DETERMINANTS OF STUNTING AMONG CHILDREN AGED 6-23 MONTHS IN RURAL ARID AND SEMI-ARID (ASAL) COUNTIES IN KENYA

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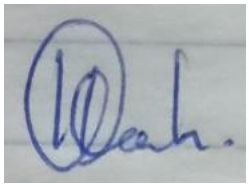
DECLARATION

This is my own original work, which has never been submitted to any other institution for degree award.



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This research project has been submitted for examination with our approval as university supervisor

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Signature Date

DR. MARTINE OLECHE

DEDICATION

This work is dedicated to my family for their support and encouragement throughout this journey.

ACKNOWLEDGEMENT

This work would not have been possible without the help and guidance of my supervisor, Dr. Martine Oleche. His guidance and support to complete this work is highly appreciated. I express my heartfelt gratitude to my family for their support and encouragement throughout this journey. To all my classmates thank you very much for encouragement.

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ABBREVIATION AND ACRONYMS

ARR	Annual reduction rate
ASAL	Arid and Semi-Arid
BMI	Body mass index
GNR	Global Nutrition Report
HAZ	Height for Age Z score
IMAM	Integrated Management of Acute Malnutrition
KHP	Kenya Health Policy
KNAP	Kenya Nutrition Action Plan
MDGs	Millennium Development Goals
MTP	Medium term plan
NFNSP	National food and nutrition security
NNAP	National Nutrition Action Plan
PHCs	Primary Health Centers
SDGs	Sustainable Development Goals
SUN	Scaling Up Nutrition
TPB	Theory of Planned Behavior
UHC	Universal Health Coverage
UN	United Nations
WAZ	Weight for Age Z- score
WHA	World Health Assembly

ABSTRACT

Just over one-quarter of Kenyan children under the age of five are stunted, or too short for their age. This is a symptom of chronic malnutrition. Rural regions have a higher incidence of stunting (29%) than urban areas (20%). In Arid and semi-arid land (ASAL) counties, stunting among children aged 6 to 23 months varies from 17 to 46 percent, according to data. This study's objective was to investigate the factors of stunting among children aged 6–23 months in rural ASAL areas in Kenya. Specifically to determining the trends of stunting among children aged 6–23 months in Kenya's rural ASAL area and analysing the influence of socioeconomic determinants on stunting among children aged 6–23 months in Kenya's rural ASAL counties. The study used KDHS 2014 as a source of data. In estimating the determinants, Probit regression model was used. From the results, it was notable that stunting was more pronounced in arid areas compared to semi-arid areas at 58.6 and 41.4 percent respectively. In arid and semi-arid rural areas, stunting trends at 38.4 percent and 28.9 percent respectively compared to urban where it trends at 20.6 percent compared to 12.6 percent respectively. Age of the mother, age squared of the mother, age of the child, marital status, education levels, wealth index, employment status, health insurance, awareness levels, distance greater than four kilometres, and desire for more children were statistically significant, according to the model estimation. The study recommends for increased civic education as the government intervention. The line ministries should conduct campaigns, and general advocacy to reverse the effects. The government may work with the private sector to provide and support nursing mothers with a few more weeks of maternity leave. In addition, a national effort should be

made to establish rules that compel businesses to adopt childcare practices by providing a conducive climate at the workplace so that mothers who desire to bring their children to work may do so. To address regional disparities in child malnutrition, national governments should enhance healthcare expenditures in ASAL rural areas to ease the burden of purchasing additional health products by mothers with children aged 6-23 months. Specifically, they should expand funding for nutritionists and dietitians stationed in hospitals and communities. It is important to understand that that education interventions can help increase knowledge on the importance of adopting better nutrition, enabling individuals to make informed decisions.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Diet play a vital role in the health and well-being of an individual. Malnutrition is a disorder characterized by an imbalance in protein, energy, and other nutrients, all of which can impair physical performance, alter body composition, and have other clinical consequences. The cornerstone of good health is a balanced diet combined with frequent exercise. Under-and over nutrition are both considered forms of malnutrition (Wells et al., 2020). Individuals who are undernourished will require services such as health and social care. According to Prendergast (2015) decreased ability to fight diseases, increased ailment vulnerability, weakened physical and mental growth, as well Poor nutrition may have a variety of negative effects, including lower productivity.

Dietary requirements for children are referred to as "child nutrition," which means that the correct foods and portions must be provided to ensure that children grow normally and that stunting, wasting, obesity, and other disorders do not occur (Khan et al., 2021). In order to maintain adequate physical, mental, and social well-being, adequate nutrition requires not just adequate food intake but also adequate food quality. The symptoms of malnutrition's effects and a variety of micronutrient deficiencies are among the symptoms of malnutrition's effects, both mild and moderate (Choge, 2020). Kwashiorkor, which is characterized by enlargement of the arms and legs as well as skin and hair colouring, and marasmus, or extreme wasting, are two short-term effects of severe malnutrition. Although the vast majority of malnourished children do not present apparent signs, these symptoms, which affect less than 5% of children in impoverished countries, are the hallmark of malnutrition.

According to Khan et al. (2021) nearly half of children in the least developed nations suffer from one or more symptoms of mild to moderate malnutrition, such as stunting, underweight,

and vitamin insufficiency. Despite the fact that these symptoms are less severe, the prevalence of mild and moderate malnutrition in developing countries is a major public health concern. Furthermore, even modest malnutrition can have significant short and long-term ramifications for household welfare and economic development.

According to researchers malnutrition is strongly linked to more diseases and death.. Young children, especially those under 5 years old who live in households with subpar sanitation, inadequate training for mothers, or lack of nutrition expertise, are among society's most fragile and vulnerable members. Many young children die every year as a consequence of undernourishment-related problems, making it a huge public health issue. Prendergast (2015) the high death rates among children in poor nations can be attributed to malnutrition and an abundance of infectious diseases. As a result, it is critical that children under the age of five get diagnosed and treated as soon as possible if they are to avoid malnutrition.

Children's growth rates are higher before the age of three than at any other time following birth. Moreover, crucial brain development and synapse formation take place, both of which have long-term implications for cognitive performance (Wainaina, 2019). As a result, young children's dietary requirements are higher than those of adults. Failure to accomplish these goals can contain long-term effects for a children health, cognitive growth, behavioural development, and educational success.

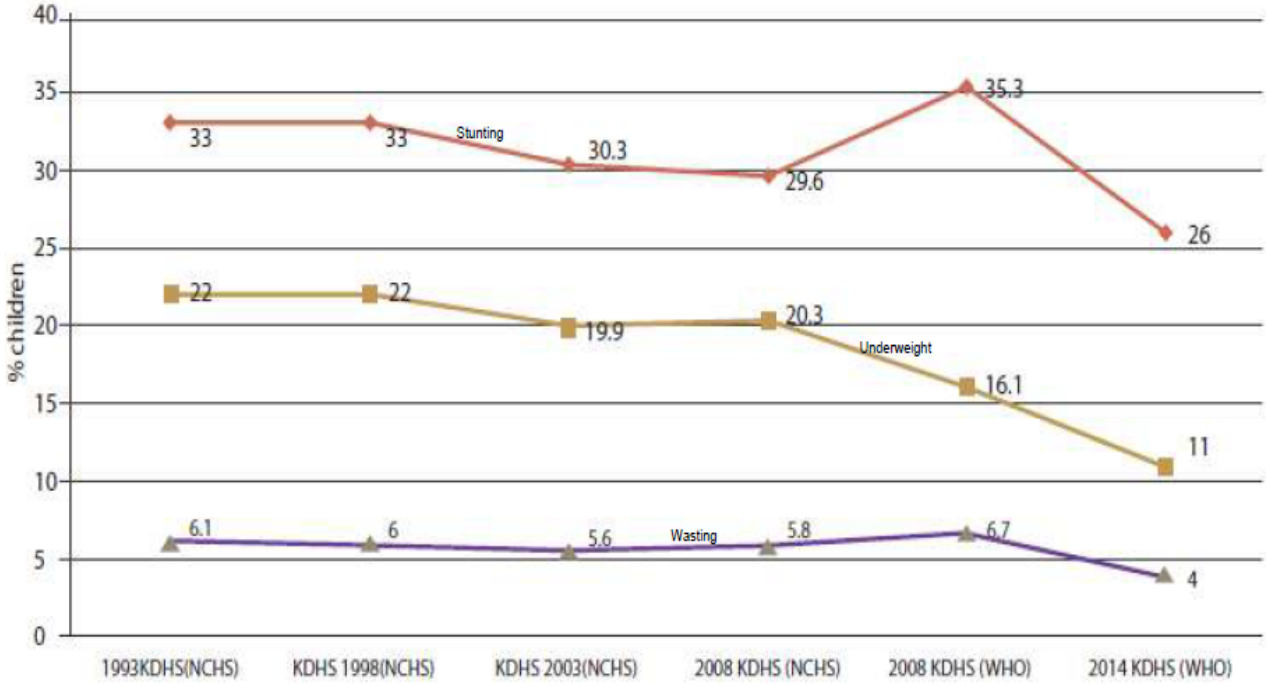
Globally, malnutrition affects at least one out of every three persons. A serious nutrition-related issue exists in almost every nation in the globe, whether it is undernourishment, lack of micronutrient, DRNCDs, and obesity/being overweight, or a triple burden of all types (Khodaee, Khademi, & Saeidi, 2015). The 2018 Global Nutrition Report (GNR) approximates that 50.5 million children are underweight (7.4%) and that 22.2% of all children under the age of 5 are stunted. With 32.8 percent girls and ladies who can have children having anaemia, this

