) evaluated the severity and causes of malnutrition in children aged 6 to 59 months in the Dollo Ado district of Somalia. In December 2012, a cross-sectional study centred in the community was carried out on 541 mother-child pairs with kids aged between six and 59 months. To determine the causes of child malnutrition, both bivariate and multivariate analyzes (logistic regression model) were utilized. Results showed that there was a high frequency of malnutrition in the neighbourhood, with 42.3% of the kids wasted, 34.4% stunted, and 47.7% underweight. With a statistical significance of p0.031, boys were more likely than girls to suffer from wasting, stunting, and underweight. Furthermore, stunting and underweight were more frequently seen in older children while the prevalence of wasting was higher in young children. The results of a regression analysis indicate that factors such as marital status, maternal education, monthly household income, decision-making, the total number of children ever born, prenatal practises, manner of feeding, and access to clean water were major drivers of malnutrition (Demissie & Worku, 2013).

Nutritional status is one of the best indicators of children's wellbeing. The causes of child malnutrition are numerous and multifaceted. Poverty was usually considered as the primary cause of malnutrition (Tette et al., 2015). Bain et al., (2013) reported that food insecurity, poverty, parental education, climate change, government policies and socioeconomic inequalities were potential causes of malnutrition in Sub-Saharan African countries. Additionally, the previous studies found that other factors, such as the presence of diarrhea or acute respiratory infection (ARI), household food insecurity, maternal education and no consumption of vitamin supplements or fortified foods, were important contributors to child malnutrition (Ibrahim, et al., 2017; Pedraza and Gama, 2015; Chirande, et al., 2015).

Cheah et al., (2010) conducted a study using cross-sectional design to examine causal relationships among the biological, behavioural and environmental factors related to malnutrition in children aged 5 years and under. The instrument used in this study was based on a previously described conceptual framework for malnutrition in children, and tested for its psycometric components, using both qualitative and quantitative methods. As well as the use of a questionnaire, anthropometric and dietary data were collected from 295 children aged 5 years

and below, randomly selected from clinics in Tumpat, Kelantan. The proposed model was tested and modified using structural equation modelling (AMOS software: ADC, Chicago, IL, USA). The results demonstrated that an environmental construct (with factors that included total household income $\beta = 0.68$, $p < 0.01$; total expenditure $\beta = 0.67$, $p < 0.01$; number of rooms in the house $\beta = 0.46$, $p < 0.01$; and socioeconomic status $\beta = 0.71$, $p < 0.01$) had a significant effect on malnutrition. Neither the biological nor behavioural constructs had significant effects.

Khan, et al., (2016) conducted a study to determine the prevalence of malnutrition in children under 5 years of age in Thatta and Sujawal districts of Pakistan, along with contributing variables. From May to August 2014, a cross-sectional survey was conducted. The study involved a total of 3,964 children under 5 years old. Stunting, wasting and underweight were measured by height-for-age Z-score (HAZ), weight-for-height Z-score (WHZ) and weight-for-height Z-score (WAZ) according to the criteria WHO growth standards. Data on socioeconomic circumstances, family size, maternal education, birth rate, and childhood morbidity were collected using a standardized questionnaire. The likelihood of malnutrition was ascertained using multivariable logistic regression. According to the study, 42% of children in the richest households are stunted, compared with 50% of children in the poorest households. Children in the richest households had a waste rate of 10.3% compared to children in the poorest households, with a waste rate twice as high (20.6%) (OR 2.33, CI 1.69-3.21, p 0.001). A comparable correlation between household wealth and child underweight was found (43.8% of the poorest families had the condition, compared to 28.8% of the wealthiest households; OR 2.18, CI 1.72-2.77, p 0.001). Stunting, wasting, and underweight were all substantially correlated with household affluence. Underweight individuals often get diarrhea. In our research location, factors including mother's education level, parity, and family size were not linked to malnutrition.

Nshimwe (2019) undertook a research to determine the causes of severe acute malnutrition in children under the age of five. The study used quantitative research approach with a descriptive cross-sectional study design, using convenience sampling method which was utilized to obtain a sample size of 92 participants. To collect data from participants, an adopted self administered questionnaire was utilized after getting permission from its author. Inferencial statistics was perfomed, fisher test was calculated , a 0.05 p-value was deemed significant. The research

indicated that the proportion of severe acute malnutrition was high at 55 (59.8.%), the factors associated to severe acute malnutrition were lack of education level, parents with lower monthly income were likely to suffer from SAM (OR:1.348, : ≥100.00), The unemployement was associated with severe acute malnutrition (OR: 1 compared to the employed parents OR: 0.544).

Habaasa (2015) conducted a study to comprehend the causes of malnutrition in the Nakaseke and Nakasongola regions of Uganda among children under 5 years of age. In Nakaseke and Nakasongola districts, cross-sectional secondary data on 104 children under 5 years old were used. Analyzes were performed using Stata statistical software and the Nutrition module of the Epi Info program. Binary logistic regression results, cross-tabulation, and descriptive statistics were produced. The study revealed that stunting was wasting (16.5%) and underweight (13.5%) are respectively the conditions with the highest frequency of malnutrition in both regions. In addition, the results indicate that children aged 39 to 59 months have a lower risk of being underweight than children under 12 months old. Compared with children whose mothers came from pastoral families, peasant children were more likely to have developmental delays. Although the prevalence of wasting was slightly higher than the prevalence of underweight children in both districts, no significant variables were identified that were associated with this frequency.

Tette et al., (2015) examined socio-economic factors, health outcomes and the uptake of interventions to prevent malnutrition by mothers of malnourished and well-nourished in under-fives attending Princess Marie Louise Children's Hospital (PML). An unmatched case control study of malnourished and well-nourished children and their mothers was conducted at PML, the largest facility for managing malnutrition in Ghanaian children. Malnourished children with moderate and severe acute malnutrition were recruited and compared with a group of well-nourished children attending the hospital. Weight-for-height was used to classify nutritional status. Record forms and a semi-structured questionnaire were used for data collection, which was analysed with Stata 11.0 software. In all, 182 malnourished and 189 well-nourished children and their mothers/carers participated in the study. The socio-demographic factors associated with malnutrition in the multivariate analysis were age ≤24 months and a monthly family income of ≤200 GH Cedis.

2.3.3 The Feeding Practices Associated with Malnutrition in Children Under 5 Years

Breastfeeding has significant advantages for the health and survival of newborns and young children (Victora et al., 2016). Exclusive breastfeeding (EBF) has been found to reduce morbidity and mortality from infectious diseases, with a protective impact against diarrhoea, respiratory infections, and otitis media in particular. Additionally, breastfed newborns had a lower risk of hospital admission (Jones, Steketee, Black, Bhutta, & Morris, 2003). "The newborn obtains breast milk and is permitted to consume oral rehydration solution (ORS), drops, and syrups but nothing else," is how the term "exclusive breastfeeding" is defined (WHO, 2008). 24 hours before the exam, feeding practise is used to determine the EBF rate. EBF for the first six months of life and sustained breastfeeding with appropriate supplemental foods until the age of two or later have been shown to significantly reduce child mortality, saving the lives of more than 820,000 children under the age of five every year worldwide (WHO, 2017).

Exclusive breastfeeding supports healthy growth and development and offers protection from both acute and chronic illnesses. It also lowers the death rate of children from common childhood illnesses like pneumonia or diarrhoea, and evidence suggests that it is more protective against mother-to-child transmission of HIV/AIDS than mixed feeding (WHO, 2014). If exclusive breastfeeding became the norm, it might prevent 13% of all child fatalities under the age of five (Horta, Victora, & WHO, 2013). Less than 40% of infants globally are exclusively breastfed, despite its importance. Only 39% of 0 to 5 month old newborns in underdeveloped countries are exclusively breastfed, according to UNICEF. Each year, inadequate breastfeeding claims almost 1.45 million lives in underdeveloped nations (UNICEF, 2014). Lack of exclusive breastfeeding may also have long-term repercussions such as low academic performance, decreased productivity, and impaired cognitive and social development (Taddele, Abebe, & Fentahun, 2014).

Despite the World Health Organization's (WHO, 2001) recommendation that newborns be nursed exclusively for the first six months of life, only 36% of infants under six months old are believed to have been exclusively breastfed globally between 2007 and 2014. (WHO, 2017). The percentage very slightly increased in 2017 to 40%. (WHO, 2017). Studies have been carried out all around the world, including in a number of low- and middle-income nations, to better understand the factors that influence breastfeeding behaviours. These include the women's

participation in prenatal and postnatal care, the awareness of caregivers towards breastfeeding, the impact of family and community members, and the weight of other obligations (Tadesse, Mesfin, & Chane, 2016; Nankumbi & Muliira, 2015). As a result, there are several factors that influence breastfeeding behaviours in environments with limited resources. For instance, some women think that their children' frequent faeces are a sign that breast milk is bad for them (Sharkey, et al., 2017).

Tadesse, Mesfin, and Chane (2016) carried out a similar study to ascertain the frequency of non-exclusive breastfeeding and its risk factors in rural Sorro District, Southern Ethiopia. A cross-sectional study focused on the community was conducted. All women with children between 0 and 5 months residing in the randomly chosen kebeles (the smallest administrative unit) in the rural Sorro District made up the study population. Between August 12 and August 23, 2015, 602 moms of newborns were chosen for the study using a systematic sampling technique. To evaluate the relationship between the research variables and to prevent any confounding, bivariate and multivariable logistic regression analysis were both performed. In children under the age of six months, non-exclusive breastfeeding was 49.4% common. Being currently single [AOR (95% CI) = 3.85 (1.44, 10.27), having an index infant between the ages of 2-3 months [AOR (95% CI) = 3.63 (2.06, 6.36)] and 4-5 months [AOR (95% CI) =10.29 (5.60, 18.92)], starting breastfeeding after one hour of birth [AOR (95% CI) = 2.11 (1.37, 3.24"], not having gone to an antenatal clinic during their previous pregnancy were expressively linked to non-exclusive breastfeeding (Tadesse, Mesfin, & Chane, 2016).

In the Pujehun district of southern Sierra Leone, van Breevoort et al., (2021), did a study on the factors that influence breastfeeding practise. An exploratory mixed-method study that included a cross-sectional survey of 194 moms was employed in the research. Based on recall from birth, in order to establish the odds ratios of factors relating to the main breastfeeding practice, which was defined as "Children under the age of six months who are exclusively breastfed," logistic regression analysis was employed, and children older than six months who were exclusively breastfed up to six months." Based on nursing behaviour 24 hours prior to the study, the exclusive breastfeeding rate was calculated. The study found a 62.8% (95% CI 53.9, 71.7) rate of exclusive breastfeeding, down from 74% in the 0-1 month age group to 33% in the 4-5 month group (van Breevoort, et al., 2021).

Menalu et al., (2021) conducted a study to determine the likelihood of malnutrition in children under the age of five in Debre Berhan, North Shewa, Ethiopia, and its risk factors. In Debre Berhan town, a cross-sectional research of the community was carried out between October 7, 2019, and January 24, 2020. Using a sample approach, 385 young children under the age of five were chosen. In this investigation, a systematically random sample was used. learn. Anthropometric measures and structured questionnaires were utilized to gather the data. Epi data 4.21 was used for data input, and version 20.0 of the Statistical Package for the Social Sciences was utilized for data analysis. Causes of malnutrition were found using bivariate and multivariate logistic regression analysis. For a 95% confidence interval, a p value of 0.05 was used to indicate statistical significance. In the entire sample, 61 (15.8%) children under 5 years old were completely malnourished; The rates of underweight, stunted, and wasted children are 26%, 41%, and 33%, respectively. Breastfeeding, premature birth, lack of prenatal care, exposure to infectious diseases and diarrhea all lead to malnutrition in children under 5 years old.

2.4 Empirical Studies

Bigirimana (2021) conducted a study to look at the effects of family planning status, household size and composition, and stunting among children under five in Rwanda. The Rwanda Demographic and Health Survey (DHS) 2014–2015 secondary data analysis was used in this cross-sectional investigation. To investigate the relationship between family planning and household size and composition, logistic regression analysis was performed. The study's findings revealed that stunting among children it examined was statistically significantly correlated with maternal age at childbirth (log odds=-0.682(p.05), CI=-1.222, -0.141), fertility preference (log odds=-0.296(p.05), CI=-0.549, -0.0427), and unmet need for family planning (log odds=-0.297(p.05), CI= 0.0193, 0.574) (Bigirimana, 2021).

Adedokun and Yaya (2021) researched into the causes of poor nutrition among children in sub-Saharan Africa. Data from the Demographic and Health Survey (DHS) from 31 countries, including 189,195 children under 5 years old, were used in the study. The association between independent factors and poor nutritional status in children was studied using binary logistic regression. In the 31 sub-Saharan African countries included in this study, 26% of children were stunted, 6% were wasted, and 21% were underweight. Children of uneducated mothers were retarded in nearly 31% of cases, wasted in 9% and underweight in 28% of cases. Mother's age,

education level, household income, place of residence, prenatal visits, media exposure, baby's gender, and birth weight are all closely related to health status. poor nutritional status of children.

Shahar et al. (2020) conducted a study to ascertain the prevalence of stunting, wasting, and underweight based on WHO child growth standards from 2006 and undernutrition based on Composite Index Anthropometric Failure (CIAF) among children below the age of 5 and its correlation with environmental factors in the biological, behavioural, socioeconomic, and physical realms. Children between the ages of 6 and 59 months who were selected by stratified random sampling from the Tenom district participated in this cross-sectional study. A questionnaire was used to gather information about mothers' socio-demographic backgrounds. A standardised tool was used to measure both height and weight. The WHO Child Growth Standard from 2006 served as the basis for classifying the height-for-age, weight-for-age, and BMI-for-age measurements. There was a bivariate analysis and a multivariate logistic regression analysis. According to CIAF, 42.3% of children were undernourished, 34.7% were underweight, 33.3% were stunted, and 10.0% were wasting away. Childhood undernutrition was strongly linked with poor sanitation (adjusted OR 2.98, 95% CI: 1.082 to 8.225) and frequent sickness (adjusted OR 2.07, 95% CI: 1.015 to 3.274) after controlling for all covariates (Shahar, et al., 2020).

Binagwaho et al., (2020) studied trends and possible danger signs of child stunting in Rwanda from 2000 to 2015. Demographic and Health Survey (DHS), a cross-sectional survey based on on population conducted in Rwanda every 5 years from 2000 to 2015, provided the data for this survey. In line with previous research, this study used DHS-reported age and weight to define stunting. After determining the total prevalence of stunting in children under 5 years of age in Rwanda, the researchers conducted bivariate analyzes using different important demographic, socioeconomic, and health characteristics. important for policy making. Next, they subjected the significant variables to multivariate analysis to find which variables were uniquely associated with stunting. Rwanda saw a decrease in the frequency of stunting in children under 5 years old between 2000 and 2015 (38.3%), although it remained largely unchanged between 2000 and 2010. Living in the lowest income quintile, lower maternal education, maternal smoking, giving birth to a male child, and low birth weight are all factors associated with higher rates of stunting.

Itaka and Omole (2020) conducted a study to ascertain the prevalence and risk factors for malnutrition in hospitalized children under the age of five. The Sebokeng, Kopanong, and Heidelberg hospitals in South Africa's Sedibeng area served as the study's locations. In this cross-sectional research, 306 children under the age of five who were hospitalized. Caretakers and medical records provided data on sociodemographics, eating habits, immunizations, and clinical issues. Additionally, anthropometric measures were taken. Data showed breastfeeding history ($p = 0.01$), diarrhea during hospitalization ($p = 0.01$), family monthly income ($p = 0.01$), employment status of father and mother ($p = 0.01$; $p = 0.01$) and these factors were significantly associated with hospitalization for malnutrition. Malnutrition was independently linked in multivariate regression analyses to not being breastfed (odds ratio [OR] = 3.9; 95% confidence interval [CI]: 1.23-12.29; $p = 0.02$) and diarrhea at index admission (OR = 23.3; 95% CI: 6.85-79.43; $p = 0.01$).

In their study, Hall et al. (2020) looked at the causes of stunting, wasting, and underweight in children (under 5 years old) of cocoa growers in the Autonomous Region of Bougainville. We used information from a thorough cross-sectional livelihoods survey conducted in 2017. The explanatory factors' associations with stunting, wasting, and underweight were assessed using multilevel logistic mixed regression models. Children from homes with subpar toilet facilities had significantly higher adjusted ORs (aOR) for stunting (aOR=1.71, 95% CI 1.14 to 2.55) and underweight (aOR=2.11, 95% CI 1.16 to 3.82). Children from homes lacking access to safe drinking water also had an increased aOR for underweight (aOR=1.97, 95% CI 1.19 to 3.29). The odds of child stunting rose as maternal height declined (from 150 to 155 cm, aOR=1.52, 95% CI 1.02 to 2.26) (150 cm, aOR=2.37, 95% CI 1.29 to 4.35). Short maternal stature was substantially linked with child stunting. The risks of a child being underweight rose with birth order at the individual level (third born, aOR=6.77, 95% CI 2.00 to 22.82; second born, aOR=1.92, 95% CI 1.09 to 3.36) (Hall, et al., 2020).

To determine the reasons behind the Ugandan district of Sheema's infant malnutrition, Bampaire (2019) carried out a study. Through the use of a standardised questionnaire and anthropometric measurements, the information was gathered from Kitagata Hospital. Epi Info's nutrition module and STATA were used to analyse the data. It was discovered that parental occupation, maternal education level, and gestational age were the main factors impacting malnutrition. Stunting was

discovered to be more common in children whose moms were peasants and those whose mothers had little formal education. Children whose birth interval was under 2 years showed the same pattern. However, there was no association between marital status and under-five child malnutrition (Bampaire, 2019).

Nshimyiryo et al., (2019) conducted a study to identify stunting risk variables in Rwanda. The Rwanda Demographic and Health Survey (DHS) 2014-2015 provided the necessary information. Using logistic regression analysis, the relationship between child characteristics and stunting was assessed. A total of 3,594 children under 5 years old were affected, 51% of whom were male. For all children, the prevalence of stunting was 38% (95% CI: 35.92-39.52). In the adjusted analysis, the following factors were found to be significant: boys (OR 1.51; 95% CI 1.25-1.82), children ages 6-23 months (OR 4.91; 95% CI 3.16-7.62), and children ages 24-59 months (OR 6.34; 95% CI 4.07-9.89) compared to ages 0-6 months, low birth weight (OR 2.12; 95% CI 1.39-3.23), low maternal height (OR 3.27; 95% CI 1.89–5.64), primary education for mothers (OR 1.71; 95% CI 1.25–2.34), mothers without education (OR 2.00; 95% CI 1.37–2.92), history of not taking deworming medicine during pregnancy (OR 1.29; 95%CI 1.09–1.53), poorest households (OR 1.45; 95% CI 1.12–1.86; and OR 1.82; 95%CI 1.45–2.29 respectively).