is an increase from 31.6 percent in 2000. More than two billion individuals, including 38.3 million overweight children and 678 million obese adults, are considered to be overweight. In comparison to the 1.87 percent of stunted and overweight children under the age of five throughout the globe (8.23 million children), 3.62 % of children below five years in the United States being wasted and stunted. Various nations are impacted by malnutrition to varied degrees. 141 countries were evaluated, and 124 of them (88%) have various kinds of malnutrition, with 41 (29%) having high levels of all three (Lu, Black, & Richter, 2016). According to the research, none of the nations are on pace to achieve the world's objectives for anaemia and obesity. Malnutrition is estimated to cost up to 3.5 trillion USD annually.

According to Von Grebmer (2015), regionally, Stunting rates have fallen from 38.3 percent to 30.3 percent in Africa, 16.9 percent to 9.6 percent in Caribbean and Latin America and 38.1 percent to 23.2 percent in Asia. Stunting frequency in Africa has decreased, but From 50.6 million in 2000 to 58.7 million in 2017, more children were born stunted. The majority of nutritional burden in Africa is placed on Sub-Saharan Africa with 17.6 million children severely malnourished. The likelihood of a child dying before turning five is fourteen times more in Sub-Saharan Africa compared to industrialized nations. Africa had the highest incidence of infant mortality in 2015, a rate that is more than five times as high as the European average of 10 deaths per 1,000 births. It is anticipated in sub Saharan Africa that the prevalence of stunting among children below 5 would be 34.2% in that year (Khodaee, Khademi, & Saeidi, 2015; Khan et al., 2021).

The level of undernutrition in Kenya is strikingly similar to that of the rest of the globe. Of the 7.22 million children under the age of 5, about 1.8 million are stunted (26%), 290,000 are wasting (4%), and 794,200 are underweight (11%). Figure 1.1 demonstrations trends in stunting, wasting and underweight (1998–2014).

Figure 1.1: Trends in stunting, wasting and underweight (1998–2014).



Source: *Adapted from UNICEF/ WHO/ World Bank Group, Joint Child Malnutrition Estimates (JCME), 2017*

From Figure 1.1, stunting fell by 9%, going from 35% to 26%, resulting in an annual reduction rate (ARR) of 1.8%. The 16 percent National Nutrition Action Plan (NNAP) 2012-2017 aim was not achieved. The proportion of children with severe stunting (3SD) dropped from 14 to 8 percent, a drop of 6 % points, or an AAR of 1.2 percent (Yang et al. 2018). Males are more impacted (30%) than girls are by stunting, which peaks in the 18-23-month age range (36%) and affects boys more than girls (22 percent). dropped from 7 to 4 percent on waste by 3 percent. Undernutrition with severe acute declines from 2% to 1%. As a result, total acute malnourishment decreased by 50%. Kenya has met the WHA 2025 objective of 5 percent or less with its current level of 4 percent waste. Children born by moms (BMI of 18.5 or less) had a greater (9%) incidence of acute malnutrition than children of mothers with higher BMIs (Birch, 2021). Although it occurs at lesser levels in all counties, acute malnutrition is more prevalent in the Arid and Semi-Arid (ASAL) region (KDHS, 2014).

The percentage of persons who are underweight dropped from 16 % to 11 %, a decline of 5 percentage points. This indicates that Kenya successfully met its millennium development goal (MDG) of reducing the prevalence rate from its peak of 22% in the early 1990s. Children above the age of 12 months had the highest underweight prevalence, according research by Cruz et al (2015). More boys than girls (12%) struggle with being underweight (10%). Twenty-four percent more children of thin mothers are underweight than children of mothers with a higher Body Mass Index (BMI).

In addition, the degree of malnutrition varies according to geography and social demographics. Stunting is prevalent in 15% of children in Nyeri and Kiambu counties, likened to 46 percent in West Pokot sub county and Kitui county. About 9 (19%) of the fourty seven counties have a stunting prevalence of more than 30%, which has major implications for the health of the public (Abuya & Ng'ang'a, 2021). Stunting is very high in the age group of 19-23 months (36%) in line with other low-income nations, with boys having a slightly greater prevalence (30%) than girls (22%), and rural regions taking high rates (29%) than towns (20%). Stunting reduces by the mother's level of education, with moms Women have children with a stunted growth rate of 34% are twice as likely to be moms who did not finish basic school (17 per cent). Turkana has 23% more waste than Siaya, whereas Siaya has just 0.23 %. The percentage of children born with a birth weight of 2.5 kilograms or less rose from 6% to 8%, with the Coast area having the highest rate of 13% and the Nyanza region having the lowest rate (4%). The nutritional condition of women of reproductive age (WRA) was found to be a triple burden in the KDHS, yet the trend indicated that undernutrition was reducing while overweight and obesity were growing. (Jepkoech, 2020).

Kenya has ratified a number of international agreements and mechanisms relating to nutrition, including the Scaling Up Nutrition (SUN) initiative, the 2025 nutrition objectives set by the World Health Assembly (WHA), the United Nations' (UN) Decade of Action on Nutrition

(2016–2025), the Sustainable Development Goals (SDGs), and the ICN2 Declaration and Plan of Action. The agreements laid the foundation for tackling the immediate, root, and fundamental causes of hunger and for creating more room in the political, social, economic, and technological domains for nutrition efforts (United Nations, 2020).

Article 43 (1) of Kenya's Constitution states that everyone has freedom to the best possible level of health, free from hunger, and access to sufficient, wholesome food . Vision 2030, the National Food and Nutrition Security Policy (2012) and the Kenya Health Policy (KHP 2014-2030), all make it clear that the government is committed to making a place where people can live, work, and thrive. Some of the key initiatives that the government will carry out to realize Vision 2030 are outlined in the national food and nutrition security (NFNSP) and the Kenya Health Policy (KHP). This will be achieved through working to ensure that all Kenyans have access to equitable, cost-effective, and high-standard health care and associated services (Makokha, 2019). The MTP III, which places a high priority on achieving Universal Health Coverage (UHC) by 2022, underlined the government's commitment to provide all Kenyans with a high standard of living.

In addition, a number of laws addressing important aspects of nutrition interventions have been put into place, such as iodizing salt and prescribing the fortification of packed wheat and maize flour as well as vegetable fats and oils to address micronutrient deficiencies. Regulation and Control Act of 2012 as well as Articles 71 and 72 of the Health Act of 2017, promote, protect, and support breastfeeding.

The ministry of health directed the creation of the National Nutrition Action Plan (NNAP) 2012-2017 when the NFNSP was introduced in 2012, which aimed to manage nutrition and dietary interventions across all levels of government and nutrition partners. Stunting, wasting, and underweight are less common now than they were in the Kenya Demographic and Health

Survey (KDHS) from 35%, 7%, and 16% in 2009 to 26%, 4%, and 11% in 2014. The NNAP-guided coordinated implementation of nutrition interventions was credited with the improvement.

The Kenya Nutrition Action Plan (KNAP) 2018–2022 incorporates lessons acquired from execution of the National Nutrition Action Plan (NNAP) 2012–2017, as well as global and regional nutrition targets. The KNAP's principal goal is to accelerate and scale up efforts to eliminate malnutrition by 2030 as a public health problem, with an emphasis on particular accomplishments by 2022. The KNAP emphasizes the importance of multisector collaboration in treating malnutrition by focusing on three areas of intervention: dietary specificity, dietary sensitivity, and supportive environments.