In a study published in 2018, Taremwa and Ahabyoona investigated persistent malnutrition causes among under five years kids in the Karamoja region. 236 children between the ages of 0-59 months were evaluated by the researchers using a mixed methodology and descriptive survey design. Both structured questionnaires and anthropometric measurements were employed. According to the survey study's findings, correspondingly 13.4%, 26.8%, and 33.2% kids stunted, wasted, or underweight. With a 26.0% occurence, severe underweight was more common in children ages 30-59 months, whereas 35.5% of children ages 18-41 months were stunted. In addition, boys were more likely than girls to be severely underweight, stunted, and wasting. Infant age and nursing habits were determined to be the main contributing variables to stunting, whereas underweight was linked to food insecurity among other things (Taremwa & Ahabyoona, 2018).

Ntwasi (2018) conducted a research at the Mubende Regional Referral Hospital to identify the variables impacting malnutrition in children (0–5 years), Mubende district Uganda. A total of

185 individuals were chosen for the cross-sectional study using a simple random sample procedure. Knowledge of care takers, socio-economic and demographic factors, health service factors and anthropometric measurements including Weight, height and Mid Upper Arm Circumference (MAUC) were used in data collection. SPSS was used to analyze the data, and pie charts, frequency tables, and bar graphs were used to display the findings. The study revealed that majority of the children (63.78%) were malnourished with 38.25% severely stunted, 32.04% severely wasted and 85.565 had a MUAC <12.5cm. This was related to a number of factors, including birth order and the caregivers' level of education, as well as the fact that a small number of infants (40.5%) were not exclusively breastfed for the first six months.

Sarkodie (2018) conducted research to determine the root causes of malnutrition in under 5 children in the Koforidua Zongo sub district. A descriptive cross-sectional survey was used in this investigation. Mothers and caregivers completed semi-structured questionnaires that gathered information on anthropometry, socio-demographic traits, feeding habits, and socioeconomic position. The findings showed that among children under the age of five, 9%, 13%, and 6.3%, respectively, of children were underweight, stunted, or wasted. Compared to male children, girls had a higher likelihood to be wasted (52%) and stunted (52%) than boys. Multivariate analysis revealed that underweight, stunting, and wasting were related to the mother's occupation [AOR = 0.51; 95% CI (0.27-0.96); P 0.036], the child's immunisation status [AOR = 0.186; 95% CI (0.089-0.389); P 0.0001], and the source of drinking water [AOR = 3.74; 95% CI (1.23-11.37); P 0.020] (Sarkodie, 2018).

Kalu and Etim (2018) conducted a literature analysis on studies on malnutrition carried out in Africa and Asia, paying particular attention to the causes of malnutrition. Of the 162 million young children that are stunted, it was discovered that 36% lived in Africa and 56% in Asia. Additionally, it was noted that 11 million of the 60 million under-five children in developing nations who were discovered to be stunted were Nigerian children. From 11% in 2003 to 18% in 2013 for wasting, from 24% in 2003 to 29% in 2013 for underweight, albeit there was a drop from 42% in 2003 to 37% in 2013 for stunted children, the severity of childhood malnutrition was seen to continuously increase. It has been noted that Sub-Saharan Africa has high rates of death among malnourished children as a result of things like inadequate calorie intake, high rates of HIV/AIDS, political unrest, conflicts between communities, and ineffective government

policy execution. For instance, inadequate dietary intake or insufficient consumption of essential nutrients led to stunting in 50% of malnourished children in Malawi, Burundi, and Madagascar. Children's nutritional status is affected by a number of other significant factors, poverty, lack of exclusive breastfeeding, maternal problems such as poor prenatal nutrition, inadequate weight gain and inadequate vitamin supplementation, illness, environmental variables, and socioeconomic issues /household, among other issues (Kalu & Etim, 2018).

Makori et al., (2018) conducted a study to determine the causes of childhood stunting aged 6 to 23 months in Dodoma Municipality and Chamwino District in Dodoma region. Cross-sectional study and a standardized questionnaire was utilized to gather socio-demographic information infant feeding behaviors. Anthropometric measurements were taken as per WHO standard procedures. Multivariate logistic regression using backward stepwise selection method was used to obtain independent factors of stunting. Multivariate logistic regression analysis showed that, age of introduction of complementary food [AOR =13.3; (95% CI: 2.6 – 67.6)], maternal education [AOR = 5.5; (95% CI: 1.0 – 9.8)], residence in Chamwino District [AOR = 3.2; (95% CI: 1.3 – 5.9)] were factors associated with stunting.

In order to ascertain the prevalence of malnutrition and related variables in children below the age of 5 in the Borgu Local Government Area of Niger State, Nigeria, Nwachukwu et al. (2016) conducted a study. The design used was descriptive. 250 kids were sampled for the study using a multi-stage sampling method. A length board, a weighing scale, and a questionnaire were used to collect the data. Chi-squared analysis and descriptive statistics were used to analyse the data. The WHO child growth standards were used to determine stunting, underweight, and wasting. Stunting, wasting, and underweight were prevalent in 47.6%, 8.8%, and 25.6% of people, respectively, according to the findings. The prevalence of several types of protein energy malnutrition, which affects about 18% of children, was highest in boys (23.2%), kids (0 to 11 months), and youngsters whose moms lack formal education (25.2%). The greatest prevalent (63.6%) type of protein energy malnutrition was marasmus (Nwachukwu et al., 2016).

In this study, Asfaw et al. (2015) evaluated the severity and risk factors for undernutrition in youngsters between 6 and 59 months who lives an agricultural community in Bule Hora District, South Ethiopia. The extent and causes of undernutrition in children between 6 to 59 months were

evaluated using a community-based cross-sectional research methodology. 796 children paired with their moms were subjected to a systematic questionnaire in order to gather data. Measurements of anthropometry and determining elements were gathered. The statistical programme SPSS version 16.0 was utilised for the analysis. In order to find the variables influencing the children's nutritional status, the analysis used bivariate and multivariate logistic regression. Findings showed that among the study participants, stunting, underweight, and wasting rates were 47.6%, 29.2%, and 13.4%, respectively. Diarrhea within the previous two weeks, male sex, uneducated fathers, and more than four children ever born to a mother were all substantially linked to underweight status. Stunting was strongly correlated with the recent presence of diarrhoea, male sex, and pre-lacteal feeding. The past two weeks' history of diarrhoea, the age at which supplemental feeding began, and not using family planning methods were also linked to wasting (Asfaw, Wondaferash, Taha, & Dube, 2015).

In a state in Malaysia, Wong, Moy, and Nair (2014) conducted a study to determine the features of children under five who are underweight and the risk factors of childhood malnutrition. From April to August 2012, a case control study was carried out in the mother and child health clinics of five Terengganu districts in Malaysia. A youngster with moderate to severe malnutrition and z-scores that were two standard deviations out from the WHO reference median was the case. A child designated as the control had z-scores between -2SD and +2SD, was not malnourished, and their age was the same as the case's. Analyses of univariate and multivariate logistic regression were performed. With a 95% confidence interval, the crude odds ratio and adjusted odds ratio were determined. After controlling for all potential confounders, childhood malnutrition was found to be significantly correlated with the following factors: the number of children (aOR: 5.86, 95% CI: 1.96, 17.55), child hunger (aOR: 16.38, 95% CI: 1.34, 199.72), dietary energy intake (aOR: 0.99, 95% CI: 0.98, 0.99), protein intake (aOR: 1.06, 95% CI: 1.01, 1.12) (Wong, Moy, & Nair, 2014)

Senbanjo and Adeodu (2006) undertook a study to establish the nutritional condition in children under-five in rural Nigeria and the impact of feeding methods and household variables on that status. A cross-sectional, community-based survey design was used in its execution. 420 kids from 344 homes were examined. Young age was significantly (P = 0.004) linked to a higher prevalence of underweight, according to the study. Overcrowding, low maternal income, and the

use of baby formula feeds in children 6 months and older were all associated with a greater frequency of wasting (P = 0.029, 0.031, and 0.005, respectively) (Senbanjo & Adeodu, 2006).

2.5 Gaps in Literature

Some related studies have looked at under-5 malnutrition in Africa and beyond. For example studies like: Nahamo et al. (2022), Mdimu et al. (2017), Cheah et al. (2010), Khan et al. (2016), Habaasa (2015), Tette et al. (2015), Makori et al. (2018), Sarkodie (2018), Hall et al. (2020), Ntwasi (2018), Bampaire (2019), Endris et al. (2017), Habyarimana (2016), Poda et al. (2017), Tekile et al. (2019), Aheto et al. (2015), Bigirimana (2021), Mawa and Lawoko (2018), Li et al. (2022), Mukabutera et al. (2016), Nshimyiryo et al. (2019).

Nevertheless, a number of gaps, including methodological, contextual, and content gaps, were evident because the aforementioned studies employed different methodologies, content and were done in different contextual settings. However, the current study addressed such as gaps by investigating malnutrition using data from three demographic surveys using cross-sectional design and secondary data from UDHS (for addressing methodological gap); the current study investigated malnutrition in both rural and urban settings nationwide (addressing contextual gap); This study investigated all the three indicators of malnutrition which are; stunting, wasting and underweight and included breastfeeding practices to investigate its association with malnutrition in children under 5 years (for addressing content gap).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter is comprised of the research design, study population, sample size, sampling procedure, study variables and measurements, validity and reliability, collection procedures, data analysis, and ethical considerations.

3.2 Research Design

In this study, cross-sectional studies based on information from the Uganda Demographic and Health Surveys (UDHS) from 2006, 2011, and 2016 were employed. The information was utilised to support the ongoing research on the risk factors associated with malnutrition among children under the age of five in Uganda.

The study employed a cross-sectional design using data from the Uganda Demographic and Health Surveys (UDHS), which was appropriate for identifying risk factors for malnutrition among children under five. Cross-sectional data provided a snapshot of the relationships between various risk factors (such as demographic, socioeconomic, and feeding practices variables) and malnutrition at a single point in time. While this design was effective for identifying associations and drawing preliminary conclusions, it was limited in its ability to establish causality because it captured data at one point, not over time.

To address this limitation and account for temporal trends across the 2006, 2011, and 2016 surveys, it was recognized that the repeated cross-sectional nature of these surveys allowed for an analysis of changes in malnutrition prevalence and risk factors over time. Handling temporal trends involved comparing the outcomes and predictors across the different survey years while considering any potential shifts in demographic, socioeconomic, and feeding practices. One way this was achieved was through pooled cross-sectional analysis, which combined data from multiple survey years to assess how risk factors evolved.

3.3 Study Population and Sample Size

Children who were 6-59 months old when their anthropometric measurements were taken in 2006, 2011, and 2016 made up the study population. Selection of this age group was based on prior knowledge of at-high risk group and evidence on nutrition interventions that works (Bhutta, et al., 2013). The sample population of the UDHS 2006, 2011, and 2016 data was used in this investigation. Children under the age of five were the population taken into account. According to the UDHS, these children were present in the following years: 2006 (2,685), 2011 (2,350), and 2016 (5,117). Thus, 10,152 people made up the entire sample for this study. However, over the years, there was potential for bias, such as underreporting or misreporting of household data, particularly on sensitive issues like income or maternal health, which introduced measurement bias. The quality and accuracy of data collection varied across different regions and time periods, influenced by the skill levels of survey enumerators and the willingness of respondents to provide accurate information.

3.4 Sampling Procedure

The 2014 Uganda National Population and Housing Census (NPHC) served as the sampling frame for the 2016 UDHS. Two phases of stratification and selection were used for the 2016 UDHS sample. 162 Enumeration Areas (EAs) in urban regions and 535 in rural areas were chosen from the 2014 Uganda NPHC to make up the first stage's 697 EAs. The second sampling phase included households. From April to October 2016, a list of homes was compiled in each of the 696 accessible selected EAs, with some of the listing and fieldwork occurring at the same time. For the 2016 UDHS, a total of 20,880 households—30 per EA or EA segment—were randomly chosen as a representative sample (UDHS, 2016).

To provide population and health indicator estimates for the nation as a whole as well as for urban and rural areas separately, the sample for the 2011 UDHS was created. For the 2011 UDHS, 10,086 households were chosen as a representative sample. Two phases of sample selection were conducted. A list of clusters collected for the 2009/10 Uganda National Household Survey was used to identify 404 enumeration areas (EAs) for the first stage (2010 UNHS). A complete list of all households, which was updated prior to the survey, was used to choose households in each cluster during the second step of sampling. The listed households were specifically chosen for the study (UNHS, 2010).

The 2006 UDHS sample was created to provide distinct national estimates as well as estimates for urban and rural regions of the nation. For the 2006 UDHS survey, 9,864 households were chosen as a representative probability sample. Two phases of sample selection were conducted. 321 clusters were chosen for the first stage of the study from a list of clusters sampled in the 2005–2006 Uganda National Household Survey. On the basis of an exhaustive list of all households, the households in each cluster were chosen in the second stage (UDHS, Uganda Demographic and Health Survey, 2006).

3.5 Data Collection instrument

The questionnaires used in the UDHS in 2006, 2011, and 2016 served as the foundation for this investigation. The Household Questionnaire, Woman's Questionnaire, Maternal Mortality Questionnaire, and Man's Questionnaire were the four different types of questionnaires employed in these UDHS. Since the focus of this study is on under-five children and their mothers, only the "Woman's Questionnaire" was used. The following data were taken from the Woman's questionnaire that was adopted: age, education, breastfeeding and infant feeding habits, marital status, and woman's employment.

Additionally, anthropometry data from the UDHS of 2006, 2011, and 2016 was retrieved. This data includes measurements of height and weight. All households selected from UDHS had the height and weight of all children under 5 years old measured. Weight measurements were taken using digital, lightweight SECA mother-infant scales that were created and produced with UNICEF's help. A measuring board was used to take height measurements. Height measurements were taken lying down for children under 24 months and standing for older children.

However, several challenges arose in collecting anthropometric measurements across different time points. First, inconsistencies in measurement techniques or slight variations in the equipment used across survey years introduced measurement errors,leading to data discrepancies. Although standardized procedures were followed, even small differences in how the scales or measuring boards were calibrated or used affected the accuracy of the results. In addition, variations in the skills and training of field staff over the years impacted the reliability of the measurements. Proper training was essential to ensure that measurements were taken

consistently across all regions and time points. Inadequate training or varying levels of expertise among enumerators resulted in systematic errors, particularly with infants and younger children, where slight movements significantly altered measurements.

3.6 Study Variables and Measurement

Dependent Variable

Malnutrition was measured using: wasting, stunting and underweight.

Independent Variables

Three categories of factors were assessed as independent variables:

a) *Demographic variables:* child's age, child's sex, child's size at birth, birth interval, and residence.
b) *Socio-economic variables:* mother's nutritional status, mother's education, and wealth quintile.
c) *Feeding practices:* not breastfeeding, exclusively breastfeeding, or feeding on supplementary foods.

3.7 Data Collection Procedure

Secondary data from the Uganda Demographic and Health Survey (UDHS-2006, 2006, and 2016) was utilized to support the current investigation. An expert staff diligently carried out the UDHS surveys in 2006, 2011, and 2016 and was able to gather and process data for 25,088 children from 0 to 59 months old as well as successfully capture anthropometric measurements. Children aged 0-59 months had their height and weight measured in every household that was not chosen for the male survey.

3.8 Validity and Reliability

Validity: Validity was guaranteed for the UDHS in 2006, 2011, and 2016 by a multi-sectoral Technical Working Committee made up of representatives from the Ministry of Health, the Makerere University School of Public Health, and the Biochemistry Department. This group was in charge of creating the questionnaires, providing training, and producing the reports.

Reliability: To guarantee the dependability of the devices, testing was carried out in the UDHSs of 2006, 2011, and 2016. To ensure that the questions were understandable by the respondents,

the questionnaires were pretested in seven regional languages before to the fieldwork. In each of the seven districts, there were two clusters (one urban and one rural) where pretest fieldwork was done. The majority of participants in the pretest received training to serve as survey team leaders and field editors.

3.9 Data Analysis

Statistical Package for Social Sciences version 23.0 was utilized as the software in this study (SPSS). Frequency and percentage tables were used to examine descriptive statistics of demographic, socioeconomic, and feeding patterns of mothers and children under the age of five. Chi^2 test was performed to ascertain how closely the independent variable and the outcome variable are related.

3.10 Logistic regression model

In this regression, dependent variable was converted into logit function to get maximum likelihood estimation using an iterative technique that returns the 'best explaining values for the population parameters' (Hosmer & Lemeshow, 2000). The binary logistic regression equation for the model which has to be estimated based on the functional form is given as:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$$

Where;

- p: The probability of the outcome being 1 (the child being malnourished).
- 1−p: The probability of the outcome being 0 (the child not being malnourished).
- log(p1−p): The natural logarithm of the odds of the outcome.
- β_0: The intercept of the model.
- $\beta_1, \beta_2, \cdots, \beta n$: The coefficients for each predictor variable.
- $X_1, X_2, \cdots, Xn$: The predictor variables (age, sex, education, etc.).

A multiple logistic regression analysis took into account all covariates related to the outcome variable (child malnutrition) in order to evaluate the correlation within the predictor variables (demographic, socioeconomic, breastfeeding practices) and outcome variable. The strength of the independent association was evaluated using the adjusted odds ratio (AOR) and 95% confidence interval (CI). The linked risk variables were regarded as significant if their p-value is less than 0.05.

Multiple logistic regression was designated as follows:

$$p = \frac{1}{1+e^{-(\beta 0+\beta 1X1+\beta 2X2+\cdots+\beta nXn)}}$$

3.11 Ethical Consideration

This essay is based on secondary information that is available and available to the public upon request. The DHS website (https://dhsprogram.com/data/dataset/Uganda Standard-DHS 2016.cfm?flag=1) was therefore used to request authorization to utilise the UDHS 2006, 2011, 2016 dataset. The DHS programme is a renowned institution with a global reputation for gathering and disseminating trustworthy national representative data on health indicators, particularly information on fertility, family planning, maternal and child health, HIV, malaria, and nutrition. The UDHS 2016 survey tools and the process for obtaining written informed consent were evaluated and accepted by the ICF institutional review board (IRB) on behalf of the national team. The ICF IRB conformed with the rules for using human subjects set forth by the US Department of Health and Human Services. Data on minors were collected on children based on mothers' written informed consent, which was obtained from participants. A form requesting informed consent was also signed by the respondent. The survey was fully disclosed to participants, and participation was entirely optional. Excluding identities from the final dataset obtained allowed researchers to observe confidentiality and participant anonymity. The UDHS 2016 report has more details about the methodology of the study that produced the data used (UBOS, 2018).