According to Harison, Mark & Imwati (2017) arid and semi-arid regions make up about 88 percent of Kenya's total land area. Malnutrition has improved in the rest of the country as a result of efforts to combat malnutrition, but trends in ASAL areas remain bad. A wide range of agricultural and pastoral kinds make up the ASAL population. The majority of agro-pastoralists rely on rain fed agriculture, which has been scarce due to irregular rainfall and poor soils and a socio-economic factor such as lack of transportation and capital. As a result, food production and availability in these places has been problematic (Mburu, Kung’u & Muriuki, 2015). Climate shocks and pressures are more likely in Kenya's ASALs because of poor human development and high levels of poverty, particularly drought, have more severe implications in these areas, such as severe food deficiencies. Figure 1.2 shows malnutrition indicators (undernutrition) in ASAL in 2017.

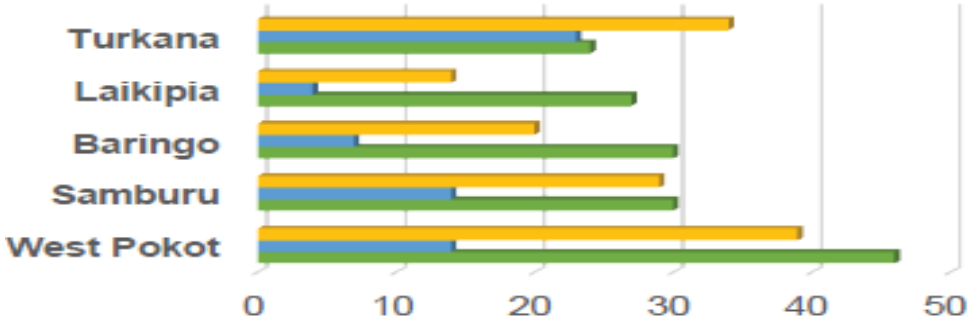


Figure 1.1: Malnutrition indicators in the ASAL countries (2017).

1.2 Statement of the Problem

Nutrition is a critical constituent in the development and maintenance of human health. The health and wellbeing of children, their capacity to learn and grow, their potential to become productive members of society, and the economy as a whole are all linked to nutrition. Every year, 3.5 million people die as a result of maternal and child malnutrition (WHO, 2021). Malnutrition is thus, and still among leading causes of illness and mortality in children all across the world. Despite successful health measures, nearly 10 million children below the 5 perish annually from preventable and treatable diseases (Khan et al., 2021). Malnutrition is to blame for at least half of these deaths. Several enabling and predisposing factors including household size, prenatal maternal nutritional status and poverty levels among others were revealed to be significant predictors of child malnutrition. A further assessment of the literature reveals an association between under-fives' nutritional condition and demographic, socioeconomic, trends in infant nutrition, rates of disease, access to clean water and medical care behavior (Kismul et al., 2018; Macharia et al., 2019; Adong, 2019).

In Kenya, Overweight and obesity, undernutrition (underweight, stunting and wasting), and deficits in some micronutrients are all on the rise. Kenya Demographic and Household Survey (KDHS) data indicates that, just over 1/4 of children below 5 are too short for their age stunted (KDHS, 2014). Harison, Mark and Imwati (2017) concluded that stunting is more pronounced in upcountry than in towns (29 percent versus 20 percent) and ranges from 15percent in Nyeri

to 46percent in West Pokot and Kitui, with the highest levels of chronic undernutrition being reported in most parts of the ASAL region with children from the age of 6-23 months.

Literature on causes of malnutrition has been explored in many studies globally, regionally and locally from where a strong nexus between malnutrition, and household's social and economic issues revealed. They include: Krishna et al. (2018) in Asia; Galgamuwa et al. (2017) in Sri Lanka; Sharaf and Rashad 2016) in Egypt; Mzumara et al. (2018) in Zambia; Kismul et al. (2018) in Democratic Republic of Congo as well as in Rwanda (Nshimyiryo et al. 2019; Binagwaho et al., 2020). In Kenya few researches have assessed associated factors to child malnutrition. They include Wairimu (2018) in Isiolo and Ndemwa (2017) in Kwale counties. Some of these studies focused on other forms of undernutrition such as underweight and wasting as opposed to stunting. Most studies employed descriptive statistics and correlational analysis to assess the underlying factors as opposed to modelling the determinants of nutritive status amongst children aging from 6-23 months in ASAL counties in Kenya. Despite these entire studies attempt, few or none of them has been able to solve the problem of persistent rise in cases of stunting specifically in ASAL areas in Kenya. Determining the factors that contribute to stunting in children between the ages of six and twenty-three months in Kenya's ASAL counties is the objective of this research.

1.3 Research questions

a) What are the trends in stunting among children aged 6-23 months in rural Arid and Semi-Arid (ASAL) region in Kenya?
b) How do socio-economic determinants affect stunting among children aged 6-23 months in rural Arid and Semi-Arid (ASAL) counties in Kenya?

1.4 Objectives of the study

1.4.1 Main objective

The main objective will be to examine the determinants of stunting among the children aged 6-23 months in rural Arid and Semi-Arid (ASAL) counties in Kenya.

1.4.2 Specific objectives

Specific objectives include to;

i. To determine the trends of stunting among children aged 6-23 months in rural Arid and Semi-Arid (ASAL) region in Kenya.
ii. To establish the effect of socio-economic determinants on stunting among children aged 6-23 months in rural Arid and Semi-Arid (ASAL) counties in Kenya.
iii. To suggest policy recommendations based on the objectives (i) and (ii) above.

1.5 Significance of the Study

Children who don't get enough food will be less physically and mentally productive just like adults. It is thus a significant source of resource waste and lost output. As a result, malnutrition is a major stumbling block to development, yet it can almost always be avoided. As a result, children's growth and cognitive development are delayed, resulting in their overall poor health (Datta & Singh, 2016). The aim of the research is to establish a foundation for understanding the determinants, nature, size, and extent of the prevalence of nutritional problems in infants from the age of 6 to 23 months, as they are a particularly vulnerable segment of the population, which is a prerequisite for triggering nutritional improvement programs and policies. The research will also add to the literature on malnutrition in ASAL areas.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents theories and previous studies on nutritional status. Overview of literature which synthesizes the studies reviewed is also provided.

2.2 Theoretical literature

With an ever-increasing population (which means a large number of children), food shortages, insufficient nutritional knowledge, poverty, and poor sanitation conspire to cause widespread malnutrition, especially among the most vulnerable, who are particularly hard-hit by this epidemic. This section will review theories that link various socioeconomic factors to malnutrition.

2.2.1 Theory of Planned Behaviour (TPB)

TPB is one of the most often used behaviour modification ideas in nutrition education. Ajzen was the one to first advance the theory (1991). In reference to this theory, a person purpose can be foreseen by three factors: their attitude toward the behaviour, their beliefs about their inspiration to adhere to other aspirations (subjective norms), and their customs about their supposed level of control over the variables that can help or hinder behaviour performance (perceived behavioural control). Recent evidence also highlights the importance of including a wide range of social, cultural, and economic aspects into the design of health treatments of ladies in the reproductive age, as well as importance of involving family members in the process (Richards, 2018; Centobelli et al., 2020). Despite the dearth of research and the overwhelming majority of existing assessments being of pilot or short-term initiatives, the advantages of interventions to encourage male involvement in household health outcomes have been shown. In factors such the use and compliance with postnatal care provider visits and the use of the PMTCT regimen in reproductive healthiness, mostly in the prevention of HIV

transmission from mother to infant, have demonstrated considerable benefits. Less attention has been paid to the results of male involvement on nourishment- or children-health-related behaviours and outcomes (particularly in community-focused involvements) than has been paid to maternal health and PMTCT. It is particularly important to include spouses in social behaviour-change initiatives for nutrition in communities where women's decision-making autonomy is limited and families are mostly led by males. The effects of a nutrition knowledge intervention on pregnant women's dietary diversification habits and nutritive status are not well supported by the available research (Birch, 2021). As a result, the theory is effective in analysing the study goal of determining the role of nutrition education in enhancing dietetic variety practice and nourishing status of children from the age of 6-23 months in Kenya's ASAL counties.

2.2.2 Human Choice and Agency

The human choice also known as the sense of agency is often described as the perception that an individual is the author of their own acts as well as the consequences of those actions. The development of children is an area of study that takes into consideration the decisions made by a number of different parties, including the children, the child's parents, additional guardians, and medical professionals (Biggeri, Bellanca Bonfanti & Tanzj, 2011). On agency, for instance, breastfeeding may be encouraged by many health promotion programs, although other companies promote the use of alternative feeding techniques. Actor's contemporaries could be pro- or anti-breastfeeding supporters which affects their choices. Therefore, the question of choice develops into a complicated one, and these complexities need to be taken into consideration while researching the capacities of child development. The use of a choice approach to the development of children gives room for unhealthy choices that are a reflection of people's beliefs and norms since it emphasizes the importance of choice.