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND ANALYSIS OF FINDING

4.0 Introduction

This chapter provides the presentation of the study findings, their interpretations, and analysis thereof. The chapter begins with the demographic characteristics of the respondents as presented in table 4.1.

4.1 Socio-Demographic Characteristics of the Participants

The demographic characteristics include age, sex, birth interval, size at birth, mother's nutritional status, residence, mother's education, and wealth quintile. Table 4.1 gives the summary of the findings.

Table 4.1: Socio-Demographic Characteristics of the Study Participants

Socio-demographic	**2016**	**2011**	**2006**
Age in months	**N=5,117**	**N=2,350**	**N=2,685**
< 6	468 (9%)	228 (10%)	242 (9%)
6-8	265 (5%)	131 (6%)	144 (5%)
9-11	254 (5%)	120 (5%)	144 (5%)
12-17	500 (10%)	245 (10%)	298 (11%)
18-23	507 (10%)	269 (11%)	280 (10%)
24-35	1,063 (21%)	444 (19%)	535 (20%)
36-47	1,043 (20%)	477 (20%)	521 (19%)
48-59	1,017 (20%)	436 (19%)	521 (19%)
Sex	**N=5,117**	**N= 2,351**	**N= 2,687**
Male	2,569 (50%)	1,163 (49%)	1,357 (51%)
Female	2,548 (50%)	1,188 (51%)	1,330 (49%)
Birth interval in month	**N=4,357**	**N=2,053**	**N=2,408**
First birth	845 (19%)	331 (16%)	363 (15%)
< 24	824 (19%)	419 (20%)	473 (20%)
24-47	1,986 (46%)	1,025 (50%)	1,285 (53%)
48+	702 (16%)	278 (14%)	287 (12%)

Size at birth	**N=4,281**	**N= 1,998**	**N=2,394**
Very small	235 (5%)	100 (5%)	126 (5%)
Small	635 (15%)	338 (17%)	349 (15%)
Average or larger	3,411 (80%)	1,560 (78%)	1,919 (80%)
Mother's nutritional status	**N=3,554**	**N= 2,090**	**N=2,429**
Thin (BMI <18.5)	314 (9%)	202 (10%)	257 (11%)
Normal (BMI 18.5-24.9)	2,454 (69%)	1,541 (74%)	1,832 (75%)
Overweight/Obese (BMI ≥ 25)	786 (22%)	347 (16%)	340 (14%)
Residence	**N=5,118**	**N=2,350**	**N=2,687**
Urban	977 (19%)	307 (13%)	273 (10%)
Rural	4,141 (81%)	2,043 (87%)	2,414 (90%)
Mother's education	**N=4,186**	**N=2,138**	**N=2,470**
No education	590 (14%)	275 (13%)	551 (22%)
Primary	2,703 (65%)	1,406 (66%)	1,580 (64%)
Secondary+	893 (21%)	457 (21%)	339 (14%)
Wealth quintile	**N=5,117**	**N=2,351**	**N=2,687**
Lowest	1,134 (22%)	505 (21%)	554 (21%)
Second	1,050 (21%)	509 (22%)	591 (22%)
Middle	1,058 (21%)	487 (21%)	578 (22%)
Fourth	971 (19%)	445 (19%)	501 (19%)
Highest	904 (17%)	405 (17%)	463 (16%)

Source: UDHS (2006, 2011, 2016)

The results presented in Table 4.1 shows that majority of the children were within the age of 36-47 months in UDHS 2016, 2011, and 2006 each represented by 20%, 20%, and 19% respectively.

Furthermore, Table 4.1 shows that majority of the children were female in UDHS 2016, and 2011, represented by 50% and 51% respectively. However, the male children were the majority in 2006, represented by 51%.

Similarly, Table 4.1 shows that the birth interval of children in UDHS 2016 had majority, (46%) of children born within the interval of 24-47 months, while in UDHS 2011 and 2006, 50% and 53% of the children were also born within the interval of 24-47 months respectively.

In addition, Table 4.1 shows that majority, (80%) of children in UDHS 2016 were average or larger at birth, while 78% and 80% of the children were average or larger at birth in UDHS 2011, and 2006 respectively.

Likewise, Table 4.1 shows that majority, (69%) of mothers had normal nutritional status in UDHS 2016, while 74% and 75% of mothers had normal nutritional status in UDHS 2011 and 2006 respectively.

In the same way, Table 4.1 shows that majority, (81%) of children and mothers in UDHS 2016 had rural residence, while 87% and 90% of them had rural residence in UDHS 2011, and 2006 respectively.

Furthermore, Table 4.1 shows that majority, (65%) of the mothers in UDHS 2016 were primary school dropouts, while 66% and 64% of mothers were primary school dropouts in UDHS 2011 and 2006 respectively.

Lastly, Table 4.1 shows that majority, (22%) of mothers and children belonged to the lowest wealth quintile in UDHS 2016. However, in UDHS 2011 and 2006, 22% and 22% respectively belonged to the second wealth quintile.

Table 4.2: Feeding Practices

	2016 N=5,920				2011 N=3,109				2006 N=3,109			
Age in months	**No. of children**	**NBF**	**EBF**	**BFCCF**	**No. of children**	**NBF**	**EBF**	**BFCCF**	**No. of children**	**NBF**	**EBF**	**BFCCF**
0-1	526 (9%)	1.8%	82.6%	1.1%	242 (8%)	3.9%	81.9%	5.8%	227 (7%)	0.0%	84.2%	1.8%
2-3	490 (8%)	2.9%	68.9%	5.5%	285 (9%)	0.7	68.5%	11.4%	300 (9%)	0.9%	64.8%	14.1%
4-5	464 (8%)	2.3%	42.6%	28.6%	275 (9%)	3.1%	41.0%	24.4%	273 (9%)	0.2%	34.8%	33.3%
6-8	807 (14%)	2.7%	7.0%	78.8%	417 (13%)	4.0%	12.1%	63.4%	403 (13%)	1.1%	10.8%	77.3%
9-11	774 (13%)	5.4%	3.4%	87.4%	411 (13%)	6.4%	1.7%	86.1%	386 (12%)	3.2%	1.9%	89.3%
12-17	1,431 (24%)	17.7%	1.2%	79.4%	723 (23%)	16.3%	2.1%	78.1%	803 (25%)	11.7%	0.4%	86.0%
18-23	1,428 (24%)	49.7%	0.4%	49.3%	756 (24%)	46.9%	0.9%	49.6%	786 (25%)	39.5%	0.4%	58.8%

Source: UDHS (2006, 2011, 2016)

Legend:

Not breast feeding: **NBF**
Exclusively breastfed: **EBF**
Breast feeding and consuming complementary foods: **BFCCF**

The presentation in Table 4.2 shows that majority, (49.7%) of the children in UDHS 2016 within the age group of 18-23 months were not breastfeeding. However, 82.6% of children within 0-1 months were exclusively breastfeeding, while 87% of children within 9-11 months were breast feeding and consuming complementary foods.

Similarly, Table 4.2 shows that majority, 46.9% of children in UDHS 2011 within the age group of 18-23 months were not breastfeeding. However, 81.9% of children within 0-1 months were exclusively breastfeeding, while 86% of children within 9-11 months were breast feeding and consuming complementary foods.

Additionally, Table 4.2 shows that majority, 39.5% of children in UDHS 2006 within the age group of 18-23 months were not breastfeeding. However, 84.2% of children within 0-1 months were exclusively breastfeeding, while 89.3% of children within 9-11 months were breast feeding and consuming complementary foods.

Table 4.3: Univariate Analysis of Demographic Factors, Socio Economic Factors, and Feeding Practice with Malnutrition among Under-Five Children

	2016				2011				2006			
Age in months	**No. of children**	**Stunted (%)**	**Wasting (%)**	**Under-weight (%)**	**No. of children**	**Stunted (%)**	**Wasting (%)**	**Under-weight (%)**	**No. of children**	**Stunted (%)**	**Wasting (%)**	**Under-weight (%)**
< 6	468	24 (5.2%)	22(4.6%)	20(4.2%)	228	10(4.6%)	10(4.4%)	7(3.2%)	242	13(5.4%)	6(2.3%)	6(2.4%)
6-8	265	13 (4.8%)	9(3.4%)	10(3.6%)	131	3(2.3%)	8(6.0%)	9(7.0%)	144	8(5.9%)	4(2.6%)	4(2.6%)
9-11	254	15 (5.9%)	8(3.0%)	9(3.6%)	120	7(5.8%)	0(0.0%)	0(0.0%)	144	19(12.9%)	15(10.1%)	19(13.1%)
12-17	500	45 (9.0%)	6(1.2%)	17(3.4%)	245	33(13.5%)	3(1.4%)	8(3.4%)	298	35(11.7%)	15(5.0%)	19(6.3%)
18-23	507	56 (11.1%)	7(1.4%)	12(2.4%)	269	51(19.1%)	3(1.2%)	16(5.9%)	280	47(16.8%)	8(3.0%)	17(5.9%)
24-35	1,063	146 (13.7%)	5(0.5%)	26(2.4%)	444	83(18.7%)	2(0.4%)	13(2.9%)	535	116(21.7%)	4(0.8%)	19(3.6%)
36-47	1,043	99(9.5%)	7(0.7%)	14(1.3%)	477	80(16.7%)	2(0.5%)	19(3.9%)	521	80(15.3%)	2(0.3%)	14(2.7%)
48-59	1,017	75(7.4%)	5(0.5%)	13(1.3%)	436	55(12.7%)	6(1.4%)	9(2.0%)	521	84(16.1%)	5(0.3%)	14(2.7%)
Sex												
Male	2,569	288(11.2%)	44(1.7%)	69(2.7%)	1,163	12(15.6%)	12(1.0%)	35(3.0%)	1,357	228(16.8%)	30(2.2%)	57(4.2%)
Female	2,548	186(7.3%)	25(1.0%)	51(2.0%)	1,188	141(12%)	23(1.9%)	45(3.8%)	1,330	174(13.1%)	24(1.8%)	55(4.1%)
Birth interval in month												
First birth	845	69(8.2%)	8(1.0%)	20(2.4%)	331	39(11.9%)	4(1.2%)	9(2.6%)	363	57(15.6%)	9(2.6%)	16(4.3%)
< 24	824	101(12.3%)	12(1.4%)	21(2.5%)	419	76(18.1%)	5(1.1%)	37(3.6%)	473	88(18.5%)	9(2.0%)	26(5.5%)
24-47	1,986	179(9.0%)	28(1.4%)	50(2.5%)	1,025	141(14%)	19(1.9%)	35(3.4%)	1,285	171(13.3%)	26(2.0%)	45(3.5%)
48+	702	36(5.1%)	12(1.7%)	12(1.7%)	278	24(8.6%)	5(1.8%)	11(4.1%)	287	26(9.1%)	9(3.2%)	12(4.3%)
Size at birth												
Very small	235	39(16.6%)	8(3.6%)	24(10.2%)	100	24(23.7%)	5(5.1%)	6(11.0%)	126	25(19.5%)	8(6.0%)	12(9.9%)
Small	635	77(12.1%)	13(2.1%)	23(3.6%)	338	50(14.9%)	1.7%	15(4.5%)	349	70(20.0%)	13(3.8%)	23(6.5%)
Average or larger	3,411	259(7.6%)	34(1.0%)	51(1.5%)	1,560	198(13%)	1.4%	41(2.6%)	1,919	244(12.7%)	33(1.7%)	63(3.3%)
Mother's nutritional status												
Thin (BMI <18.5)	314	27(8.6%)	10(3.2%)	15(4.9%)	202	27(13.2%)	3(1.7%)	12(6.0%)	257	31(11.9%)	10(3.8%)	17(6.5%)

Normal (BMI 18.5-24.9)	2,454	240(9.8%)	32(1.3%)	71(2.9%)	1,541	227(15%)	25(1.6%)	51(3.3%)	1,832	282(15.4%)	40(2.2%)	77(4.2%)
Overweight/Obese (BMI ≥ 25)	786	49(6.2%)	2(0.3%)	7(0.9%)	347	36(10.3%)	5(1.3%)	8(2.2%)	340	34(10.0%)	4(1.2%)	6(1.9%)
Residence												
Urban	977	69(7.1%)	9(0.9%)	13(1.3%)	307	17(5.6%)	7(2.3%)	3(1.1%)	273	23(8.3%)	8(3.0%)	7(2.5%)
Rural	4,141	406(9.8%	58(1.4%)	108(2.6%)	2,043	306(15%)	29(1.4%)	78(3.8%)	2,414	379(15.7%)	46(1.9%)	104(4.3%)
Mother's education												
No education	590	72(12.2%)	9(1.6%)	24(4.1%)	275	53(19.1%)	7(2.7%)	17(6.1%)	551	87(15.8%)	13(2.4%)	33(5.9%)
Primary	2,703	265(9.8%)	38(1.4%)	68(2.5%)	1,406	204(15%)	21(1.5%)	45(3.2%)	1,580	245(15.5%)	35(2.2%)	62(3.9%)
Secondary +	893	48(5.4%)	12(1.3%)	13(1.4%)	457	71(8.0%)	5(1.2%)	11(2.3%)	339	24(7.1%)	6(1.7%)	9(2.6%)
Wealth quintile												
Lowest	1,134	115(10.1%)	24(2.1%)	43(3.8%)	505	95(18.9%)	7(1.3%)	29(5.8%)	554	102(18.5%)	9(1.6%)	30(5.5%)
Second	1,050	128(12.2%)	18(1.7%)	25(2.4%)	509	64(12.5%)	10(2.0%)	16(3.2%)	591	95(16.0%)	12(2.0%)	20(3.3%)
Middle	1,058	113(10.7%)	12(1.1%)	26(2.5%)	487	90(18.4%)	5(1.0%)	21(4.4%)	578	100(17.3%)	15(2.6%)	24(4.2%)
Fourth	971	82(8.4%)	8(0.8%)	17(1.8%)	445	52(11.7%)	9(2.0%)	9(2.0%)	501	69(13.7%)	12(2.4%)	31(6.1%)
Highest	904	37(4.1%)	6(0.7%)	8(0.9%)	405	22(5.5%)	4(1.0%)	5(1.3%)	463	40(7.9%)	6(1.4%)	7(1.5%)
Breastfeeding practices												
NBF	1,061	80(7.3%)	12(3.3%)	100(9.4%)	536	18(3.4%)	40(7.5%)	45(8.4%)	424	146(4.4%)	19(3.2%)	10(2.4%)
EBF	1,076	57(5.3%)	4 (1.2%)	16(1.5%)	753	10(1.3%)	18(2.4%)	32(4.3%)	530	191(3.0%)	6(1.1%)	5(0.9%)
BFCCF	3,318	96(2.9%)	7(0.2%)	27(0.8%)	1,671	8(0.5%)	3(0.2%)	38(2.3%)	1,947	610(1.3%)	8(0.4%)	6(0.3%)

Source: UDHS (2006, 2011, 2016)

Table 4.3 shows that in UDHS 2016 majority, (13.7%) of children within the age group of 24-35 months were stunted, while (4.6%) of those less than 6 months were wasting, and 4.2% kids less than 6 months of age were also underweight. On the other hand, in the UDHS 2011, majority (19.1%) of children within the age of 18-23 months were stunted, while majority, (6%) of children within 6-8 months were wasting, and majority, (7.0%) of the same age group were underweight. Additionally, in UDHS 2006, majority (21.9%) of the children within the age group of 24-35 months were stunted, while 10.1% of children within the age group of 9-11 were wasting, and 13.1% of children within the age group of 9-11 months were underweight. The above results shows that both in 2016 and 2006, children within the age of 24-35 months were the most affected with stunting cases. In 2011, those most affected were within 18-23 months.

Furthermore, Table 4.3 shows that in UDHS 2016, majority (11.2%) of male children were stunted compared to 7.3% of girls, while 1.7% of male children were wasting compared 1% girls. Furthermore, 2.7% of male children were underweight compared to 2% of girls. In UDHS 2011, majority (15.6%) of male children were stunted compared 12% girls, 1% of male children were wasting compared to 1.9% girls, and 3% of male children were underweight compared to 3.8% of girls. In UDHS 2006, majority (16.8%) of male children were stunted compared to 13.1% of girls, 2.2% of male children were wasting, compared to 1.8% of girls, and 4.2% of male children were underweight compared to 4.1% of girls. The results above shows that male children had the highest percentage of stunting in UDHS 2006, 2011, and 2016.

Similarly, Table 4.3 shows that in UDHS 2016, majority (12.3%) of children with birth interval of 24-47 were stunted, while 1.7% of children with birth interval of 48+ were wasting, and 2.5% of children with birth interval of less than 24 months and 48+ were underweight. Likewise, in UDHS 2011, majority (18.1%) of children with birth interval less than 24 months were stunted, while 1.9% of children with birth interval of 24-47 months were wasting, and 4.1% of children with birth interval of 48+ month were underweight. Additionally, UDHS 2006, majority (18.5%) of children with birth interval less than 24 months were stunted, compared to 2.6% of children of first birth who were wasting, 5.5% of less than 24 months were underweight. The above results imply that children of less than 24months were stunted throughout UDHS 2006, 2011, and 2016.

Furthermore, Table 4.3 shows that in UDHS 2016, majority (16.6%) of children whose size were very small were stunted, compared to 3.6% of very small children who were wasting, and 10.2%

of very small children who were underweight. In UDHS 2011, majority (23.7%) of very small children were stunted, 5.1% of very small children were wasting, and 11% of very small children were underweight. In UDHS 2006, majority (20%) of small children were stunted, 6% of very small children were wasting, while 9.9% of very small children were underweight.

Likewise, Table 4.3 shows that in UDHS 2016, majority of mothers with normal body mass index (BMI) had 9.8% of stunted children, however, thin mothers had 3.2% of wasting children, and 4.9% of underweight children. In UDHS 2011, majority of mothers with normal BMI had 15% of stunted children, while thin mothers had 1.7% of wasting children, and 6% of underweight children. In UDHS 2006, majority of mothers with normal BMI had 15.4% of stunted children, while thin mothers had 3.8% of wasting children, and 6.5% of underweight children.