2.2.3 A Capability Approach to Child Growth

The capacity approach (also known as the capacities approach) a normative perspective on human flourishing that places more emphasis on people's actual capacity to seek fulfilment than on their freedom or liberty to do so. In the 1980s, it was offered as a replacement for welfare economics. The approach used by welfare economists Amartya Sen and Martha Nussbaum unifies a number of topics that have been ignored by, or poorly defined by, more traditional schools of thought. Choice, diversity of experience, and the multifaceted nature of human wellbeing are highlighted by this viewpoint. To a large extent, the approach is analogous to how conventional microeconomic consumer theory deals with the issue of free will and preference, but it departs from that theory in its recognition of the presence of claims, such as rights, that normatively supersede utility-based claims (Sen, 1979).

The "capability approach" aids in identifying the many aspects and important competencies that comprise healthy development. These skills might relate to the child's, caregiver's, or society's possibilities for healthy development. Abilities are important actions or entities that indicate human freedom and choices; they represent genuine, accessible options from which individuals may select (Gasper, 2017). The capacities are followed by the accomplished doings or beings (the functioning), which represent the amount to which the opportunities have been translated into completed results. This concept implies that growth may be defined as the attainment of certain capacities. Physical development would be one of these capacities, but it would be part of an aggregated metric that also included other interconnected characteristics at the child, family and society levels.

2.3 Empirical Literature

This sub section explores studies associated with nutritional status and associated factors. It examines studies that attempt to link the hypothesized relationship. According to previous

studies performed in various parts of the world, childhood undernourishment is obviously related to a number of ecological and socioeconomic determinants including poverty/wealth index among others. Yang et al. (2018) investigated the prevalence and risk determinants of stunting in children less than five years old. In this research, researchers in Uganda analysed the effects of mother's education, income, and location on the prevalence of childhood stunting in children younger than five. Longitudinal and cross-sectional analyses of the UDHS data. The incidence of stunting and the mean height-for-age Z-score were determined using mother's education, the income index, the location, and other socioeconomic variables. On survey-specific and pooled data, linear regression and multivariable logistic models were fitted to investigate the independent correlations between variables and stunting or Z-score. Each analysis was weighted to account for the sample size. Totalling 14,747 children were included in the weighted sample. According to the report, the global prevalence of stunting reduced from 44.8% in 1995 to 33.2% in 2011. The reduction in stunting seen by the UDHS in 1995 was overstated because of the switch from National Center for Health Statistics to World Health Organization (WHO) standards.

Binagwaho et al. (2020) explored trends and possible risk determinants for children in Rwanda who were short for their age from 2000 to 2015. The Demographic and Health Surveys (DHS) that were carried out in Rwanda from 2000 to 2015 provided the information for this research. To determine "short height," the research examined DHS data on age and weight. After examining the frequency of stunting among children below the age of 5 in Rwanda, the research conducted bivariate analysis on a variety of influential population data for policymaking, health, and social economic factors. The researchers then conducted a multivariable analysis using important variables to identify the independent risk factors for stunting. Even though the rate didn't change significantly between 2000 and 2010, the research indicated that the proportion of children under five in Rwanda who were stunted reduced from 2000 to 2015

(38.3%). Children whose mothers had lower levels of education or who smoked during pregnancy, who were born early, and who were male were most likely to be stunted.

Kahssay et al. (2020) did a study to highlight the causes of stunting in Dubti district, Afar rural place, North East. Ethiopian children between the ages of six and fifty-nine months. From March 2 to 30, community-based unmatched case-control research with 322 children (161 controls and 161 cases) aged 6 to 59 months was carried out. Five kebelles were chosen at random from a pool of thirteen kebelles. Supervisors and data collectors received training. EPI Data version 3.02 was used to input the data, which was then exported to SPSS version 20 for analysis. The multivariable binary logistic regression analysis included further examination of the variables from the univariable binary logistic regression analysis. The findings showed that stunting was significantly influenced by a lack of maternal education, a prenatal interval of less than 24 months, the absence of antenatal care (ANC) follow-up, an inadequate access to latrines, short maternal height, the refusal to feed colostrum, a non-exclusive breastfeeding and breastfeeding period below 24 months.

Undernutrition in children is associated with missed developmental milestones, and the severity of common diseases is getting worse. There has been no major improvement in the reduction of malnutrition throughout the years. Despite the efficacy of Integrated Management of Acute Malnutrition (IMAM) in controlling severe malnourishment, young children remain most likely to suffer from sickness, relapse, and mortality in the year after being treated. Wairimu (2018) conducted research to investigate the eating patterns and nutritional health of Isiolo County's 6-23-month-old children who had been successfully discharged from the Supplemental Feeding Program (SFP). The research used a cross-sectional approach to analyse 204 mother-child pairings. The study collected and triangulated data using tools like researcher-administered surveys, FGDs, and key KIIs. Study findings indicate that maternal

age, infant age, breastfeeding status, and time from SFP discharge all had significant roles in a child's nutritional condition. The research recommended that caregivers be encouraged to maintain breastfeeding for a minimum of two years, with greater follow-up after discharge in which women are asked to attend the hospital regularly for monitoring.

Within the key age range of up to 23 months, this susceptible age group of children should adopt optimal feeding habits to avoid relapse with better linear growth. Macharia et al. (2019) undertook research to determine why children who were effectively treated for acute malnutrition are still at risk of diseases, relapse, and mortality in the year after being treated. This investigation was prompted by a lack of scientific record of these children's nutritional status following their discharge from a malnutrition treatment program. A cross-sectional analytical design was utilized among cured children exiting the supplemental feeding program aged 6 to 23 months. Children who were still enrolled in the program were not included in the research. Purposive sampling was utilized to sample children from the program registrations and the Garbatulla sub-county in Isiolo. At the 0.05 level of significance, relationships between variables were established using Chi-square, Pearson Correlation, and odds ratio. By Z-scores, wasting (14.7 percent), stunting (33.8 percent), and underweight (19.1 percent) all showed undernutrition. The findings showed that maintaining a lowest meal frequency and a least adequate diet proved difficult for non-breastfed and older children. Individual dietary variety, meal frequency, and achieving the minimum permissible diet all had significant correlations with wasting. Children continue to relapse after effective therapy for acute malnutrition.

Stunting may be prevented by identifying the risk factors that lead to the condition. Nshimyiryo et al. (2019) carried out a cross-sectional population research, researchers in Rwanda used data from the 2015 Rwanda Demographic and Health Survey (RDHS) to examine the risk determinants for stunting among children under the age of five. Stunting was the primary aim

of this research in Rwanda. The RDHS were utilized in this research. To scrutinize the link between several features of children and their risk of stunting logistic regression analysis was used. From the findings, boys comprised 51% of the 3594 participants aged 5 and below. Stunting affected 38% of the children in the study. The outcomes of the research showed that all of these factors were significant in an adjusted analysis, including: boys aged 6–23 months and 24–59 months compared to those under 6 months old; lower birth weight and maternal height; primary education for the mother; illiterate mothers; prior instances of not taking deworming medication while pregnant; and the poorest households. In conclusion, Rwandan children's development was stunted by family-level problems.

Mzumara et al. (2018) examined the factors linked with stunting in research on the health and development of children aged 0-5 in Zambia, 2014. Stata version 13 was used with a data extraction software to compile the data was used to conduct the analysis. Data samples from 12,328 infants between the ages of 0 and 59 months were examined. Simple and multivariate logistic regressions were employed in the investigation to identify relationships between independent factors and stunting. In Zambia, 40% of children under the age of 5 had stunted growth. Of the 4,937 children who were stunted, more male children than female children made up the total. A lower risk of stunting was seen in children who had better access to water compared to those who did not. Stunting was related to the child's socioeconomic status, residency, and length of breastfeeding, as well as the mother's level of education, the child's gender, and age. Factors in Zambia that affected a child's health were the child's age and gender, the family's socioeconomic situation, the mother's age and education, the water quality, the mother's duration of nursing, and the family's location.

In the Democratic Republic of the Congo (DRC), childhood stunting is one of the greatest worldwide (DRC). It is important to perform in-depth research on the processes behind stunting

at various determination levels and to discover critical elements that lead to its emergence. Kismul et al. (2018) looked into the 2013–2014 Demographic and Health Survey data in order to determine what factors contribute to the high rate of childhood stunting in the DRC. The study made use of information from the 2013–2014 DRC DHS, which included anthropometric data on 9,030 children under the age of five. According to WHO recommendations, HAZ score was computed and categorized. To assess the connection between bio-demographic factors and stunting, logistic regression was used. The findings showed that stunting occurred much more frequently in boys than in girls. Stunting occurred more frequently in rural than urban areas, with upcountry having a higher percentage of stunted children than in town areas. Stunting occurred at an abnormally high rate in several provinces. A lower risk of stunting was linked to early breastfeeding initiation and maternal age of at least 20 at delivery.

Childhood stunting has well-known causes at the individual level, but the government has given less attention to the reasons at the communal level. Fantay et al. (2019) utilised data from the 2016 Ethiopian DHS to conduct a study on the causes of stunting in children below 5 years old in Ethiopia. In this investigation, there are 640 clusters of communities and 8,855 children below 5 years. To examine the individual and societal factors influencing childhood stunting, using a multilevel logistic regression model. The findings of the research showed that 38.39% of Ethiopian children below 5 were stunted on average. According to the analysis, the total model's percentage change in variance explained about 53.6% of the variation in localities' odds of having stunted children. Individual factors that increased a child's risk of stunting included being male, having a child older than 12 months, having a small birth weight, coming being from a low-income background and having a mother with a little education., and having multiple pregnancies.

Stunting is the result of persistent, cumulative nutritional and health inadequacies. Because of its simplicity underweight is used by the healthcare system to track growth. Recent years have seen a revival of attention in stunting and particularly acute malnutrition. Stunting as a sign is often ignored. It is thus essential to understand the reasons for early childhood stunting so that preventative interventions may be made. Deshmukh et al. (2013) did research to evaluate the social and economic factors that contribute to stunting in Wardha rural areas. A cross-sectional study was done at 3 primary health centers (PHCs) in the 88,187-person Wardha area. The responses were collected using a 30-cluster sampling approach in three PHC locations. Using the WHO Child Growth Standards for HAZ, stunting was defined. HAZ, levels less than two standard deviations were deemed stunted, and values less than 3 standard deviations were deemed "severe stunting." The study's results indicated that important determinants of stunting included low revenue and associated characteristics, such as the father's level of education and work. The father's education was crucial as the decision-maker. As proxy indicators of health care access, vitamin A supplementation and anaemia were revealed to be major predictors of stunting.

Krishna et al. (2018) analysed socioeconomic differences in South Asian stunting that have been analysed and linked to individual, care provider, and household-level factors characteristics (poor nutritional variety, inadequate maternal knowledge, and household deficiency). The study included a time-series analysis of 55,459 children 6–23 months old from the India, Bangladesh, Pakstan and Nepal Demographic and Health Surveys (1991–2014). Accustomed for gender, order of birth, age, and place of residence, to explore relationships between stunting and several categories of socioeconomic disadvantage logistic regression models were used. According to the study's results, regardless of disadvantage type, socioeconomic disadvantage was related with an increased risk of stunting. Stunting was most likely to occur in children from poor background with inadequate nutrition and uneducated

mothers. Although rates of stunting decreased among the most disadvantaged groups over time, socioeconomic gaps were mostly maintained and, in some instances, widened, namely between wealth quintiles. In nations with large stunting burdens, the disproportionately high rates of stunting among the poorest children and the rising gaps across socioeconomic categories are cause for worry.

Malnutrition in children aged 5 and below is a persistent matter in undeveloped countries. Kamal (2011) investigated the socioeconomic causes of moderate and severe stunting in rural Bangladeshi children below five. The research Data from the 2007 Bangladesh DHS were utilised in the research. The impact of socio-demographic factors on moderate and severe stunting compared to normal in children was assessed using cross-sectional and multinomial logistic regression analyses. Children with a thinner mother than those with a normal weight mother had a noticeably higher risk of moderate and severe stunting, according to the multivariate multinomial logistic regression analysis. Other important variables affecting children's nutritional health included place, father's education, bathroom accessibility, birth order, child's age, and wealth index. Over half of the children were found to be stunted, with 15.1% having severe stunting and 26.3% having moderate stunting. The study's findings suggested that development and poverty-reduction efforts should have focused on disadvantaged rural populations to improve their nutritional status.

In another research, Galgamuwa et al. (2017) examined the nourishing status and associated socioeconomic determinants of preschool and school-aged children in Sri Lankan plantation villages. In three rural Sri Lankan villages, preschool and school-aged children participated in a cross-sectional research. Using demographic and household data, anthropometric measurements were obtained to determine weight-for-age (WAZ), BMI-for-age (BAZ) and height-for-age (HAZ). For data analysis, versions of SPSS, Epi-info and Anthroplus, were

utilized. The results of the research indicated that malnutrition was more prevalent among elementary school students. Preschool children were much more likely to be undernourished if their mothers were employed, if they had many siblings, if they were born first, and if they were female. Under-nutrition among schoolchildren was substantially connected to living in small homes, having a large family size, having a low monthly income, and having a mother work. The study indicated that undernourishment among children was a serious problem to the public health in Sri Lanka's plantation sector. Health education efforts within the people under investigation might have been beneficial in resolving the issue.

The most frequent causes of stunting in children below the age of three are being unable to meet basic needs and having poor parenting. The family-centered nursing theory was applied by Krisnana et al. (2020) to investigate the relationship between socioeconomic traits, parenting practices, and infant stunting. With a sample size of 100 participants chosen using a stratified random selection method, this research used a cross-sectional technique. Stunting was the dependent variable in this research, while socioeconomic status and parenting style were the independent variables. Questionnaires were used to collect data, and a 0.05 p-value Spearman rank test was used to analyse it. The finding of this research showed a correlation between social variables and stunting. In this research, it was determined that there was no correlation between economic variables and stunting incidences and between stunting incidents and democratic, authoritarian, or permissive parenting styles. It was shown that social variables had an important influence on the frequency of stunting. The degree to which women understood how to regulate their family's health and nutrition had a significant impact on parenting and nutritional status. Therefore, education was required to modify habits that might result in better nutrition for mother and child.

Sharaf and Rashad (2016) used data from the 2014 National Health and Nutrition Examination Survey to examine the socio-demographic and economic factors that influence the nutritional condition of Egyptian children. Employing the HAZ, one may evaluate the growth of children (HAZ). Utilizing a quantile regression model to permit a distinct impact of each determinants along various percentiles of the conditional distribution of the HAZ score, this research contributes to the existing literature. There were 13,682 children aged 0 to 4 included in the research, making it a nationally representative sample. As part of the multivariate analysis, a group of HAZ variables that are often referenced in the literature is considered. Children from low-income households had lower HAZs than children from high-income homes, as shown by both the conditional and unconditional analyses. There were large differences in children's nutritional status across demographic and socioeconomic groups, according to the research. Quantile regression analysis indicates distinct correlations between socioeconomic and demographic factors and HAZ in each tertile of the conditional HAZ distribution.

Ndemwa (2017) conducted research in Kwale County, Kenya, to look into the nutritional status of children between the ages of one day and 24 months and the relationship between demographic factors and malnutrition. In Mwaluphamba, Kwale County, Kenyan researchers conducted a cross-sectional study. To collect information, 380 randomly selected mothers of toddlers were given a semi-structured questionnaire. The analysis of the nutrition status was done employing anthropometric data. The data were analysed with descriptive statistics, and the relationships were found using univariate logistic regression. According to the data, there was a high incidence of malnutrition among children in Kwale, with 13.4 percent of severely stunted and 29.2 percent of stunted children. 20.8% of people reported being underweight, with 9.5% reporting being extremely underweight. 18.9% of people around the world had acute malnutrition. Male and female stunting differed greatly from one another. Stunting and underweight differences by age were also reported. Global rates of acute malnutrition,

underweight, and stunting in children were all significant. Compared to female children, male children were significantly having a higher likelihood of being stunted. Stunting and underweight were much more common as people aged.

Joshi et al. (2017) examined the socioeconomic and demographic trends affecting the health of children in Mongolia. Between 2000 and 2010, the LMICs with the highest economic growth were those in Central Asia, which also had a developing healthcare system. The data came from multiple indicator cluster surveys conducted in Mongolia. Height-for-age z-scores (HAZ), weight-for-age z-scores (WAZ), and the frequency of stunted and underweight children were used to assess child nutrition and growth. The percentage of children below 5 years who received all recommended vaccinations was used to gauge access to healthcare. For each of the years 2000, 2005, and 2010, socioeconomic and demographic determinants' effects on each outcome were assessed using multivariate multilevel logistic mixed modelling. T-tests were used to evaluate the importance of variations in HAZ and WAZ over the previous ten years. All three outcomes significantly improved between 2000 and 2010, despite the fact that socioeconomic factors had a greater impact on stunting and weight than on the other two outcomes. Region was a significant factor in 2000; children in three provinces had significantly higher rates of stunting and lower vaccination rates than children in Ulaanbaatar. But in 2010, this was no longer the case. None of the criteria had, by 2010, developed into reliable indicators of children's vaccination rates. Stunting was unaffected by economic status in 2000, but by 2010, children in the lowest quintile had a four-fold higher risk than those in the highest quintile.