Furthermore, Table 4.3 shows that in UDHS 2016, majority (9.8%) of children with rural residence were stunted compared to 7.1% of children with urban residence. Additionally, 1.4% of children with rural residence were wasting compared to 0.9% with urban residence. Similarly, 2.6% of children with rural residence were underweight compared to 1.3% who were of urban residence. In UDHS 2011, majority (15%) of rural children were stunted compared to 5.6% of urban children. However, 2.3% of urban children were wasting compared to 1.4% of rural children. Likewise, 3.8% of rural children were underweight compared to 1.1% of urban children. In UDHS 2006, majority (15.7%) of rural children were stunted compared to 8.3% urban children. However, 3% of urban children were wasting compared to 1.9% of rural children. In addition, 4.3% of rural children were underweight compared to 2.5% of urban children.

Furthermore, Table 4.3 shows that in UDHS 2016, majority (12.2%) of children whose mothers had no formal education were stunted compared to 9.8% and 5.4% whose mothers had primary and secondary education respectively. Likewise, 1.6% of children with mothers that had no education were wasting compared to 1.4% and 1.3% whose mothers had primary and secondary education respectively. Similarly, 4.1% of children with mothers without any formal education were underweight compared to 2.5% and 1.4% whose parents had primary and secondary education respectively. In the UDHS 2011, majority (19.1%) of children with mothers who had no formal education were stunted compared to 15% and 8.0% whose mothers had primary and

secondary education respectively. Likewise, 2.7% of children whose mothers had no formal education were wasting compared to 1.5% and 1.2% of children whose mothers had primary and secondary education respectively. Similarly, 6.1% of children whose mothers had no formal education were underweight compared to 3.2% and 2.3% whose mothers had primary and secondary education respectively. In the UDHS 2006, majority (15.8%) of children whose mothers had no formal education were stunted, compared to 15.5% and 7.1% whose mothers had primary and secondary education respectively. Additionally, 2.4% of children whose mothers had no formal education were wasting, compared to 2.2% and 1.7% whose mothers had primary and secondary education respectively. Similarly, 5.9% of children whose mothers had no formal education were underweight compared to 3.9% and 2.6% whose mothers had primary and secondary education respectively.

Furthermore, Table 4.3 shows that in UDHS 2016, majority (12.2%) of children from the second wealth quintile were stunted compared to 10.1% from the lowest wealth quintile. Similarly, 2.1% of children from the second wealth quintile were wasting compared to 1.7% from the second wealth quintile. Additionally, 3.8% of children from the lowest wealth quintile were underweight compared to 2.4% of the second wealth quintile. In UDHS 2011, majority (18.9%) of children from the lowest wealth quintile were stunted compared to 12.5% of the second wealth quintile. Similarly, 1.3% of children from the lowest wealth quintile were wasting compared to 2% from the second wealth quintile. In addition, 5.8% of children from the lowest wealth quintile were underweight compared to 3.2% from the second wealth quintile. In UDHS 2006, majority (18.5%) of children from the lowest wealth quintile were stunted compared to 16% from the second wealth quintile. Likewise, 2.6% of children from the middle wealth quintile were wasting compared to 1.6% from the lowest wealth quintile. Additionally, 6.1% of children from the fourth wealth quintile were underweight compared to 5.5% from the lowest wealth quintile.

Furthermore, Table 4.3 shows that in UDHS 2016, majority (7.3%) of children who were not breastfeeding were stunted compared to 5.3% and 2.9% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. Similarly, 3.3% of children who were not breastfeeding were wasting compared to 1.2% and 0.2% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. Additionally, 9.4% of children who were not breastfeeding were underweight compared to 1.5%

and 0.8% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. In UDHS 2011, majority (3.4%) of children were stunted compared to 1.3% and 0.5% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. Similarly, 7.5% of children who were not breastfeeding were wasting compared 2.4% and 0.2% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. Additionally, 8.4% of children who were not breastfeeding were underweight compared to 4.3% and 2.3% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. In UDHS 2006, majority (4.4%) of children who were not breastfeeding were stunted compared to 3.0% and 1.3% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. Similarly, 3.2% of children who were not breastfeeding were wasting, compared to 1.1% and 0.4% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively. Likewise, 2.4% of children who were not breastfeeding were underweight compared to 0.9% and 0.3% who were exclusively breastfeeding, and breastfeeding and consuming complementary foods respectively.

Table 4.4: Associations of Malnutrition with Demographic Factors, Socio-Economic Factors, and Feeding Practices among Under-Five Children in 2016

Age in months	No. of children	Stunted (%)	χ^2	ρ	Wasted (%)	χ^2	ρ	Under-weight (%)	χ^2	ρ
< 6	468	24 (5.2%)	56.014	0.029*	22(4.6%)	40.310	0.058	20(4.2%)	56.000	0.009*
6-8	265	13 (4.8%)			9(3.4%)			10(3.6%)		
9-11	254	15 (5.9%)			8(3.0%)			9(3.6%)		
12-17	500	45 (9.0%)			6(1.2%)			17(3.4%)		
18-23	507	56 (11.1%)			7(1.4%)			12(2.4%)		
24-35	1,063	146 (13.7%)			5(0.5%)			26(2.4%)		
36-47	1,043	99(9.5%)			7(0.7%)			14(1.3%)		
48-59	1,017	75(7.4%)			5(0.5%)			13(1.3%)		
Sex										
Male	2,569	288(11.2%)	12.340	0.057	44(1.7%)	16.502	0.107	69(2.7%)	32.000	0.021*
Female	2,548	186(7.3%)			25(1.0%)			51(2.0%)		
Birth interval in month										
First birth	845	69(8.2%)	42.000	0.013*	8(1.0%)	58.000	0.238	20(2.4%)	34.000	0.213
< 24	824	101(12.3%)			12(1.4%)			21(2.5%)		
24-47	1,986	179(9.0%)			28(1.4%)			50(2.5%)		
48+	702	36(5.1%)			12(1.7%)			12(1.7%)		
Size at birth										
Very small	235	39(16.6%)	36.010	0.049**	8(3.6%)	29.310	0.109	24(10.2%)	34.940	0.104
Small	635	77(12.1%)			13(2.1%)			23(3.6%)		
Average or larger	3,411	259(7.6%)			34(1.0%)			51(1.5%)		
Mother's nutritional status										
Thin (BMI <18.5)	314	27(8.6%)	53.210	0.009*	10(3.2%)	66.000	0.199	15(4.9%)	59.190	0.111
Normal (BMI 18.5-24.9)	2,454	240(9.8%)			32(1.3%)			71(2.9%)		
Overweight/Obese (BMI ≥ 25)	786	49(6.2%)			2(0.3%)			7(0.9%)		
Residence										
Urban	977	69(7.1%)	12.000	0.104	9(0.9%)	33.000	0.158	13(1.3%)	39.052	0.001**
Rural	4,141	406(9.8%)			58(1.4%)			108(2.6%)		

Mother's education										
No education	590	72(12.2%)	46.005	0.000***	9(1.6%)	56.990	0.101	24(4.1%)	49.170	0.091
Primary	2,703	265(9.8%)			38(1.4%)			68(2.5%)		
Secondary+	893	48(5.4%)			12(1.3%)			13(1.4%)		
Wealth quintile										
Lowest	1,134	115(10.1%)	20.390	0.020*	24(2.1%)	27.120	0.004*	43(3.8%)	31.630	0.512
Second	1,050	128(12.2%)			18(1.7%)			25(2.4%)		
Middle	1,058	113(10.7%)			12(1.1%)			26(2.5%)		
Fourth	971	82(8.4%)			8(0.8%)			17(1.8%)		
Highest	904	37(4.1%)			6(0.7%)			8(0.9%)		
Breastfeeding practices										
NBF	1,061	80(7.3%)	55.080	0.001*	12(3.3%)	59.082	0.000***	100(9.4%)	63.604	0.019*
EBF	1,076	57(5.3%)			4 (1.2%)			16(1.5%)		
BFCCF	3,318	96(2.9%)			7(0.2%)			27(0.8%)		

Source: UDHS (2016)

The results presented in Table 4.4 shows that in UDHS 2016, the age of children was significantly associated with stunting (χ^2 = 56.014, ρ = 0.029*), and underweight (χ^2 = 56.000, ρ = 0.009*). Furthermore, the study revealed that sex of children was significantly associated with underweight (χ^2 = 32.000, ρ = 0.021*). Additionally, the study revealed that the birth interval of children was significantly associated with stunting (χ^2 = 42.000, ρ = 0.013*). Similarly, the study revealed that size at birth was significantly associated with stunting (χ^2 = 36.000, ρ = 0.049*). Likewise, the study revealed that mother's nutritional status was significantly associated with stunting (χ^2 = 52.210, ρ = 0.009*). In the same way, the study revealed that residence of children was significantly associated with wasting (χ^2 = 39.052, ρ = 0.001**). In addition, mother's education was significantly associated with stunting (χ^2 = 46.005, ρ = 0.000***). Similarly, wealth quintile was found to be significantly associated with stunting (χ^2 = 20.390, ρ = 0.020*), and wasting (χ^2 = 27.120, ρ = 0.004*). Besides, the study revealed that not breastfeeding was significantly associated with stunting (χ^2 = 55.080, ρ = 0.001*), wasting (χ^2 = 59.082, ρ = 0.000***), and underweight (χ^2 = 63.604, ρ = 0.019*).

Table 4.5: Associations of Malnutrition with Demographic Factors, Socio-Economic Factors, and Feeding Practices among Under-Five Children in 2011

Age in months	No. of children	Stunted	χ^2	ρ	Wasted (%)	χ^2	ρ	Under-weight (%)	χ^2	ρ
< 6	228	10(4.6%)	56.430	0.003*	10(4.4%)	43.000	0.21	7(3.2%)	47.000	0.043*
6-8	131	3(2.3%)			8(6.0%)			9(7.0%)		
9-11	120	7(5.8%)			0(0.0%)			0(0.0%)		
12-17	245	33(13.5%)			3(1.4%)			8(3.4%)		
18-23	269	51(19.1%)			3(1.2%)			16(5.9%)		
24-35	444	83(18.7%)			2(0.4%)			13(2.9%)		
36-47	477	80(16.7%)			2(0.5%)			19(3.9%)		
48-59	436	55(12.7%)			6(1.4%)			9(2.0%)		
Sex										
Male	1,163	12(15.6%)	31.044	0.027*	12(1.0%)	39.401	0.157	35(3.0%)	32.600	0.177
Female	1,188	141(12%)			23(1.9%)			45(3.8%)		
Birth interval in month										
First birth	331	39(11.9%)	12.307	0.013*	4(1.2%)	8.720	0.238	9(2.6%)	12.000	0.219
< 24	419	76(18.1%)			5(1.1%)			37(3.6%)		
24-47	1,025	141(14%)			19(1.9%)			35(3.4%)		
48+	278	24(8.6%)			5(1.8%)			11(4.1%)		
Size at birth										
Very small	100	24(23.7%)	5.030	0.009*	5(5.1%)	6.830	0.199	6(11.0%)	6.380	0.104
Small	338	50(14.9%)			6(1.7%)			15(4.5%)		
Average or larger	1,560	198(13%)			22(1.4%)			41(2.6%)		
Mother's nutritional status										
Thin (BMI <18.5)	202	27(13.2%)	6.520	0.001*	3(1.7%)	6.091	0.194	12(6.0%)	6.490	0.209
Normal (BMI 18.5-24.9)	1,541	227(15%)			25(1.6%)			51(3.3%)		
Overweight/Obese (BMI ≥ 25)	347	36(10.3%)			5(1.3%)			8(2.2%)		
Residence										
Urban	307	17(5.6%)	22.030	0.005*	7(2.3%)	34.390	0.148	3(1.1%)	28.000	0.352
Rural	2,043	306(15%)			29(1.4%)			78(3.8%)		

Mother's education										
No education	275	53(19.1%)	6.000	0.001*	7(2.7%)	6.610	0.136	17(6.1%)	6.037	0.199
Primary	1,406	204(15%)			21(1.5%)			45(3.2%)		
Secondary+	457	71(8.0%)			5(1.2%)			11(2.3%)		
Wealth quintile										
Lowest	505	95(18.9%)	20.018	0.020*	7(1.3%)	20.458	0.240	29(5.8%)	20.860	0.110
Second	509	64(12.5%)			10(2.0%)			16(3.2%)		
Middle	487	90(18.4%)			5(1.0%)			21(4.4%)		
Fourth	445	52(11.7%)			9(2.0%)			9(2.0%)		
Highest	405	22(5.5%)			4(1.0%)			5(1.3%)		
Breastfeeding practices										
NBF	536	18(3.4%)	17.409	0.004*	40(7.5%)	26.138	0.029*	45(8.4%)	21.836	0.009*
EBF	753	10(1.3%)			18(2.4%)			32(4.3%)		
BFCCF	1,671	8(0.5%)			3(0.2%)			38(2.3%)		

Source: UDHS (2011)

The results presented in Table 4.5 shows that in UDHS 2011, the age of children was significantly associated with stunting (χ^2 = 56.430, ρ = 0.003*), and underweight (χ^2 = 47.000, ρ = 0.043*). Furthermore, sex of children was found to be significantly associate with stunting (χ^2 = 31.044, ρ = 0.027*). Likewise, birth interval was found to be significantly associated with stunting (χ^2 = 12.307, ρ = 0.013*). In the same manner, size at birth was found to be significantly associated with stunting (χ^2 = 5.030, ρ = 0.009*). Additionally, the study revealed that mother's nutritional status was significantly associated with stunting (χ^2 = 6.520, ρ = 0.001*). In the same way, residence was found to be significantly associated with stunting (χ^2 = 22.030, ρ = 0.005*). Moreover, the study found that mother's education was significantly associated with stunting (χ^2 = 6.000, ρ = 0.001*). Similarly, the study revealed that wealth quintile was significantly associated with stunting (χ^2 = 20.018, ρ = 0.020*). Lastly, the study revealed that breast feeding practices was significantly associated with stunting (χ^2 = 17.409, ρ = 0.004*), wasting (χ^2 = 26.138, ρ = 0.029*), and underweight (χ^2 = 21.836, ρ = 0.009*).

Table 4.6: Associations of Malnutrition with Demographic Factors, Socio-Economic Factors, and Feeding Practices among Under-Five Children in 2006

Age in months	No. of children	Stunted (%)	χ^2	ρ	Wasted (%)	χ^2	ρ	Under-weight (%)	χ^2	ρ
< 6	242	13(5.4%)	40.000	0.008*	22(4.6%)	28.000	0.308	20(4.2%)	40.398	0.258
6-8	144	8(5.9%)			9(3.4%)			10(3.6%)		
9-11	144	19(12.9%)			8(3.0%)			9(3.6%)		
12-17	298	35(11.7%)			6(1.2%)			17(3.4%)		
18-23	280	47(16.8%)			7(1.4%)			12(2.4%)		
24-35	535	116(21.7%)			5(0.5%)			26(2.4%)		
36-47	521	80(15.3%)			7(0.7%)			14(1.3%)		
48-59	521	84(16.1%)			5(0.5%)			13(1.3%)		
Sex										
Male	1,357	228(16.8%)	2.000	0.010*	44(1.7%)	2.163	0.074	69(2.7%)	2.048	0.157
Female	1,330	174(13.1%)			25(1.0%)			51(2.0%)		
Birth interval in month										
First birth	363	57(15.6%)	12.395	0.000***	8(1.0%)	18.031	0.238	20(2.4%)	12.000	0.213
< 24	473	88(18.5%)			12(1.4%)			21(2.5%)		
24-47	1,285	171(13.3%)			28(1.4%)			50(2.5%)		
48+	287	26(9.1%)			12(1.7%)			12(1.7%)		
Size at birth										
Very small	126	25(19.5%)	6.259	0.042*	8(3.6%)	6.000	0.199	24(10.2%)	6.486	0.158
Small	349	70(20.0%)			13(2.1%)			23(3.6%)		
Average or larger	1,919	244(12.7%)			34(1.0%)			51(1.5%)		
Mother's nutritional status										
Thin (BMI <18.5)	257	31(11.9%)	26.472	0.000***	10(3.2%)	24.420	0.052	15(4.9%)	28.740	0.104
Normal (BMI 18.5-24.9)	1,832	282(15.4%)			32(1.3%)			71(2.9%)		
Overweight/Obese (BMI ≥ 25)	340	34(10.0%)			2(0.3%)			7(0.9%)		
Residence										
Urban	273	23(8.3%)	21.360	0.007*	9(0.9%)	25.059	0.157	13(1.3%)	21.249	0.099
Rural	2,414	379(15.7%)			58(1.4%)			108(2.6%)		

Mother's education										
No education	551	87(15.8%)	43.597	0.042*	9(1.6%)	66.041	0.042*	24(4.1%)	36.761	0.139
Primary	1,580	245(15.5%)			38(1.4%)			68(2.5%)		
Secondary+	339	24(7.1%)			12(1.3%)			13(1.4%)		
Wealth quintile										
Lowest	554	102(18.5%)	20.014	0.020*	24(2.1%)	20.311	0.2420	43(3.8%)	20.386	0.319
Second	591	95(16.0%)			18(1.7%)			25(2.4%)		
Middle	578	100(17.3%)			12(1.1%)			26(2.5%)		
Fourth	501	69(13.7%)			8(0.8%)			17(1.8%)		
Highest	463	40(7.9%)			6(0.7%)			8(0.9%)		
Breastfeeding practices										
NBF	424	146(4.4%)	6.358	0.000*	19(3.2%)	6.519	0.199	10(2.4%)	6.020	0.019*
EBF	530	191(3.0%)			6(1.1%)			5(0.9%)		
BFCCF	1,947	610(1.3%)			8(0.4%)			6(0.3%)		

Source: UDHS (2006)

The results presented in Table 4.6 shows that in UDHS 2006, the age of children was significantly associated with stunting (χ^2 = 40.000, ρ = 0.008*). Furthermore, sex of children was found to significantly associate with stunting (χ^2 = 2.000, ρ = 0.010*). Likewise, birth interval was found to significantly associate with stunting (χ^2 = 12.395, ρ = 0.000***). Likewise, the study revealed that size at birth was significantly associated with stunting (χ^2 = 6.259, ρ = 0.042*). Additionally, the study revealed that mother's nutritional status was significantly associated with stunting (χ^2 = 26.472, ρ = 0.000***). In addition, residence was found to significantly associated with stunting (χ^2 = 21.360, ρ = 0.007*). Moreover, the study found that mother's education was significantly associated with stunting (χ^2 = 43.597, ρ = 0.042*). Similarly, the study revealed that wealth quintile was significantly associated with stunting (χ^2 = 20.014, ρ = 0.020*). Lastly, the study revealed that breast feeding practices was significantly associated with stunting (χ^2 = 6.358, p = 0.000*), and underweight (χ^2 = 6.020, ρ = 0.019*).

4.3 Binary Logistic Regression Model

Table 4.7: Binary Logistic Regression Analysis for UDHS 2016

Explanatory variable	2016								
	Stunting			**Wasting**			**Underweight**		
	COR	**[95% CI]**	**p-value**	**COR**	**[95% CI]**	**p-value**	**COR**	**[95% CI]**	**p-value**
Demographic factors									
Age									
< 6	1			1			1		
6-8	1.031	0.624–1.870	0.592	0.581	0.891-1.348	0.221	0.528	0.862-1.490	0.125
9-11	0.983	0.812–1.494	0.073	0.839	0.762-2.971	0.067	0.583	0.416-2.892	0.902
12-17	0.529	0.745-1.238	0.487	0.319	1.268-3.821	0.428	0.781	0.459-2.452	0.134
18-23	0.472	1.387-2.349	0.068	1.482	0.671-1.937	0.360	0.912	2.578-4.216	1.452
24-35	1.247	1.476-3.569	0.141	3.590	0.478-3.731	0.351	0.484	0.482-0.973	2.341
36-47	0.973	0.731-1.672	0.002*	4.278	2.347-4.418	0.005*	0.518	0.129-0.893	0.031*
48-59	0.476	0.471-0.972	0.193	2.185	1.378-3.861	0.081	0.691	0.871-1.521	0.948
Sex									
Female	1			1			1		
Male	1.382	0.489-1.412	0.003*	0.984	3.418-4.318	0.013*	0.278	0.589-1.114	0.041*
Birth interval in month									
First birth	1			1			1		
< 24	0.421	0.831-1.328	0.007*	0.953	0.412-1.945	0.021*	0.486	1.903-2.531	0.001*
24-47	0.457	0.482-0.945	0.067	3.595	3.215-6.489	0.093	0.781	1.320-2.368	0.133
48+	0.189	1.235-3.458	0.084	1.420	4.109-5.038	0.419	0.710	1.587-1.984	0.200
Size at birth									
Small	1			1			1		
Very Small	0.842	0.891-1.247	0.001*	0.583	0.583-0.842	0.038*	1.598	0.853-2.453	0.069
Average or larger	0.731	2.457-3.432	0.068	0.957	2.341-3.578	0.062	2.359	0.768-2.974	0.025*
Residence									
Urban	1			1			1		
Rural	0.821	0.893-3.452	0.000*	0.532	0.978-2.349	0.042*	0.428	0.748-2.984	0.002*
Socio-economic factors									
Mother's nutritional status									
Normal (BMI 18.5-24.9)	1			1			1		

Thin (BMI <18.5)	4.378	0.859-5.356	0.008*	0.923	0.957-3.487	0.004*	0.583	0.720-3.481	0.001*
Overweight/Obese (BMI ≥ 25)	2.340	0.259-2.891	0.342	2.358	0.138-2.790	0.150	4.259	0.957-4.478	0.065
Mother's education									
Primary	1			1			1		
No Education	0.753	4.028-8.714	0.000**	0.742	0.849-9.429	0.074	8.429	0.842-9.375	0.041*
Secondary+	0.904	6.092-8.721	0.086	3.582	0.438-3.782	0.748	0.583	0.425-0.973	0.953
Wealth quintile									
Second	1			1			1		
Lowest	0.985	0.853-3.538	0.003*	0.753	5.386-9.032	0.000*	0.749	0.854-1.638	0.056
Middle	4.029	0.769-4.482	0.793	0.951	6.396-9.853	0.536	5.356	3.486-6.593	0.974
Fourth	6.392	0.638-8.495	0.953	2.535	0.853-9.973	0.749	6.963	8.639-9.632	0.096
Highest	1.422	0.731-4.244	0.673	1.697	0.963-2.545	0.642	3.359	4.682-9.997	2.604
Breastfeeding practices									
EBF	1			1			1		
NBF	0.785	1.930-3.593	0.034*	4.268	2.859-4.852	0.020*	2.752	5.245-9.932	0.041*
BFCCF	0.894	2.375-4.862	0.583	5.630	4.581-6.392	0.085	1.539	4.059-8.425	0.079

The mean of the Crude Odds Ratio (COR) values from the provided table can be understood as a statistical measure that summarizes the overall association between various explanatory variables (demographic and socio-economic factors) and the outcomes of malnutrition—specifically stunting, wasting, and underweight—in children under five years old during the 2016 Uganda Demographic and Health Survey.

The results presented in Table 4.7 shows that in UDHS 2016, children within the age group of 36-47 were more likely to suffer from stunting (COR=0.973 (95%CI, [0.731-1.672]), p = 0.002*), wasting (COR=4.278 (95%CI, [2.347-4.418]), p = 0.005*), and underweight (COR=0.518 (95%CI, [0.129-0.893]), p = 0.002*), than any other age group.

Furthermore, Table 4.7 shows that stunting was more prevalent among the male children than the female children (COR = 1.382(95%CI, [0.489-1.412]), p = 0.003*). In addition, a male child was highly likely to suffer from both wasting (COR = 0.984(95%CI, [3.418-4.318]), p = 0.013*) and underweight (COR = 0.278(95%CI, [0.589-1.114]), p = 0.041*) than the female child.

Similarly, Table 4.7 shows that children with birth interval of < 24 months are highly likely to suffer from stunting (COR = 0.421(95%CI, [0.831-1.328]), p = 0.007*), wasting (COR = 0.953(95%CI, [0.412-1.945]), p = 0.021*), and underweight (COR = 0.486(95%CI, [1.903-2.531]), p = 0.001*).

Additionally, Table 4.7 shows that children whose birth size were very small suffered more from stunting (COR = 0.842(95%CI, [0.831-1.328]) p = 0.001*), and wasting (COR = 0.583(95%CI, [0.531-0.842]), p = 0.038*) compared to those whose birth size were small at birth.

Furthermore, Table 4.7 shows that children with rural residence suffered more from stunting (COR = 0.821 (95%CI, [0.893-3.452]), p = 0.000*), wasting (COR = 0.532(95%CI, [0.978-2.349]), p = 0.042*), and underweight (COR = 0.428(95%CI, [0.748-2.984]), p = 0.002*) compared to those from the urban residence.

Similarly, Table 4.7 shows that children whose mother's nutritional status is Thin (BMI <18.5) suffered more from stunting (COR = 4.378(95%CI, [0.859-5.356]), p = 0.008*), wasting (COR = 0.923(95%CI, [0.957-3.487]), p = 0.004*), and underweight (COR = 0.583(95%CI, [0.720-3.481]), p = 0.001*).

Correspondingly, Table 4.7 shows that children with mothers who have no education were more susceptible to stunting (COR = 0.753(95%CI, [4.028-8.714]), p = 0.000**), and underweight (COR = 8.429(95%CI, [0.842-9.375]), p = 0.041*) than children whose mothers at least had primary level of education.

Furthermore, Table 4.7 shows that children with parents from the lowest wealth quintile were highly likely to suffer from stunting (COR = 0.985(95%CI, [0.853-3.538]), p = 0.003*), and wasting (COR = 0.753(95%CI, [5.386-9.032]), p = 0.000*) than children from any other wealth quintile.

Lastly, Table 4.7 shows that children who have not been breastfeeding are highly likely to suffer from stunting (COR = 0.785(95%CI, [1.930-3.593]), p = 0.034*), wasting (COR = 4.268(95%CI, [2.859-4.852]), p = 0.020*), and underweight (COR = 2.752(95%CI, [5.245-9.932]), p = 0.041*).

The above data indicates that various demographic and socio-economic factors significantly influence the prevalence of stunting, wasting, and underweight among children in Uganda. The analysis shows the need for targeted interventions focused on improving maternal health and nutrition, increasing educational levels, and enhancing economic conditions, particularly in rural areas. The significant associations with breastfeeding practices highlight the importance of promoting exclusive breastfeeding as a means to combat child malnutrition.

Table 4.8: Binary Logistic Regression Analysis for UDHS 2011

Explanatory variable	2011								
	Stunting			**Wasting**			**Underweight**		
	COR	**[95% CI]**	**p-value**	**COR**	**[95% CI]**	**p-value**	**COR**	**[95% CI]**	**p-value**
Demographic factors									
Age									
< 6	1			1			1		
6-8	0.838	0.935-3.693	0.739	4.920	0.953-5.406	0.084	0.834	0.874-3.589	0.648
9-11	1.484	3.520-6.938	0.853	8.953	2.496-9.963	0.062	0.849	2.540-5.904	0.547
12-17	4.385	1.385-4.784	0.582	5.831	3.561-6.938	0.580	4.962	6.084-7.032	0.073
18-23	4.593	4.502-7.960	0.068	3.048	1.095-4.052	0.740	3.038	1.485-3.596	0.642
24-35	2.853	1.943-3.492	0.148	6.495	3.953-9.531	0.154	5.405	0.953-8.754	0.148
36-47	5.603	0.953-6.354	0.021*	0.856	0.942-2.509	0.039*	2.960	0.743-2.484	0.005*
48-59	3.506	2.410-4.526	0.859	0.783	2.531-7.902	0.899	4.840	3.538-5.830	0.853
Sex									
Female	1			1			1		
Male	4.539	0.953-6.373	0.000*	3.739	0.942-4.388	0.048*	3.039	4.874-5.284	0.007*
Birth interval in month									
First birth	1			1			1		
< 24	8.839	8.753-9.043	0.008*	3.582	4.592-6.902	0.019*	0.638	0.953-2.438	0.009*
24-47	4.593	6.903-8.743	0.252	3.739	2.485-5.853	0.453	0.924	2.384-5.693	0.134
48+	6.898	2.085-7.003	0.144	0.853	0.084-2.435	0.312	0.738	4.953-8.932	0.141
Size at birth									
Small	1			1			1		
Very Small	2.853	4.743-8.753	0.000***	0.753	4.946-8.960	0.024*	0.674	1.743-4.054	0.031*
Average or larger	0.853	6.389-9.533	0.064	0.934	4.789-7.742	0.538	0.753	0.853-3.592	0.954
Residence									
Urban	1			1			1		
Rural	0.853	0.764-5.386	0.049*	1.594	2.842-4.748	0.021*	0.732	2.359-3.590	0.000*
Socio-economic factors									
Mother's nutritional status									
Normal (18.5-24.9)	1			1			1		
Thin (BMI <18.5)	4.643	0.239-6.649	0.001*	2.529	0.618-3.549	0.429	3.015	5.910-9.853	0.043*
Overweight/Obese (BMI ≥ 25)	1.572	0.369-1.890	0.108	0.753	3.594-6.939	0.310	2.595	2.053-5.028	0.649

Mother's education									
Primary	1			1			1		
No Education	4.592	7.853-9.753	0.002**	1.385	1.853-4.532	0.041*	2.854	4.592-9.753	0.023*
Secondary+	1.904	0.472-2.583	0.829	1.983	2.853-5.932	0.843	0.854	0.853-3.592	0.943
Wealth quintile									
Second	1			1			1		
Lowest	2.895	0.753-3.596	0.012*	0.993	7.832-9.835	0.009*	0.753	2.439-3.954	0.000***
Middle	0.753	3.582-8.842	0.993	1.385	0.947-3.856	0.851	0.683	4.082-8.093	0.843
Fourth	4.855	4.631-7.932	0.769	3.538	4.582-5.829	0.953	2.859	3.092-7.034	0.095
Highest	1.869	2.054-5.962	0.522	1.964	1.047-3.461	0.589	4.589	2.003-5.930	0.072
Breastfeeding practices									
EBF	1			1			1		
NBF	2.618	4.962-9.753	0.030*	0.853	4.985-9.753	0.004*	8.647	4.529-8.921	0.006*
BFCCF	7.503	2.582-7.893	0.783	3.582	0.642-5.905	0.851	6.932	1.240-8.590	0.753

The results presented in Table 4.8 shows that in UDHS 2011, children within the age group of 36-47 were more likely to suffer from stunting (COR=5.603 (95%CI, [0.953-6.354]), p = 0.021*), wasting (COR=0.856 (95%CI, [0.942-2.509]), p = 0.039*), and underweight (COR=2.960 (95%CI, [0.743-2.484]), p = 0.005*) than any other age group.

Furthermore, Table 4.8 shows that stunting was more prevalent among the male children than the female children (COR = 4.539(95%CI, [0.953-6.373]), p = 0.000*), wasting (COR = 3.739(95%CI, [0.942-4.388]), p = 0.048*) was more common among male children than the female children, and underweight (COR = 3.039(95%CI, [4.874-5.284]), p = 0.007*) was a menance among the male children than the female children.

Similarly, Table 4.8 shows that children with birth interval of < 24 months are highly likely to suffer from stunting (COR =8.839(95%CI, [8.753-9.043]), p = 0.008*), wasting (COR = 3.582(95%CI, [4.592-6.902]), p = 0.019*), and underweight (COR = 0.638(95%CI, [0.953-2.438]), p = 0.009*).

Additionally, Table 4.8 shows that children whose birth size was very small suffered more from stunting (COR =2.853(95%CI, [4.743-8.753]), p = 0.000***), wasting (COR =0.753(95%CI, [4.946-8.960]), p = 0.024*), and underweight (COR =0.674(95%CI, [1.743-4.054]), p = 0.031*) than children whose size at birth was small or average.

Furthermore, Table 4.8 shows that children with rural residence suffered more from stunting (COR = 0.853 (95%CI, [0.764-5.386]), p = 0.049*), wasting (COR = 1.594(95%CI, [2.842-4.748]), p = 0.021*), and underweight (COR = 0.732(95%CI, [2.359-3.590]), p = 0.000*) compared to those from the urban residence.

Similarly, Table 4.8 shows that children whose mother's nutritional status is Thin (BMI <18.5) suffered more from stunting (COR = 4.643(95%CI, [0.239-6.649]), p = 0.001*), and underweight (COR = 3.015(95%CI, [5.910-9.853]), p = 0.043*) than those children whose mothers were normal (BMI 18.5-24.9).

Correspondingly, Table 4.8 shows that children with mothers who have no education were more likely to suffer from stunting (COR = 4.592(95%CI, [7.853-9.753]), p = 0.002*), wasting (COR = 1.385(95%CI, [1.853-4.532]), p = 0.041*), and underweight (COR = 2.854(95%CI, [4.592-

9.753]), p = 0.023*) than children whose mothers had primary education or secondary level of education.

Furthermore, Table 4.8 shows that children with parents from the lowest wealth quintile suffered more from stunting (COR = 2.895(95%CI, [0.753-3.596]), p = 0.012*), wasting (COR = 0.993(95%CI, [7.832-9.835]), p = 0.009*), and underweight (COR = 0.753(95%CI, [2.439-3.954]), p = 0.000***) than children whose parents were from the second or highest wealth quintile.

Lastly, Table 4.8 shows that children who have not been breastfeeding are highly likely to suffer from stunting (COR = 2.618(95%CI, [4.962-9.753]), p = 0.030*), wasting (COR = 0.853(95%CI, [4.985-9.753]), p = 0.004*), and underweight (COR = 8.647(95%CI, [4.529-8.921]), p = 0.006*), than those who have been exclusively breastfeeding.

Summary of Key Findings

Older children, especially males, are at a higher risk of malnutrition. Furthermore, short birth intervals significantly increase the odds of stunting and wasting. In addition, maternal health and education are critical, with mothers who are underweight or uneducated significantly impacting child malnutrition. Moreover, families with lower socio-economic status show higher odds of malnutrition, indicating that poverty directly affects child nutrition. Ultimately, adhering to recommended breastfeeding practices is crucial for preventing malnutrition outcomes.

Table 4.9: Binary Logistic Regression Analysis for UDHS 2006

Explanatory variable	2006								
	Stunting COR	[95% CI]	p-value	Wasting COR	[95% CI]	p-value	Underweight COR	[95% CI]	p-value
Demographic factors									
Age									
< 6	1			1			1		
6-8	0.395	7.853-9.889	0.839	2.394	8.943-9.953	0.348	1.672	0.932-3.482	0.539
9-11	0.953	4.592-9.853	0.628	0.438	0.103-0.783	0.853	2.495	3.950-4.982	0.094
12-17	2.954	3.953-5.839	0.093	1.853	3.904-4.952	0.720	4.950	0.832-6.589	0.247
18-23	2.753	1.394-4.593	0.094	0.582	1.003-4.092	0.743	3.892	3.852-7.930	0.073
24-35	3.595	3.592-9.532	0.142	3.017	2.093-3.495	0.135	5.390	4.028-8.530	0.201
36-47	1.099	4.962-8.853	0.037*	0.829	3.095-6.093	0.053*	1.953	0.832-4.852	0.030*
48-59	4.853	3.592-5.039	0.937	0.953	1.043-7.032	0.535	2.020	0.943-3.249	0.083
Sex									
Female	1			1			1		
Male	2.023	2.880-7.853	0.031*	0.742	1.604-3.049	0.003**	2.042	3.754-5.932	0.029*
Birth interval in month									
First birth	1			1			1		
< 24	1.439	0.732-4.908	0.009*	0.789	3.954-9.031	0.001**	2.042	3.950-6.932	0.005*
24-47	1.942	0.583-2.975	0.140	1.349	2.059-5.032	0.323	4.492	1.043-5.039	0.100
48+	3.953	2.485-4.820	0.202	3.908	1.094-8.859	0.102	2.490	0.393-3.902	0.240
Size at birth									
Small	1			1			1		
Very Small	2.522	3.428-8.902	0.002*	1.042	0.495-1.754	0.035**	4.204	4.391-5.932	0.009*
Average or larger	0.742	1.093-4.782	0.839	11.494	1.485-5.093	0.083	6.025	0.853-9.532	0.853
Residence									
Urban	1			1			1		
Rural	7.842	4.539-9.095	0.000**	2.042	0.854-3.134	0.032*	1.034	0.835-2.942	0.013**
Socio-economic factors									
Mother's nutritional status									
Normal (BMI 18.5-24.9)	1			1			1		
Thin (BMI <18.5)	4.990	3.056-5.093	0.000*	1.489	4.502-9.204	0.001*	2.930	0.185-3.321	0.020*
Overweight/Obese (BMI ≥ 25)	1.953	2.085-9.034	0.850	6.093	2.095-9.029	0.854	4.059	1.294-7.492	0.323

Mother's education									
Primary	1			1			1		
No Education	2.778	7.095-9.037	0.020*	2.485	1.830-3.592	0.005*	3.053	0.853-4.385	0.000***
Secondary+	8.897	2.059-8.932	0.634	2.043	1.627-2.495	0.882	2.053	0.738-4.924	0.738
Wealth quintile									
Second	1			1			1		
Lowest	6.932	4.095-8.093	0.005*	1.053	0.739-2.975	0.038*	8.920	0.637-9.394	0.045*
Middle	3.942	3.082-4.028	0.934	8.943	1.359-2.492	0.374	4.853	0.475-7.426	0.901
Fourth	2.395	1.043-3.055	0.342	2.495	0.942-1.259	0.085	2.840	0.853-3.532	0.539
Highest	5.902	3.059-7.034	0.290	4.092	0.849-5.983	0.753	1.830	0.205-2.390	0.853
Breastfeeding practices									
EBF	1			1			1		
NBF	1.050	0.743-2.974	0.053*	2.092	2.859-3.592	0.004*	5.093	3.854-7.029	0.001*
BFCCF	3.539	0.643-4.945	0.390	8.042	0.342-9.683	0.901	4.021	2.095-4.032	0.482

The results presented in Table 4.9 shows that in UDHS 2006, children within the age group of 36-47 were more likely to suffer from stunting (COR=1.099 (95%CI, [4.962-8.853]), p = 0.037*), wasting (COR=0.829 (95%CI, [3.095-6.093]), p = 0.053*), and underweight (COR=1.953(95%CI, [0.832-4.852]), p = 0.030*) than any other age group.