Adong (2019) conducted a study assessing the association between socioeconomic and demographic determinants and undernourishment among 0-59 month-old hospitalized children at Lira Regional Referral Hospital. Despite being referred to by some as the gem of Africa and

the fruit and food basket of the continent, Uganda was among the nations with high rates of under-five malnutrition. Demographic and socioeconomic variables, among others, may have contributed to the trend's unsettling nature. This descriptive cross-sectional research included 1,080 children under five hospitalized to LRRH, of whom 196 incidences of malnutrition were documented between January and March 2019. This resulted in a worldwide frequency of 18.02 percent, of which 6.98 percent was moderate and 11.04 percent was severe. Age of the child, Male sex, living in a rural family, being a peasant, having a short time between births, and being the first or last child in the family are all risk factors were shown to be linked with under-five malnutrition. The significant frequency of malnutrition among children under five necessitates prompt action.

Wainaina (2019) conducted research to identify the causes of malnourishment in 0 to 59-month-old Kenyan children. With regard to under-five malnutrition in Kenya, the research specifically sought to examine the effects of socio-economic determinants, and the effects of bio-demographic and socio-cultural factors. KDHS 2014 served as the main data source. The two main methods for analysing the data were descriptive analysis and logistic regression. All socioeconomic, biodemographic, and social and 5 years determinants were shown to be strongly associated with undernourishment in children below, as suggested by the bivariate findings. According to the results of a multivariate analysis, the independent variables significantly influenced the likelihood of malnutrition in children below 5 years. On the basis of these findings, the study found that a younger birth age, a longer duration of breastfeeding, a lower birth order, and a smaller birth gap increased the risk of malnutrition in children under 5 years. The findings showed that, wasting and stunting continue to be significant public health concerns in Kenya and a leading cause of mortality for children under the age of five.

In developing nations, stunting is a significant public health issue. Uwiringiyimana et al. (2019) investigated the demographic, socioeconomic, and environmental variables that determine the regional distribution of stunting. A cross-sectional analysis was done utilizing environmental information from third-party geospatial databases as well as data from the 2014–2015 Rwanda DHS. The research population consisted of mothers and children below two years. The effects of demographic, socioeconomic, and biophysical factors on height-for-age were assessed using a multivariate linear regression model. A proxy for measuring aflatoxins exposure was also considered. Height-for-age was found to be correlated with a child's age, mother's height, gender and level of education at least in high school as well as with birth weight. After accounting for demographic and socioeconomic factors, it was found that elevation and living in a rural area served by a market were both significantly related with children's short height. The results also showed that height-for-age in the research group was not related to exclusive breastfeeding, deworming medication use, better water supply, or improved sanitation. Adding to the known effects of child and mother factors, the research supports the significance of environmental factors in influencing the height-for-age of children in Rwanda.

2.4 Overview of the Literature

Several research reviewed have found a strong correlation between child malnutrition and household social and economic issues. In an investigation, household variables such as family size, poverty levels, and drinking water sources were revealed to be significant predictors of child malnutrition. Other research has linked household sanitary facilities and prenatal maternal nourishing status to a rise in the prevalence of malnutrition.

A further assessment of the literature reveals a link between under-fives' nutritional condition and demographic, socioeconomic, the state of child nutrition, the prevalence of disease, the availability of clean water and sanitary facilities, and parents' propensity to seek medical

attention are all factors. At the household level, these traits can be seen. The household allocates its resources, including nutritional commodities and services, to its individual members. Several models, including Probit, logit, multiple linear regression, as well as multivariate, have been employed. However, closer studies employed descriptive statistics to assess the underlying factors. This study will use an empirical model that is Probit regression to estimate the determinants of nutritive status among children aged 6-23 months in ASAL counties in Kenya.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter examines various important procedures and methods by which the research will be completed, that is, achieving the mentioned objectives. A conceptual framework, an empirical model, variable definitions, as well as data sources are presented.

3.2 Conceptual framework

The term "conceptual framework" is used to refer to a diagrammatical representation of the relationships between various variables that contribute to a desired outcome. The conceptual framework for understanding the determinants of the nutritive status of children between 6-23 months illustrates a number of variables that are believed to affect the level of nutrition of children under 3 years. The variables are grouped into two broad categories, which are demographic and socio-economic variables. However, it’s important to note that these variables affect nutritional status in an intermediate way rather than a direct way.

Demographic variables such as age of key household members (mostly mother), size of household, marital status of household heads. However, this will depend on how knowledgeable about nutrition the household members are. The level of understanding by the household key members will regulate the outcome of the demographic variables on nutrition. The socio-economic variables such as education level of household heads, social status, and occupation of household head, among others will equally affect the nutrition status in an intermediate way. Aspects of public health, such as latrine/toilet facilities, safe water, garbage disposal, also affect the nutritional status at the household level. The figure below has the details.

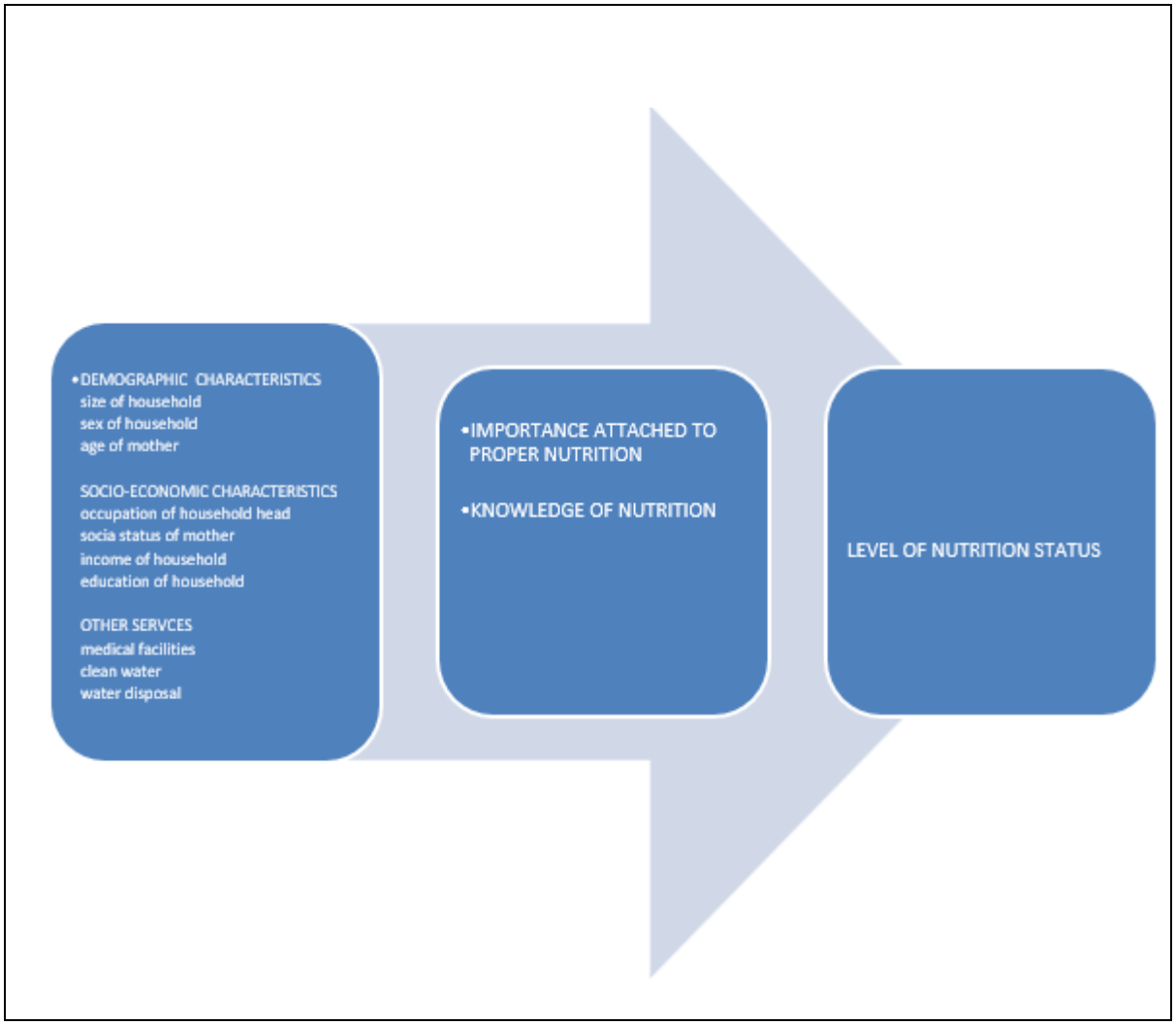


Figure 3.1: Conceptual Framework

Source: Adopted from Opaman (2014), "*Determinants of the Nutritional Status of Children Under 5 Years in Uganda*"

3.4 Empirical model

The study's predictors are based on earlier studies on nutritional status, focusing on malnutrition studies. Due to the binary features of the dependent variable, the Probit model will be used to determine the nutritional outcomes of under-five (6-23 months) children in ASAL counties in Kenya. This form of regression is based on the likelihood, as well the response factor assumes the binary (0, 1) value(s). Following Muriithi (2013), these kinds of models are predicted based on the premise that individuals must select amongst two choices, with selection

of one or the other depending on a number of circumstances. In this instance, the error term follows the normal distribution. The chance of a child being stunted or not will be considered to be determined by an underlying response variable.