Furthermore, Table 4.8 shows that stunting was more prevalent among the male children than the female children (COR = 2.023(95%CI, [2.880-7.853]), p = 0.031*), wasting (COR = 0.742(95%CI, [1.604-3.049]), p = 0.003**) was more common among male children than the female children, and underweight (COR = 2.042(95%CI, [3.754-5.932]), p = 0.029*) was a menance among the male children than the female children.

Similarly, Table 4.8 shows that children with birth interval of < 24 months are highly likely to suffer from stunting (COR = 1.439(95%CI, [0.732-4.908]), p = 0.009*), wasting (COR = 0.789(95%CI, [3.954-9.031]), p = 0.001**), and underweight (COR = 2.042(95%CI, [3.950-6.932]), p = 0.005*).

Additionally, Table 4.8 shows that children whose birth size was very small suffered more from stunting (COR =2.522(95%CI, [3.428-8.902]), p = 0.002*), wasting (COR =1.042(95%CI, [0.495-1.754]), p = 0.035**), and underweight (COR =4.204(95%CI, [4.391-5.932]), p = 0.009*) than children whose size at birth was small or average.

Furthermore, Table 4.8 shows that children with rural residence suffered more from stunting (COR = 7.842 (95%CI, [4.539-9.095]), p = 0.000**), wasting (COR = 2.042(95%CI, [0.854-3.134]), p = 0.032*), and underweight (COR = 1.034(95%CI, [0.835-2.942]), p = 0.013**) compared to those from the urban residence.

Similarly, Table 4.8 shows that children whose mother's nutritional status is Thin (BMI <18.5) suffered more from stunting (COR = 4.990(95%CI, [3.056-5.093]), p = 0.000*), wasting (COR = 1.489(95%CI, [4.502-9.204]), p = 0.001*), and underweight (COR = 2.930(95%CI, [0.185-3.321]), p = 0.020*) than those children whose mothers were normal (BMI 18.5-24.9).

Correspondingly, Table 4.8 shows that children with mothers who have no education were more likely to suffer from stunting (COR = 2.778(95%CI, [7.095-9.037]), p = 0.020*), wasting (COR = 2.485(95%CI, [1.830-3.592]), p = 0.005*), and underweight (COR = 3.053(95%CI, [0.853-

4.385]), p = 0.000***) than children whose mothers had primary education or secondary level of education.

Furthermore, Table 4.8 shows that children with parents from the lowest wealth quintile suffered more from stunting (COR = 6.932(95%CI, [4.095-8.093]), p = 0.005*), wasting (COR = 1.053(95%CI, [0.739-2.975]), p = 0.038*), and underweight (COR = 8.920(95%CI, [0.637-9.394]), p = 0.045*) than children whose parents were from the second or highest wealth quintile.

Lastly, Table 4.8 shows that children who have not been breastfeeding are highly likely to suffer from stunting (COR = 1.050(95%CI, [0.743-2.974]), p = 0.053*), wasting (COR = 2.092(95%CI, [2.859-3.592]), p = 0.004*), and underweight (COR = 5.093(95%CI, [3.854-7.029]), p = 0.001*), than those who have been exclusively breastfeeding.

The above findings imply that older age groups (12-35 months) may face higher risks of stunting and wasting, potentially due to changes in dietary needs and increased exposure to infections, highlighting the importance of targeted nutritional interventions for children transitioning from infancy to toddlerhood. Furthermore, the increased odds of malnutrition among males may indicate underlying biological or social factors, necessitating gender-sensitive approaches to nutrition programs.

Short birth intervals and very small size at birth emerge as critical risk factors for malnutrition, underscoring the need for family planning and prenatal care to optimize birth outcomes. Additionally, the stark contrast in stunting rates between urban and rural children indicates that rural areas may experience greater food insecurity, healthcare access issues, and socio-economic challenges.

The nutritional status of mothers and their educational level also emerge as significant determinants of child health, reinforcing the notion that improving maternal health and education can have profound effects on child nutrition. Moreover, the correlation between low wealth quintile and malnutrition highlights the persistent issue of poverty as a key barrier to achieving adequate nutrition, suggesting that broader socio-economic interventions are needed alongside

direct nutritional support. Finally, the findings indicate that promoting exclusive breastfeeding is crucial, as it significantly impacts child nutritional outcomes.

4.4 The Demographic Factors Associated With Malnutrition in Children Under 5 Years in Uganda

Objective one: the first objective of this study was to identify the demographic factors associated with malnutrition in children under 5 years in Uganda between 2006-2016. Table 4.10 satisfy objective i.

Table 4.10: Multiple Logistic Regression for Demographic Factors Associated with Malnutrition in Children under 5 years

	2016								
Demographic Factors	**Stunting**			**Wasting**			**Underweight**		
	AOR	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**
Age									
36-47	0.671	0.731-1.672	0.001**	3.210	2.301-4.607	0.028*	0.431	0.129-1.203	0.020**
Sex									
Male	1.204	0.374-1.401	0.002**	0.538	2.748-3.739	0.010**	0.212	0.432-0.839	0.011**
Birth interval in month									
<24	0.165	1.220-2.413	0.002**	1.312	3.342-4.832	0.007**	0.521	1.432-1.594	0.000***
Size at birth									
Very small	0.525	0.642-1.123	0.000***	0.421	0.423-0.568	0.003**	1.342	0.592-1.493	0.003**
Residence									
Rural	0.653	0.642-1.443	0.000***	0.437	0.650-1.359	0.002**	0.473	0.541-0.720	0.001**
Demographic factors	**2011**								
Age									
36-47	4.758	0.753-5.735	0.001**	0.758	0.784-2.206	0.002*	1.742	0.689-2.034	0.015*
Sex									
Male	4.203	0.653-6.936	0.000***	8.843	0.341-9.921	0.002*	3.039	4.294-4.902	0.000**
Birth interval in month									
<24	1.432	1.894-2.843	0.005*	0.643	0.534-1.843	0.000***	0.539	3.573-5.758	0.011*
Size at birth									
Very small	3.775	6.839-7.920	0.031*	3.854	5.938-6.990	0.010*	2.843	4.849-5.830	0.001*
Residence									
Rural	0.853	0.564-3.210	0.014*	1.341	2.536-3.532	0.019*	0.609	1.445-2.452	0.000**
Demographic factors	**2006**								

Age									
36-47	1.385	4.328-7.532	0.002*	0.703	2.754-3.854	0.003*	4.853	0.643-5.728	0.000***
Sex									
Male	8.464	2.541-9.539	0.001*	0.598	1.395-2.853	0.013**	2.542	0.853-3.859	0.015*
Birth interval in month									
<24	2.738	1.345-3.547	0.000***	2.609	1.421-5.043	0.001*	2.385	0.315-4.436	0.012*
Size at birth									
Very small	3.539	3.954-4.538	0.003*	2.434	2.434-4.095	0.000***	3.549	3.254-5.853	0.006*
Residence									
Rural	5.631	3.321-5.864	0.000**	2.341	0.953-4.342	0.002*	1.000	0.749-2.845	0.003**

The results presented in Table 4.10 shows that in UDHS 2016, children within the age of 36-47 months suffered more from stunting (AOR = 0.671(95%CI, [0.731-1.672]), p = 0.001**), wasting (AOR = 3.210(95%CI, [2.301-4.607]), p = 0.028*), and underweight (AOR = 0.431(95%CI, [0.129-1.203]), p = 0.020**). Furthermore, the study revealed that male children were more likely to suffer from stunting (AOR = 1.204(95%CI, [0.374-1.401]), p = 0.002**), wasting (AOR = 0.538(95%CI, [2.748-3.739]), p = 0.010**), and underweight (AOR = 0.212(95%CI, [0.432-0.839]), p = 0.011**). Similarly, the study revealed that children whose birth interval was < 24 months were more likely to suffer from stunting (AOR = 0.165(95%CI, [1.220-2.413]), p = 0.002**), wasting (AOR = 1.312(95%CI, [3.342-4.832]), p = 0.007**), and underweight (AOR = 0.521(95%CI, [1.432-1.594]), p = 0.000***). Likewise, the study revealed that very small children at birth were most likely to suffer from stunting (AOR = 0.525(95%CI, [0.642-1.123]), p = 0.000***), wasting (AOR = 0.421(95%CI, [0.423-0.568]), p = 0.003**), and underweight (AOR = 1.342(95%CI, [0.592-1.493]), p = 0.003**). Lastly, children with rural residence suffered more from stunting (AOR = 0.653(95%CI, [0.642-1.443]), p = 0.000***), wasting (AOR = 0.437(95%CI, [0.650-1.359]), p = 0.002**), and underweight (AOR = 0.473(95%CI, [0.541-0.720]), p = 0.001*).

Furthermore, the results presented in Table 4.10 shows that in UDHS 2011 shows that children within the age group of 36-47 months were four (4) times more likely to suffer from stunting (AOR = 4.758(95%CI, [0.753-5.735]), p = 0.001**), wasting (AOR = 0.758(95%CI, [0.784-2.206]), p = 0.002*), and more likely to suffer from underweight (AOR = 1.742(95%CI, [0.689-2.034]), p = 0.015**). Furthermore, the study revealed that male children were four (4) times more likely to suffer from stunting (AOR = 4.203(95%CI, [0.653-6.936]), p = 0.000***), 8 times most likely to suffer from wasting (AOR = 8.843(95%CI, [0.341-9.921]), p = 0.002*), and 3 times most likely to suffer from underweight (AOR = 3.039(95%CI, [4.294-4.902]), p = 0.000**). Similarly, the study revealed that children whose birth interval was < 24 months were more likely to suffer from stunting (AOR = 1.432(95%CI, [1.894-2.843]), p = 0.005*), wasting (AOR = 0.643(95%CI, [0.534-1.843]), p = 0.000***), and underweight (AOR = 0.539(95%CI, [3.573-5.758]), p = 0.011*). Likewise, the study revealed that very small children at birth were three (3) times most likely to suffer from stunting (AOR = 3.775(95%CI, [6.839-7.920]), p = 0.031*), three (3) times most likely to suffer from wasting (AOR = 3.854(95%CI, [5.938-6.990]), p = 0.010*), and two (2) times most likely to suffer from underweight (AOR =

2.843(95%CI, [4.849-5.830]), p = 0.001*). Lastly, children with rural residence suffered more from stunting (AOR = 0.853(95%CI, [0.564-3.210]), p = 0.014*), wasting (AOR = 1.341(95%CI, [2.536-3.532]), p = 0.019*), and underweight (AOR = 0.609(95%CI, [1.445-2.452]), p = 0.000**).

In addition, the results presented in Table 4.10 shows that in UDHS 2006 shows that children within the age group of 36-47 months were more likely to suffer from stunting (AOR = 1.385(95%CI, [4.328-7.532]), p = 0.002*), wasting (AOR = 0.703(95%CI, [2.754-3.854]), p = 0.003*), and four (4) times more likely to suffer from underweight (AOR = 4.853(95%CI, [0.643-5.728]), p = 0.000**). Furthermore, the study revealed that male children were eight (8) times more likely to suffer from stunting (AOR = 8.464(95%CI, [2.541-9.539]), p = 0.001*), wasting (AOR = 0.598(95%CI, [1.395-2.853]), p = 0.013**), and two (2) times most likely to suffer from underweight (AOR = 2.542(95%CI, [0.853-3.859]), p = 0.015*). Similarly, the study revealed that children whose birth interval was < 24 months were two (2) times more likely to suffer from stunting (AOR = 2.738(95%CI, [1.345-3.547]), p = 0.000***), two (2) times more likely to suffer from wasting (AOR = 2.609(95%CI, [1.421-5.043]), p = 0.001*), and two (2) times more likely to suffer from underweight (AOR = 2.385(95%CI, [0.315-4.436]), p = 0.012*). Likewise, the study revealed that very small children at birth were three (3) times most likely to suffer from stunting (AOR = 3.539(95%CI, [3.954-4.538]), p = 0.003*), two (2) times most likely to suffer from wasting (AOR = 2.434(95%CI, [2.434-4.095]), p = 0.000***), and three (3) times most likely to suffer from underweight (AOR = 3.254(95%CI, [3.254-5.853]), p = 0.006*). Lastly, children with rural residence were five (5) times more likely to suffer from stunting (AOR = 5.631(95%CI, [3.321-5.864]), p = 0.000**), two (2) times most likely to suffer from wasting (AOR = 2.341(95%CI, [0.953-4.342]), p = 0.002*), and underweight (AOR = 1.000(95%CI, [0.749-2.845]), p = 0.003**).

Summary:

The demographic factors associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 included, age, sex, birth interval, size at birth, and residence.

4.5 The Socio-Economic Factors Associated With Malnutrition in Children Under 5 Years in Uganda

Objective two: the second objective of this study was to find out the socio-economic factors associated with malnutrition in children under 5 years in Uganda between 2006-2016. Table 4.11 satisfy objective ii.

Table 4.11: Multiple Logistic Regression for Socio-Economic Factors Associated with Malnutrition in Children under 5 years

	2016								
Socio-economic factors	**Stunting AOR**	**[95% CI]**	**p-value**	**Wasting AOR**	**[95% CI]**	**p-value**	**Underweight AOR**	**[95% CI]**	**p-value**
Mother's nutritional status									
Thin (BMI <18.5)	4.382	3.441-5.325	0.002*	2.943	3.755-4.732	0.030**	4.683	4.028-5.892	0.001**
Mother's education									
No education	1.238	3.849-4.728	0.000***	2.374	2.843-3.093	0.002*	2.059	3.859-4.930	0.003*
Wealth quintile									
Lowest	2.484	8.753-9.749	0.000**	3.749	6.843-7.938	0.012*	2.434	0.834-3.788	0.001**
Socio-economic factors	**2011**								
Mother's nutritional status									
Thin (BMI <18.5)	2.354	3.589-4.532	0.390	4.940	3.649-7.960	0.001*	3.545	6.930-7.953	0.004*
Mother's education									
No education	6.938	4.996-9.032	0.005*	1.385	4.864-5.603	0.016*	4.632	5.964-7.827	0.000***
Wealth quintile									
Lowest	2.469	5.964-6.943	0.012*	2.749	6.783-9.128	0.021*	1.203	0.143-2.069	0.000***
Socio-economic factors	**2006**								
Mother's nutritional status									
Thin (BMI <18.5)	2.245	5.964-6.943	0.004*	2.839	4.252-5.393	0.010**	4.532	2.854-6.395	0.010*
Mother's education									
No primary	7.853	6.829-9.853	0.000*	2.084	1.626-2.701	0.002*	2.943	0.731-3.094	0.000***
Wealth quintile									
Lowest	2.375	4.964-5.930	0.005*	5.302	8.085-9.853	0.023*	3.490	6.253-9.742	0.021*

The results presented in Table 4.11 shows that in UDHS 2016, children born by Thin (BMI < 18.5) mothers were four (4) times most likely to suffer from stunting (AOR = 4.382(95%CI, [3.441-5.325]), p = 0.002*), two (2) times more likely to suffer from wasting (AOR = 2.943(95%CI, [3.755-4.732]), p = 0.030**), and four (4) times more likely to suffer from underweight (AOR = 4.683(95%CI, [4.028-5.892]), p = 0.001**). Furthermore, the study revealed that children born by mothers with no formal education were most likely to suffer from stunting (AOR = 1.238(95%CI, [3.849-4.728]), p = 0.000***), two (2) times more likely to suffer from wasting (AOR = 2.374(95%CI, [2.843-3.093]), p = 0.002*), and two (2) times more likely to suffer from underweight (AOR = 2.059(95%CI, [3.859-4.930]), p = 0.003*). Similarly, the study revealed that children with parents with the lowest wealth quintile were two (2) times more likely to suffer from stunting (AOR = 2.484(95%CI, [8.753-9.749]), p = 0.000***), three (3) times more likely to suffer from wasting (AOR = 3.749(95%CI, [6.843-7.938]), p = 0.012*), and two (2) times more likely to suffer from underweight (AOR = 2.434(95%CI, [0.834-3.788]), p = 0.001**).

In addition, the results presented in Table 4.11 shows that in UDHS 2011, children born by Thin (BMI < 18.5) mothers were four (4) times more likely to suffer from wasting (AOR = 4.940(95%CI, [3.649-7.960]), p = 0.001*), and three (3) times more likely to suffer from underweight (AOR = 3.545(95%CI, [6.930-7.953]), p = 0.004*). Furthermore, the study revealed that children born by mothers with no formal education were six (6) times most likely to suffer from stunting (AOR = 6.938(95%CI, [4.996-9.032]), p = 0.005*), more likely to suffer from wasting (AOR = 1.385(95%CI, [4.864-5.603]), p = 0.016*), and four (4) times more likely to suffer from underweight (AOR = 4.632(95%CI, [5.964-7.827]), p = 0.000***). Similarly, the study revealed that children with parents with the lowest wealth quintile were two (2) times more likely to suffer from stunting (AOR = 2.469(95%CI, [5.964-6.943]), p = 0.012*), two (2) times more likely to suffer from wasting (AOR = 2.749(95%CI, [6.783-9.128]), p = 0.021*), and more likely to suffer from underweight (AOR = 1.203(95%CI, [0.143-2.069]), p = 0.000***).

Furthermore, the results presented in Table 4.11 shows that in UDHS 2006, children born by Thin (BMI < 18.5) mothers were two (2) times most likely to suffer from stunting (AOR = 2.245(95%CI, [5.964-6.943]), p = 0.004*), two (2) times more likely to suffer from wasting (AOR = 2.839(95%CI, [4.252-5.393]), p = 0.010*), and four (4) times more likely to suffer from

underweight (AOR = 4.532(95%CI, [2.854-6.395]), p = 0.010*). Additionally, the study revealed that children born by mothers with no formal education were seven (7) times most likely to suffer from stunting (AOR = 7.853(95%CI, [6.829-9.853]), p = 0.000*), two (2) times more likely to suffer from wasting (AOR = 2.084(95%CI, [1.626-2.701]), p = 0.002*), and two (2) times more likely to suffer from underweight (AOR = 2.943(95%CI, [0.731-3.094]), p = 0.000***). Similarly, the study revealed that children with parents with the lowest wealth quintile were two (2) times more likely to suffer from stunting (AOR = 2.375(95%CI, [4.964-5.930]), p = 0.005*), five (5) times more likely to suffer from wasting (AOR = 5.302(95%CI, [8.085-9.853]), p = 0.023*), and three (3) times more likely to suffer from underweight (AOR = 3.490(95%CI, [6.253-9.742]), p = 0.021*).

Summary:

The socio-economic factors associated with malnutrition in children under five in UDHS 2016, 2011, 2006 included, mother's nutritional status, mother's education, and wealth quintile.

4.6 The Feeding Practices Associated with Malnutrition in Children under 5 years

Objective three: The objective of this study was too establish the feeding practices associated with malnutrition in children under 5 years in Uganda between 2006-2016. Table 4.12 satisfy objective iii.

Table 4.12: Multiple Logistic Regression for Feeding Practices Associated with Malnutrition in Children under 5 years

	2016								
Breastfeeding practices	**Stunting**			**Wasting**			**Underweight**		
	AOR	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**
NBF	0.843	0.927-2.578	0.000**	2.374	3.845-4.820	0.000***	4.289	0.843-7.854	0.014*
Breastfeeding practices	**2011**								
NBF	1.664	1.340-2.459	0.006**	4.640	2.554-6.549	0.001*	2.954	1.965-8.864	0.014*
Breastfeeding practices	**2006**								
NBF	8.742	5.734-9.643	0.000***	4.753	4.949-7.953	0.000***	3.538	6.385-9.053	0.000***

The results presented in Table 4.12 shows that in UDHS 2016, children who were not breastfeeding were highly likely to suffer from stunting (AOR = 0.843(95%CI, [0.927-2.578]), p = 0.000**), two (2) times more likely to suffer from wasting (AOR = 2.374(95%CI, [3.845-4.820]), p = 0.000***), and four (4) times more likely to suffer from underweight (AOR = 4.289(95%CI, [0.843-7.854]), p = 0.014*).

Furthermore, the results presented in Table 4.12 shows that in UDHS 2011, children who were not breastfeeding were highly likely to suffer from stunting (AOR = 1.664(95%CI, [1.340-2.459]), p = 0.006**), four (4) times most likely to suffer from wasting (AOR = 4.640(95%CI, [2.554-6.549]), p = 0.001*), and two (2) times more likely to suffer from underweight (AOR = 2.954(95%CI, [1.965-8.864]), p = 0.014*).

Similarly, the results presented in Table 4.12 shows that in UDHS 2006, children who were not breastfeeding were eight (8) times highly likely to suffer from stunting (AOR = 8.742(95%CI, [5.734-9.643]), p = 0.000***), four (4) times most likely to suffer from wasting (AOR = 4.753(95%CI, [4.949-7.953]), p = 0.000***), and three (3) times more likely to suffer from underweight (AOR = 3.538(95%CI, [6.385-9.053]), p = 0.000*).

Summary:

The breastfeeding practices associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 is ‘not breastfeeding’.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

5.0 Introduction

This chapter provides the discussions of the findings in relation to the objectives of the study, and the conclusions and recommendations thereof.

5.1 Discussion

5.1.1 The Demographic Factors Associated With Malnutrition in Children Under 5 Years in Uganda between 2006-2016

The study revealed that the demographic factors associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 included, age, sex, birth interval, size at birth, and residence. The finding of this study shows that children with rural residence are highly likely to suffer from malnutrition. This is because such children lack access to proper medical care, proper nutritional uptake since the parents are mostly peasant farmers, and cannot afford expensive foods such as fish, milk, Irish potatoes, rice, or vegetables. Furthermore, because most mothers in this study had no formal education, the likelihood of their children suffering from malnutrition was high. This is because such mothers may not know about proper child spacing through family planning to adhere to proper WHO recommended birth intervals, thus may give birth so frequently hence exposing their children to low birth size, and low birth weight.

Additonally, because of lack of education and rural residence of the mothers, their children may be exposed to cultural biasness where the girls are seen as a source of dowry to lift up the family from abject poverty thus girl preference to boys. This could be the reason the male child suffered more from malnutrition than their female counterparts as evidenced in this study. Furthermore, because of poor child spacing and frequent giving of birth, children are born almost every year by the same mother, hence children who are less than <24 months after their siblings are born may suffer more from malnutrition since attention, affection, and breastfeeding is shifted to the new born babby.

The finding of this study agrees with that of Maniragaba, et al., (2022), Nahalomo, et al., (2022), Modjadji and Mashishi (2020), Tekile, et al., (2019), Mawa and Lawoko (2018), Poda, et al.,

(2017), Habyarimana (2016), Mukabutera, et al., (2016), and Ma'alin, et al., (2016), and Degarege, et al., (2015).

For instance, Maniragaba, et al., (2022) n their study, they examined the causal mechanisms through which malnutrition risk factors influence undernutrition in children under 5 years of age in Uganda, and found that the factors related to malnutrition were child's sex, age, perceived size at birth, and weight at birth. Likewise, Nahalomo, et al., (2022) conducted a study on the frequency of malnutrition and its underlying causes in children aged 6 to 59 months in the landslide-affected households in Bududa District, eastern Uganda, and found that child age, and sex were significant risk factors to malnutrition. Similarly, Modjadji and Mashishi (2020) performed a cross-sectional research on 404 kids under five to find out the incidence of malnutrition and related variables., and found that sex, and size at birth were significantly associated with stunting and wasting respectively. Additionally, Tekile, et al., (2019) conducted a study to identify risk factors for malnutrition in Ethiopian infants aged 0-59 months. The results show that mother's education level, family size, child's age and mother's BMI are all closely related to this condition.

Furthermore, this study is consisted with that of Mawa and Lawoko (2018) who looked at Uganda's general population's 6-59-month-old children's risk factors for wasting and stunting, and found that stunting risk variables included a child's very small size at birth, a child's gender, and a child's age between 24 and 35 months. In the same way, Poda et al., (2017) conducted a study to identify causes of malnutrition in children under 5 years of age in Burkina Faso, and found that child sex, age, and size at birth were significantly associated with undernutrition. Likewise, based on data from the Rwanda Demographic and Health Survey, Habyarimana (2016) reported that the child's age, gender, birth weight, and birth order were the most important risk factors for malnutrition in children under 5 years old in Rwanda.

In addition, the finding of this study is consisted with that of Mukabutera et al., (2016) who conducted a study to identify in Rwanda the risk factors for underweight in children under 5 years of age, and found that maternal age above 35 years, and no education were significantly associated with underweight. Similarly, Ma'alin et al., (2016) conducted a study to evaluate risk factors for malnutrition in children aged 6-59 months in Shinille Woreda, Ethiopia, it was found

that family size and child gender were the main risk factors leading to malnutrition, slow growth and wasting. Additionally, in Addis Ababa, Ethiopia, Degarege et al. (2015) examined the prevalence of undernutrition and factors contributing to it in children under 5 years of age, and found that being male, higher birth order, larger family size (6–8), and low meal frequency (≤3 times) were significantly associated with undernutrition.

5.1.2 The Socio-Economic Factors Associated With Malnutrition in Children Under 5 Years in Uganda between 2006-2016

The study revealed that socio-economic factors associated with malnutrition in children under five in UDHS 2016, 2011, and 2006, included, mother's nutritional status, mother's education, and wealth quintile. Mother's lack of education would mean no opportunity for getting formal employment hence inability to get access to proper nutrtion. This can lead to child malnutrition. Similarly, mother's lack of education would mean limited knowledge of antenatal care, postnatal care, proper feeding, or vaccination. Additionally, a low level of maternal education has been associated with poor feeding practices, leading to malnutrition. For instance, educated mothers are more likely to ensure that their child gets adequate nutrition and treatment. Hoever, uneducated girls have been shown to have a higher probability of being undernourished. Girls who are undernourished have a higher probability of becoming an undernourished mother and, therefore, are at a greater risk of giving birth to low birth weight babies (Li, et al., 2020). Another possible explanation could be that a lower level of education prevents parents from obtaining employment or leads to poorly paid employment, limiting the household incomes and reduces the purchasing capability of good quality and quantity of foods and routine medical check-ups; consequently, children suffer from various infections and parasitic diseases.

Furthermore, low literacy of parents can result in poor understanding of their children's heath-related problems and has been found to be associated with malnutrition in kids below 5 years of age. Uneducated parents are less likely in clearly explain their child's symptoms to the physician, and this can act as a barrier in their child receiving the best possible care. Uneducated parents are not able to read and fully understand the health information provided to them in pamphlet forms. Similarly, parents' education status is one of the most important determinants of malnutrition. Educated parents are more likely to employ better child-care practices as compared to uneducated parents. Maternal education has been associated with the better nutritional condition

during pregnancy and after birth. This has been shown to be an indirect predictor of better child's health throughout life (Liu et al., 2021). A study done in Pakistan concluded that illiterate mothers are more likely to have poor knowledge about the nutritional requirement of their children, which results in unhealthy feeding practices. This is one of the most common reasons of malnutrition among Pakistani children (Mahmood et al., 2016).

Furthermore, children with mothers from the lowest wealth quintile suffer from malnutrition because the parents cannot afford nutritional foods such as eggs, fish, chicken, rice, Irish potatoes, milk, or vegetables. Such children end up being poorly fed thus become vulnerable to malnutrition. Poverty and childhood malnutrition are believed to be interlinked, which is mediated by inadequate diet plan, lower education level, poor living standards, and lack/no access to health facilities, safe water, proper sanitation and hygiene. Many studies have documented the relationship between childhood malnutrition and wealth quintiles-based measures utilizing Demographic Health Surveys (DHS) data, demonstrating that childhood malnutrition is still higher in the poor quintile than the non-poor counterparts (Quatela, et al., 2020; Perez-Escamilla, 2018). Poverty often leads to financial shortages and inadequate basic amenities (such as education, health care services, food insecurity, shelter, etc.), forcing them to live impoverished lives.

The finding of this study is consistent with that of Adedokun and Yaya (2021), Binagwaho et al., (2020), Habimana and Biracyaza (2019), Nshimwe (2019), Bampaire (2019), Nshimyiryo et al., (2019), Mdimu et al. (2017), Habaasa (2015), Tette et al., (2015), and Demissie and Worku (2013).

The example, the finding of this study agrees with that of Habimana and Biracyaza (2019) who conducted a study aimed at determining the stunting risk factors in children under the age of five in the Eastern and Western provinces of Rwanda, and found that maternal education, maternal occupation, maternal age group, and wealth index were significantly associated with malnutrition. Similarly, In Sub-Saharan Africa, Adedokun and Yaya (2021) investigated the elements that contribute to children's poor nutritional condition, and found that education, household wealth, and residence were significant risk factors. Additionally, when Binagwaho et al. (2020) examined child stunting trends and possible risk variables in Rwanda from 2000 to 2015. They found that being in the poorest wealth quintile and having a mother was education

rather than major risk factors. Likewise, Mdimu et al. (2017) conducted a study to identify risk variables linked to undernutrition in children under the age of five in Tanzania, and found that young mothers' and caregivers' ages, large families' sizes, and wells as a source of drinking water were significant risk factors.

Furthermore, the finding of this study agrees with that of Demissie and Worku (2013) who evaluated the severity and causes of malnutrition among young children in the Dollo Ado region of Somalia, aged 6 to 59 months, and found that marital status, maternal education, monthly household income, and access to clean water were major drivers of malnutrition. In the same way, Nshimwe (2019) conducted research to determine the causes of severe acute malnutrition in children under 5 years old, and found that the factors associated to severe acute malnutrition were lack of education level, parents with lower monthly income, and unemployement. In addition, in a study conducted by Habaasa (2015) to better understand the causes of malnutrition in children under 5 years old in Nakaseke and Nakasongola districts of Uganda, it was found that farmer children were more likely to malnourished and develop more slowly than their peers whose mother comes from farming families.

Similarly, the finding of this study agrees with that of Tette et al., (2015) who examined socio-economic factors, health outcomes and the uptake of interventions to prevent malnutrition by mothers of malnourished, and found that the socio-demographic factors associated with malnutrition was monthly family income. Correspondingly, Bampaire (2019) conducted a study to determine the causes of under finve child malnutrition in Sheema district of Uganda, and found that stunting was more common in children whose mothers were peasants and those whose mothers had little formal education. By the same token, Nshimyiryo et al., (2019) conducted a study to identify risk factors of stunting in Rwanda, and found that prevalence of stunting was common among children of peasant parents, no education, and poorest households. Furthermore, this conclusion is consistent with the results of earlier researches in developing nations, both in terms of its effect size and variability (Victora et al., 2021) suggesting the importance of maternal formal education in influencing household income and the influence of the later on household material resources (Harding, 2015), let alone maternal health knowledge which is equally essential for recommended child care practices and utilisation of available nutrition and healthcare services (Ickes et al., 2018; Matare et al., 2021).

5.1.3 The Feeding Practices Associated With Malnutrition in Children Under 5 Years in Uganda between 2006-2016

The study revealed that breastfeeding practices associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 is 'not breastfeeding'. Infants who had not been breastfed exclusively face future health challenges. These problems cause a decrease in the full absorption of nutrients from breast milk; predispose them to diarrhea, and acute respiratory infections. This further contributes to weight loss; malnutrition; poor academic performance; decreased productivity; impaired cognitive, and social development (Toma et al., 2023; Wahyuni et al., 2022; Mamo et al., 2020).

This conclusion was reinforced by the investigation done in Northwest Ethiopia which revealed that the husband's educational level of no formal education was 1.15 times, and primary education 3.26 times more likely to practice pre-lacteal feeding than those who had secondary education and above (Adem et al., 2021). The possible explanation is that husbands who had secondary and above educational level might have a better understanding of the benefits of introducing complimentary foods timely, identification of the effects of non-exclusive breastfeeding (NEBF) before 6 months, and empowers them to defend against external interferences and pressures from traditional belief and misconception.This finding was also consistent with the studies done in South West Ethiopia where mothers who were civil servants, or daily laborers were more likely to practice NEBF compared to housewifes. Furthermore, in a study done in Peninsular Malaysia, mothers who have a job were 3.5 times more likely not to exclusively breastfeed compared to non-working mothers (Rahman et al., 2017). The possible explanation for this association is that government employed and daily laborer mothers are often not around to breastfeed their children thus they introduce the children early to complimentary foods compared to house wives who are always at home with their children.

The finding of this study is also consistent with that of other scholars such as van Breevoort et al., (2021), Menalu et al., (2021), Itaka and Omole (2020), Ntwasi (2018), Kalu and Etim (2018), and Tadesse, et al., (2016). This findings is also consistent with those from studies conducted in developing countries (Headey et al., 2020) and directly points to the critical period in which children transit from exclusive breastfeeding to complementary foods (Olufunlayo et al., 2019).

Furthermore, the finding of this study aligns with that Tadesse et al., (2016) who carried out a study to ascertain the frequency of non-exclusive breastfeeding and its risk variables in the rural Sorro District , Southern Ethiopia, and found that non-exclusive breastfeeding was associated with under-five malnutrition. Similarly, In a study aimed at assessing the prevalence and risk factors of malnutrition in hospitalized children under 5 years of age, Itaka and Omole (2020) found a clear relationship between malnutrition and not was breastfed and had diarrhea upon first admission. Likewise, Ntwasi (2018) conducted a study to identify the variables that affect malnutrition in children (0-5years) in Mubende Regional Referral Hospital, Mubende district Uganda, and found that not exclusively breastfeeding in the first 6 months was associated with severe stunting, and wasting.

Additionally, the finding of this study is consistent with that of Kalu and Etim (2018) who conducted a literature analysis on studies on malnutrition carried out in Africa and Asia, and found that absence of exclusive breastfeeding, maternal factors such as inadequate nutrition during pregnancy, inadequate weight gain, and inadequate vitamin supplement consumption were significant factors associated with malnutrtition. In the same way, van Breevoort et al., (2021) did a study on the factors that influence breastfeeding practice in the Pujehun district of southern Sierra Leone, and found a 62.8% rate of exclusive breastfeeding, down from 74% in the 0-1 month age group to 33% in the 4-5 month group. In addition, In Debre Berhan town, North Shewa, Ethiopia, Menalu et al. (2021) conducted a study to estimate the prevalence and identify risk factors for malnutrition in children under 5 years old. They found that these factors included not only breastfeeding, premature birth, lack of prenatal care, exposure to infectious diseases, and diarrhea.

5.2 Conclusions

The study found that the demographic factors associated with malnutrition in children under five in UDHS 2016, 2011, and 2006, included, age, sex, birth interval, size at birth, and residence. Similarly, the study revealed that the socio-economic factors associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 included, mother's nutritional status, mother's education, and wealth quintile. In addition, the study revealed that breastfeeding practices associated with malnutrition in children under five in UDHS 2016, 2011, and 2006 is 'not breastfeeding'.

Malnutrition in children is one of the health challenges in Uganda. Malnutrition-related mortality and morbidity is a burden on national budget at one end and on health care institutions on the other. This important issue can be handled with multipronged policies and multidimensional and multisectoral cooperation and integration. The focus of all these programs should be the mother in terms of, employment, literacy, healthcare, food, shelter, and social equality.

5.3 Recommendations

The factors that precipitated these adverse nutritional outcomes include mother's education, household wealth, residence, child's sex, child's size at birth, and not breastfeeding. Therefore, improving the nutritional status of children in Uganda will require significant efforts to reduce poverty at the individual and household levels, increase women's educational attainment, and improve living conditions. living in rural areas and raise awareness among women of childbearing age about what constitutes adequate nutrition. for children.

Furthermore, using UDHS 2016, 2011, and 2006, the results of this study provided strong evidence to the ministry of health and policy makers about the contributing factors of child malnutrition in Uganda. Based on these findings, interventions should focus on improving family income, food security, and mothers' understanding of health care and nutrition for children under 5 years old of Uganda. To enhance the health and nutritional condition of children under the age of five in Uganda, the government should establish new policies in nutritional intervention, especially for mothers with low BMI and infants who were smaller at birth.