By monitoring a variable, say Y, whose values range from 0 to 1, as well as defining the latent factor (Y*) as:

$Y^* = \beta X_i + \varepsilon$ …….. vi

Where Y* is the response variable of being undernourished by or no not, X_i is the predictor variable(s) that act as determinant(s) of stunting, including income, age, education levels, health-care quality, and time, and other factors.

β are the coefficient(s) to be determined

ε is the disturbance term that has a normal distribution

The response variable *Y* in this case, may be detected whether $y>0$, indicating uptake, or $y=0$, denoting no uptake i.e.

$Y_i=$ 1, If a child was reported to be stunted vii

0, Otherwise

Consequently, the probability that Y equals 1 where X is evaluated by the use of the ordinary normal cumulative function, as represented by the following equation:

$P\ (Y = 1/X = \Phi(X'\beta)$……. viii

Whereby *P* indicates probability, Φ indicates the cumulative standard normal distribution function as well as ß is a number of the factors or variables with estimable parameters.

Equation (*viii*) may be read as the likelihood phrased as the conditional probability that a child being undernourished (stunted) given a set of recognized variables X_i. The same model will be

estimated using the likelihood function from where we estimate βˆ that maximizes the log likelihood function.

It is thus necessary to determine the average marginal effects (AME) for the purpose of evaluating the direction as well as the size or extent (Orayo, 2014). The AME illustrates the transformation in the likelihood of *y = 1* for each unit change in the predictor factor *X*. The marginal impact is computed for the sample average or as the mean of distinct ME.

3.4 Model Specification

The dependent variable, in nature, is a binary variable for either being stunted or not. Here, the study assumes that the probability of a child aged between 6-23 being stunted or not is established by some determined variables (explanatory factors), which is a number of predictor factors that are either, the enabling factors, predisposing variables plus the socio-demographic features of the mother, the features of the healthcare structure and environmental factors. Thus, estimable model will be stated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon$$

Where Y is the response variable undernutrition (stunted growth), X_1=Age, X_2=age squared, X_3 = marital status, X_4 = religion, X_5 = education level of a mother, X_6 = desire for more children, X_7 = wealth Index, X_8 = distance to health facility, X_9 = employment X_{10} = access to information

3.5 Variable definition and Measurements

The dependent variable was measured by stunting of children aged 6-23 months. ASAL counties are 23 in number. Baringo, Isiolo, Garissa, Mandera, Samburu, Marsabit, Tana River,

Wajir and Turkana are among the arid counties. Kajiado, Embu, Kilifi, Kwale, Kitui, Laikipia, Makueni, Lamu, Meru, Nyeri, Narok, Taita Taveta, West Pokot and Tharaka Nithi are among the semi-arid regions. Table 3.1, presents the variable definition and measurement. Also, the probable signs are presented.

Table 3.1: Variable definitions and corresponding prior expectations

Variable	**Measurement**	**Expected sign**
Regress and Variable		
Stunting	Binary factor taking the value of 1 if a child who is between age of 6-23 months in any of ASAL counties has less than -2 standard deviation, and 0 if otherwise	
Predictor Variables		
Age of the mother	This is a continuous factor that is often stated in years. In this research, years are measured in their entirety.	Negative
Age Squared	This measures effectiveness based on a mother's experience with malnutrition. This is calculated by squaring the mother's age.	Positive
Age of the child	This is a continuous factor that is often stated in years in months	Positive
Marital Status	Is a binary factor, with 1 indicating married as well, 0 indicating not married.	Negative
Education level	It is a four-part binary factor: 1 indicates primary, 2 indicate secondary education, and 3 indicate tertiary education.	Negative
Wealth Index	This is a five-part dummy variable: 1 indicates Poorest (*reference variable*), 2 indicates Poorer, 3 indicates middle, 4 indicates middle, 5 indicates richest	Negative
Employment status	Binary factor whose value is 1 if it is employed and 0 otherwise.	Negative
Medical Insurance	Is a binary factor with the value 1 if the person has health insurance and 0 otherwise	Negative

Access to Information	This is a binary factor where 1, if frequently listens to radio, or watching television or reading newspaper and 0 if not.	Negative
Distance to Health Facility	Is a binary factor where; 1 if 4km or more, and 0 if less than 4kms	Negative
Religion	This is a three-binary factor taking the value of 1 if no religion (*reference variable*), 2 if Christian, 3 if Muslim	Indeterminate
Desire for More Children	This is a binary variable measured as 1 for women indicating they wants children within two or more years and 0 otherwise	Positive

3.7 Data source

To collect information on Kenya's population and health, Kenya Demographic and Health Survey (KDHS) 2014 was established. Interviews were conducted in a few houses with a nationally representative sample of 12,819 males and 31,079 women between the ages of 15 and 49. Estimates are included in the sample design for the 2014 KDHS for urban and rural regions, at the regional (formerly provincial) and national levels, and for a few variables at the county level. County-level statistics have been included to the KDHS for the first time. The 2014 KDHS was the sixth such survey carried out in Kenya since 1989 with the objective of giving program managers and policymakers precise estimates of marriages, sexual activity, fertility levels, fertility preferences, breastfeeding practices, family planning techniques, nutrition, infant mortality and maternal, and maternal and child health., and domestic violence. By measuring children's height and weight against a global reference standard, the 2014 KDHS gauges their nutritional status.

3.8 Diagnostic tests

To guarantee that the derived estimations are consistent and free of bias, diagnostic tests will be conducted.

3.8.1 Multicollinearity

A multicollinearity analysis will be conducted to determine the existence of multicollinearity between the variables used in the research. Multicollinearity is an issue that develops when two or more explanatory variables are substantially connected but not fully so. According to Gujarati (2003), multicollinearity exists when the zero-order or pair-wise correlation coefficient between two factors exceeds 0.5. A coefficient nearer to one indicates a significant negative or positive link, depending on the sign of the coefficient. If discovered, one of the associated variables will be eliminated or maintained if the correlation is less than 0.7.

3.8.2 Heteroscedasticity

Heteroscedasticity is being tested, when inconsistency in one variable changes with the values of the second component used to forecast it (Lewis-Beck & Lewis-Beck, 2015). Data deviation is easily accessible, which is a major factor. Therefore, the sample includes small or large observations relative to the other observations, as suggested by Manoharan, Ganesh and Sathiaseelan (2016). Alternatively, it might develop as a result of key factors being overlooked when building the model. Heterogeneity of variance, or non-constant variance, will be analysed using residual plots. When using STATA, robust standard errors, or heteroscedasticity Probit regression models, it is eliminated.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the empirical results examining the determinants of stunting among the children aged 6-23 months in rural Arid and Semi-Arid (ASAL) counties in Kenya. Specifically, the research analyses; the trends of stunting among children aged 6-23 months in rural ASAL region in Kenya, the effect of socio-economic determinants on stunting among children aged 6-23 months in rural ASAL counties in Kenya. A number of tables and graphs illustrate the empirical findings.

This section presents descriptive characteristics of respondents in ASAL region sampled via KDHS 2014. The variables under study include; age of the mother, age squared, age of the child, marital status, educational level, wealth index, status of employment, medical insurance, access to information, distance to health facility, religion, and desire for more children.