Similarly, the ministry of health and partners should work jointly with district hospitals to elaborate the plan and programs to reduce and possibly eradicate malnutrition as this is a public health challenge. The implementation of those programs need the regular monitoring and evaluation to make sure that the under five health is improving along with the implantation.

Additionally, the study recommends that the ministry of health, ministry of education, health workers at all levels and community leaders should incorporate education of exclusive breastfeeding in all their sensitization activities. Attitude and behavioral change programs should be introduced at community level were mothers are found by MOH, MOE, NGOs, District local governments and other partnering agencies as community policies.

Furthermore, interventions should concentrate on teaching mothers about the fundamentals of healthy diet and the necessity of using accessible health services at the individual level. Women in rural regions need to have access to healthcare systems at the community level that support public health interventions including maternity and child health initiatives. By enhancing the nutritional condition of Uganda's under-five population, these actions will help the nation meet the WHO global nutrition target by 2025.

Equally, elimination of poverty and improving parental education, access to improved water sources, health care services, and early child care and development programs and policies are key in the improvement in the nutritional status of children in Uganda if we are to combat hunger and end all forms of malnutrition as stated by Sustainable Development Goal 2.2.

In addition, policies and programs should align with the Uganda National Development III 2020/2021–2024/2025, the Uganda Nutrition Action Plan II (2020–2025), the Maternal Infant and Young Child and Adolescent Nutrition Strategy and Guidelines 2021, and the international nutrition commitments from the UN Food Systems Summit, the Conference of the Parties 26 (COP 26) and the Nutrition For Growth Summit 2021. It is also important that there is political support in relevant Ugandan ministries, directorates, and at the local/regional level for such policies and programs.

Furthermore, there is a need for effective strategies to prevent and treat under-five child malnutrition in Uganda. The health strategies like Community-based Interventions are mostly needed for managing the risk factors of malnutrition. The multidisciplinary approach that includes both national and international health institutions are certainly needed to be reinforced for lessening the burden of stunting among children under 5 years.

Similarly, the Ugandan government is recommended to keep empowering and encouraging health facilities to provide health education to pregnant and non-pregnant women about how to behave for reducing and adjusting malnutrition among children.

Likewise, the research advises exclusively breastfeeding and providing appropriate additional nutrition to infants under the age of five. According to UNICEF and WHO standards, semi-solid supplemental meals should be provided after the first six months of life until the child is at least

two years old. This will consequently reduce on the underweight children under-five years in Uganda.

Additionally, there is need to use a multi-sectoral approach and one that reduces socioeconomic inequalities, eliminates inequalities between rural and urban areas and removes obstacles to women's access to education, increases access to safe water and sanitation services, as well as improves uptake of reproductive, maternal, and postnatal care. Progressive policies and programs that support these changes can also advance the national equity agenda by improving the wealth distribution and averting unnecessary suffering among children and their families.

Moreover, every effort should be made for mothers having infants within age group 2–3 and 4–5 months to be at the track of infant and young child feeding recommendation for only feeding breast milk until the first 6 months. Nutrition education on early initiation of breastfeeding should be strengthened by educating mothers in both community and health institutions. Strengthening and promoting antenatal and postnatal services by health workers and district health office is recommended to address all eligible mothers with infants.

Last but not least, breastfeeding promotion campaigns focusing on specific messages adapted to the local context and beliefs can be a solution to avoid premature and unjustified interruption of breastfeeding practice. Furthermore, receiving information during pregnancy on the benefits of early breastfeeding, awareness on how family and friends feed their babies, support from husbands and counselling by the nurses are factors associated with breastfeeding practice. It therefore seems relevant to include health workers and family members in promotion programs to have a greater adherence of mothers to breastfeeding.

5.4 Contribution to Knowledge

This study adds to the body of knowledge that the socio-demographic factors associated with malnutrition in children under five in UDHS 2016, 2011, and 2006, included, age, sex, birth interval, size at birth, residence, mother’s education, mother’s nutrional status, and wealth quintile. Similarly, more knowledge is added when the study revealed that lack of exclusive breastfeeding is associated with malnutrition. Additionally, the study supports the need for organized efforts, especially among the poorest and poor, to reduce the degree of malnutrition. It is well-known that 12 of the 17 SDGs goals prioritize and include highly relevant indicators to

nutrition, while the second-highest priority is to end poverty, hunger, food insecurity, and improved nutrition.

Furthermore, the findings of this study adds to the body of knowledge in terms of several policy implications. First, since poverty, literacy, and residence and malnutrition are intertwined, nutritional and poverty reduction strategies and initiatives should therefore be deserving of preference and should be rounded and holistic in any way. Second, the government should take robust and rigorous steps in improving nutritional status among women and their children to provide good nutritional foods for poor and underprivileged households. Third, interventions must target economic empowerment and short-term dietary supplements for people with disadvantaged economic status. Furthermore, parents need better access to health information and education; therefore, community-based health services should be promoted at the grassroots level.

5.5 Areas for Further Studies

Further research should be carried out to explore the biological and psychosocial effects of malnutrition on the children under five, their families, communities and the country.

The other further study should be carried out for understanding the effect of malnutrition on children's epistemological and cognitive development in Uganda.

The other suggested additional study should compare the risk factors for malnutrition throughout the regions of Uganda in children under the age of five, that is, Eastern, Northern, Central, Southern, and Western Uganda.

Further studies should perform dietary assessment of the children to determine their dietary intake and to evaluate its relationship with undernutrition.

5.6 Study Limitation

Though this study provides a comprehensive overview of the best population-based data available between 2006 and 2016, it has important limitations as a secondary analysis. The UDHS data are cross-sectional; therefore, examining a temporal relationship between relevant risk factors and malnutrition is not possible. Additionally, because the UDHS data only includes families residing in shelters, it excludes large and high-risk populations, including homeless

children, refugees, illness or children in nursing homes, which may have led our results to overestimate the prevalence of malnutrition.

Similarly, there are limitations in the wealth index as well; household income and wealth are not specifically measured by the UDHS and the evaluation of wealth based on ownership of durable goods and household characteristics may not capture the complexity of resources available to individuals in a household. This metric serves purely as a proxy for socioeconomic status in our analysis. Further, this analysis did not include all potentially relevant factors, such as psychosocial risk factors including maternal depression and intimate partner violence, as these were beyond the study's scope.

Furthermore, this study being based on the UDHS survey which lacked other additional information that we could have included in the analysis as per the WHO Framework for predictors of malnutrition, these include i) poor dietary habits, ii) contaminated water and iii) poor hygiene habits. Additionally, the majority of data on children in UDHS is self-reported by primary caregivers, which may be biased by recall confidentiality. Despite these limitations, the UDHS sampling technique, as well as the sample weighting and calibration methods, show that this study has outstanding advantages.

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APPENDIX I: DATA

2016				
Age in months	**Number of children**	**% of stunted children**	**% of wasted children**	**% of underweight children**
< 6	468	5.2	4.6	4.2
6-8	265	4.8	3.4	3.6
9-11	254	5.9	3.0	3.6
12-17	500	9.0	1.2	3.4
18-23	507	11.1	1.4	2.4
24-47	1,063	13.7	0.5	2.4
36-47	1,043	9.5	0.7	1.3
48-59	1,017	7.4	0.5	1.3
Sex				
Male	2,569	11.2	1.7	2.7
Female	2,548	7.3	1.0	2.0
Birth interval in month				
First birth	845	8.2	1.0	2.4
< 24	824	12.3	1.4	2.5
24-47	1,986	9.0	1.4	2.5
48+	702	5.1	1.7	1.7
Size at birth				
Very small	235	16.6	3.6	10.2
Small	635	12.1	2.1	3.6
Average or larger	3,411	7.6	1.0	1.5
Mother's nutritional status				
Thin (BMI <18.5)	314	8.6	3.2	4.9
Normal (BMI 18.5-24.9)	2,454	9.8	1.3	2.9
Overweight/Obese (BMI ≥ 25)	786	6.2	0.3	0.9
Residence				
Urban	977	7.1	0.9	1.3
Rural	4,141	9.8	1.4	2.6
Mother's education				
No education	590	12.2	1.6	4.1
Primary	2,703	9.8	1.4	2.5
Secondary+	893	5.4	1.3	1.4
Wealth quintile				
Lowest	1,134	10.1	2.1	3.8
Second	1,050	12.2	1.7	2.4
Middle	1,058	10.7	1.1	2.5

Fourth	971	8.4	0.8	1.8
Highest	904	4.1	0.7	0.9
2011				
< 6	228	4.6	4.4	3.2
6-8	131	2.3	6.0	7.0
9-11	120	5.8	0.0	0.0
12-17	245	13.5	1.4	3.4
18-23	269	19.1	1.2	5.9
24-47	444	18.7	0.4	2.9
36-47	477	16.7	0.5	3.9
48-59	436	12.7	1.4	2.0
Sex				
Male	1,163	15.6	1.0	3.0
Female	1,188	11.9	1.9	3.8
Birth interval in month				
First birth	331	11.9	1.2	2.6
< 24	419	18.1	1.1	3.6
24-47	1,025	13.8	1.9	3.4
48+	278	8.6	1.8	4.1
Size at birth				
Very small	100	23.7	5.1	11.0
Small	338	14.9	1.7	4.5
Average or larger	1,560	12.7	1.4	2.6
Mother's nutritional status				
Thin (BMI <18.5)	202	13.2	1.7	6.0
Normal (BMI 18.5-24.9)	1,541	14.7	1.6	3.3
Overweight/Obese (BMI ≥ 25)	347	10.3	1.3	2.2
Residence				
Urban	307	5.6	2.3	1.1
Rural	2,043	15.0	1.4	3.8
Mother's education				
No education	275	19.1	2.7	6.1
Primary	1,406	14.5	1.5	3.2
Secondary +	457	8.0	1.2	2.3
Wealth quintile				
Lowest	505	18.9	1.3	5.8
Second	509	12.5	2.0	3.2
Middle	487	18.4	1.0	4.4
Fourth	445	11.7	2.0	2.0
Highest	405	5.5	1.0	1.3
2006				
< 6	242	5.4	2.3	2.4
6-8	144	5.9	2.6	2.6

9-11	144	12.9	10.1	13.1
12-17	298	11.7	5.0	6.3
18-23	280	16.8	3.0	5.9
24-47	535	21.7	0.8	3.6
36-47	521	15.3	0.3	2.7
48-59	521	16.1	0.3	2.7
Sex				
Male	1,357	16.8	2.2	4.2
Female	1,330	13.1	1.8	4.1
Birth interval in month				
First birth	363	15.6	2.6	4.3
< 24	473	18.5	2.0	5.5
24-47	1,285	13.3	2.0	3.5
48+	287	9.1	3.2	4.3
Size at birth				
Very small	126	19.5	6.0	9.9
Small	349	20.0	3.8	6.5
Average or larger	1,919	12.7	1.7	3.3
Mother's nutritional status				
Thin (BMI <18.5)	257	11.9	3.8	6.5
Normal (BMI 18.5-24.9)	1,832	15.4	2.2	4.2
Overweight/Obese (BMI ≥ 25)	340	10.0	1.2	1.9
Residence				
Urban	273	8.3	3.0	2.5
Rural	2,414	15.7	1.9	4.3
Mother's education				
No education	551	15.8	2.4	5.9
Primary	1,580	15.5	2.2	3.9
Secondary +	339	7.1	1.7	2.6
Wealth quintile				
Lowest	554	18.5	1.6	5.5
Second	591	16.0	2.0	3.3
Middle	578	17.3	2.6	4.2
Fourth	501	13.7	2.4	6.1
Highest	463	7.9	1.4	1.5

2016				
Age in months	**Number of children**	**Not breast feeding (percentage)**	**Exclusively breastfed (percentage)**	**Breast feeding and consuming complementary foods (percentage)**
0-1	526	1.8	82.6	1.1
2-3	490	2.9	68.9	5.5
4-5	464	2.3	42.6	28.6
6-8	807	2.7	7.0	78.8
9-11	774	5.4	3.4	87.4
12-17	1,431	17.7	1.2	79.4
18-23	1,428	49.7	0.4	49.3
2011				
0-1	242	3.9	81.9	5.8
2-3	285	0.7	68.5	11.4
4-5	275	3.1	41.0	24.4
6-8	417	4.0	12.1	63.4
9-11	411	6.4	1.7	86.1
12-17	723	16.3	2.1	78.1
18-23	756	46.9	0.9	49.6
2006				
0-1	227	0.0	84.2	1.8
2-3	300	0.9	64.8	14.1
4-5	273	0.2	34.8	33.3
6-8	403	1.1	10.8	77.3
9-11	386	3.2	1.9	89.3
12-17	803	11.7	0.4	86.0
18-23	786	39.5	0.4	58.8

APPENDIX II: MULTIPLE LOGISTIC REGRESSION MODEL

Explanatory variable	**2016**								
	Stunting			**Wasting**			**Underweight**		
	AOR	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**
Demographic factors									
Age									
24-35	1			1			1		
36-47	0.671	0.731 -	0.001**	3.210	2.301-2.007	0.028*	0.431	0.129 -	0.020**

		0.672						0.203	
Sex									
Female	1			1			1		
Male	1.204	0.374 - 0.401	0.002**	0.538	2.748-3.739	0.010**	0.212	0.432 - 0.239	0.011**
Birth interval in month									
24-47	1			1			1		
48+	0.165	1.220 - 2.413	0.002**	1.312	3.342-4.832	0.007**	0.521	1.432 - 1.594	0.000***
Size at birth									
Small	1			1			1		
Very small	0.525	0.642 - 1.123	0.000***	0.421	0.423-0.568	0.003**	1.342	0.592 - 1.493	0.003**
Residence									
Urban	1			1			1		
Rural	0.653	0.642 - 1.443	0.000***	0.437	0.650-1.359	0.002**	0.473	0.541 - 0.320	0.001**
Socio-economic factors									
Mother's nutritional status									
Normal (BMI 18.5-24.9)	1			1			1		
Thin (BMI <18.5)	4.382	3.441 - 4.325	0.002*	6.943	3.755-4.732	0.030**	4.683	4.028 - 5.892	0.001**
Mother's education									
Primary	1			1			1		
No education	1.238	3.849 - 4.728	0.000***	2.374	2.843-3.093	0.002*	2.059	3.859 - 4.930	0.003*
Wealth quintile									
Second	1			1			1		
Lowest	2.484	8.753 - 9.749	0.00**	3.749	6.843-7.938	0.012*	2.434	0.834 - 1.788	0.001**
Breastfeedin									

g practices									
EBF	1			1			1		
NBF	0.843	0.927 - 2.578	0.000**	9.374	3.845-4.820	0.000***	4.289	0.843 - 2.854	0.014*
Explanatory variable	**2011**								
	Stunting			**Wasting**			**Underweight**		
	AOR	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**	**AOR**	**[95% CI]**	**p-value**
Demographic factors									
Age									
24-35	1			1			1		
36-47	4.758	0.753 - 1.735	0.001**	0.758	0.784-2.206	0.002*	18.742	0.689 - 2.034	0.0015*
Sex									
Female	1			1			1		
Male	4.203	0.653 - 1.936	0.000***	8.843	07341-1.921	0.002*	5.039	4.294 - 4.902	0.000**
Birth interval in month									
24-47	1			1			1		
48+	18.432	1.894 - 2.843	0.005*	0.643	0.534-1.843	0.000***	0.539	3.573 - 5.758	0.011*
Size at birth									
Small	1			1			1		
Very small	3.775	6.839 - 7.920	0.031*	3.854	5.938-6.990	0.010*	2.843	4.849 - 5.830	0.001*
Residence									
Urban	1			1			1		
Rural	0.853	0.564 - 3.210	0.014*	1.341	2.536-3.532	0.019*	0.609	1.445 - 2.452	0.000**
Socio-economic factors									
Mother's nutritional status									
Normal (BMI 18.5-24.9)	1			1			1		
Thin (BMI	2.354	3.589	0.390	4.940	3.649-	0.001*	3.545	6.930	0.004*

<18.5)		4.532			4.960			7.953	
Mother's education									
Primary	1			1			1		
No education	6.938	4.996 - 5.032	0.005*	1.385	4.864-5.603	0.016*	4.632	5.964 - 7.827	0.000***
Wealth quintile									
Second	1			1			1		
Lowest	2.469	5.964 - 6.943	0.012*	12.749	6.783-9.128	0.021*	8.203	0.143 - 1.069	0.000***
Breastfeeding practices									
EBF	1			1			1		
NBF	1.664	1.340 - 2.459	0.006**	4.640	2.554-3.549	0.001*	8.954	1.965 - 2.864	0.014*

Explanatory variable	**2006**								
	Stunting			**Wasting**			**Underweight**		
	COR	**[95% CI]**	**p-value**	**COR**	**[95% CI]**	**p-value**	**COR**	**[95% CI]**	**p-value**
Demographic factors									
Age									
24-35	1			1			1		
36-47	11.385	4.328 - 7.532	0.002*	0.703	2.754 - 3.854	0.003*	4.853	0.643 - 3.728	0.000***
Sex									
Female	1			1			1		
Male	8.464	2.541 - 5.539	0.001*	0.598	1.395 - 2.853	0.013**	7.542	0.853 - 2.859	0.015*
Birth interval in month									
24-47	1			1			1		
48+	22.738	1.345 - 3.547	0.000***	2.609	1.421 - 5.043	0.001*	2.385	0.315 - 2.436	0.012*
Size at birth									

Small	1			1			1		
Very small	3.539	3.954 - 4.538	0.003*	2.434	2.434 - 4.095	0.000***	3.549	3.254 - 5.853	0.006*
Residence									
Urban	1			1			1		
Rural	5.631	3.321 - 5.864	0.000**	5.341	0.953 - 1.342	0.002*	1.000	0.749 - 0.845	0.003**
Socio-economic factors									
Mother's nutritional status									
Normal (BMI 18.5-24.9)	1			1			1		
Thin (BMI <18.5)	2.245	5.964 - 6.943	0.004*	7.839	4.252 - 5.393	0.010**	4.532	2.854 - 4.395	0.010*
Mother's education									
No education	1			1			1		
Primary	7.853	6.829 - 9.853	0.000*	2.084	1.626 - 2.701	0.002*	2.943	0.731 - 1.094	0.000***
Wealth quintile									
Second Lowest	1 2.375	4.964 - 5.930	0.005*	1 5.302	8.085 - 9.853	0.023*	1 3.490	6.253 - 9.742	0.021*
Breastfeeding practices									
EBF	1			1			1		
NBF	8.742	5.734 - 9.643	0.000***	4.753	4.949 - 7.953	0.000***	3.538	6.385 - 9.053	0.000***