4.2. Trend analysis on stunting among children aged 6-23 months in rural ASAL regions

By measuring children's height and weight against a global reference standard, the 2014 KDHS assesses their nutritional status. The study assessed stunting of children aged 6-23 months in arid and also in ASAL counties for comparison. Arid counties include; Baringo, Isiolo, Garissa, Mandera, Samburu, Marsabit, Tana River, Wajir and Turkana. On the other hand, Embu, Kilifi, Kajiado, Kitui, Laikipia, Kwale, Lamu, Meru, Makueni, Narok, Taita Taveta, Nyeri, West Pokot and Tharaka Nithi. From figure 4.1, stunting is more pronounced in Arid areas compared to semi-arid areas at 58.6 and 41.4 percent respectively. In ASAL rural areas, stunting trends at 38.4 percent and 28.9 percent respectively compared to urban where it trends at 20.6 percent compared to 12.6 percent respectively.

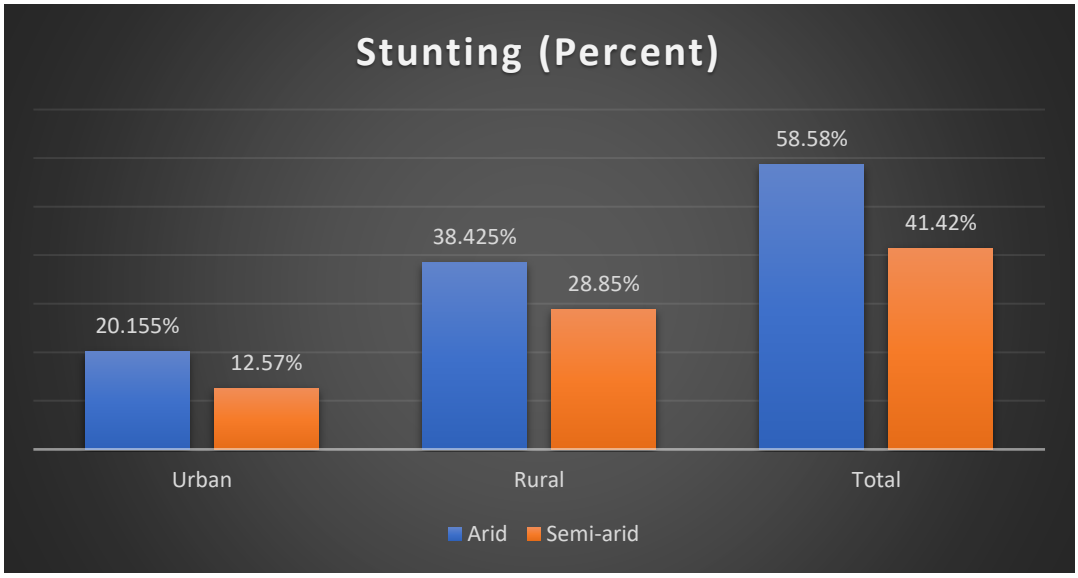


Figure 4.1: Trends in Stunting levels in rural and urban arid region in Kenya

4.3 Demographic and socio-economic characteristics

Table 4.1 show the mean age of the respondents was 29 years with youngest being 15 years and the oldest 49 years. The mean age of the children was 13 months with youngest being 6 months and the oldest 23 months old. In terms of marital status, 52% of the sample was comprised of married individuals. In assessing mother's educational attainment, majority of the respondents (40.39 %) attained primary education followed by 37.65 % who attained secondary education level while only 21.96 percent had tertiary level. Taking into account wealth quintiles, it was discovered that there was a consistent distribution pattern across various wealth cadres. For all wealth quintiles bar the first (the poorest), the distribution was 19.2, 19.1, and 19.2%, respectively. In addition, 57.4% of participants indicated they were employed, compared to 15.4% of participants who indicated they had medical insurance coverage. In addition, 43.26% of respondents indicated that they were employed, while only 15.2 % stated that they had health insurance. Respondents who had exposure to mass media were about 60.51 percent. The distance to the nearest health facility was about 4.08 kilometres on average with respondents reporting to range between 2 and 14 kilometres. Regarding the desire for more

children 57.04% of participants stated that they would want to have additional children within the next two years or during the next two years and beyond.

Table 4.1: Demographic and socioeconomic features

Variables	**Observations**	**Mean**	**Std. Dev.**	**Min**	**Max**
Age of the mother	3527	29.57	10.71	15	49
Age of the child	3527	13.43	4.862	6	23
Marital status	3527	0.5205	.4980	0	1
Education level					
Primary	3527	0.4039	0.2671	0	1
Secondary	3527	0.3765	0.3699	0	1
Tertiary	3527	0.2196	0.1859	0	1
Wealth Index					
Poorest	3527	.2337	.4232	0	1
Poorer	3527	.1921	.3940	0	1
Middle	3527	.1913	.3933	0	1
Rich	3527	.1917	.3936	0	1
Richest	3527	.1912	.3933	0	1
Awareness levels	3527	0.6051	0.0989	0.5780	3.4704
Distance (1 = >4 km)	3527	4.0819	.8983	2	15
Religion	1200	.8894	.3194	0	1
Desire for More children	1200	.5704	.4950	0	1

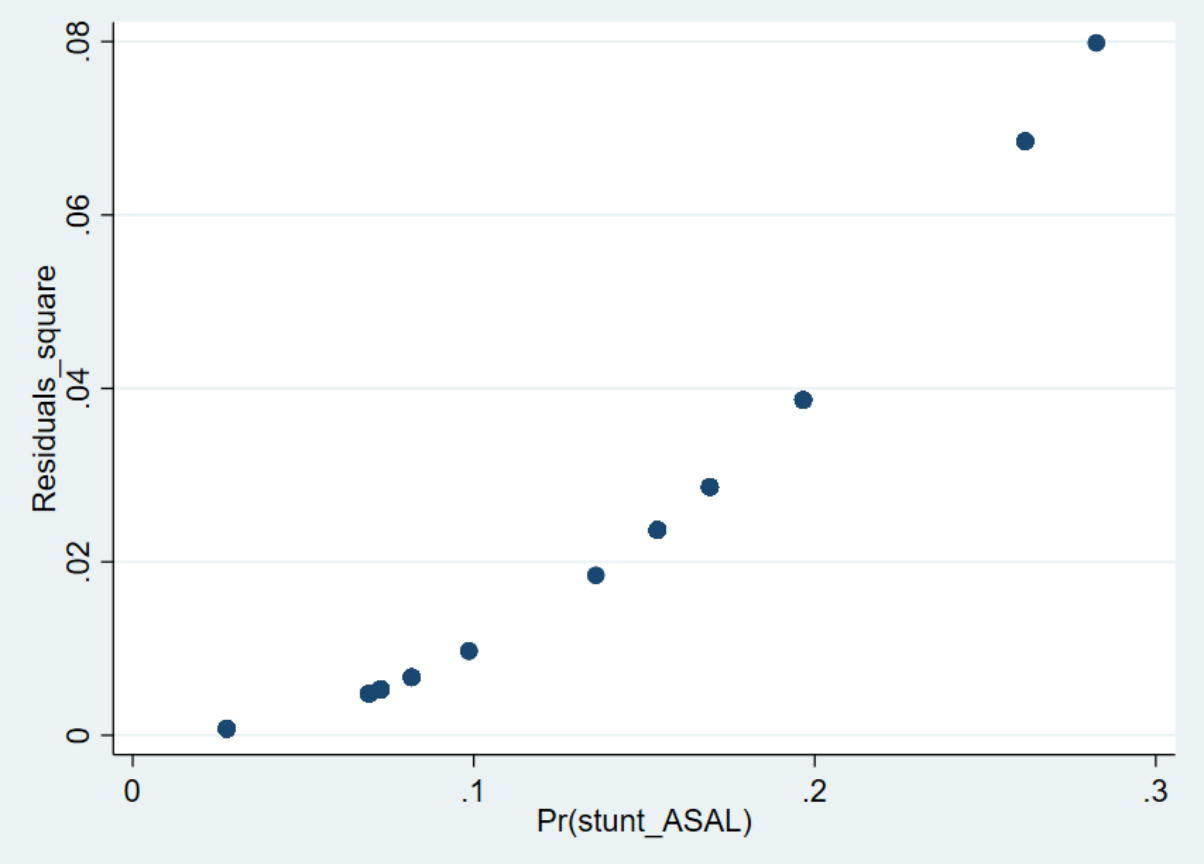
Approximately, 37.3 percent of the respondents resided in urban areas with more than half of them residing in the rural parts of rural ASAL counties in Kenya. Lastly respondents who reported to belong to a religion were approximately 88.8 percent.

4.4 Diagnostic Tests

4.4.1 Heteroscedasticity Test

The study made use of the heteroscedasticity residual plot and observed for a consistent trend. The results are as shown in figure 1. From the test findings in figure 1, a pattern but non-consistent can be observed in all curves meaning presence of constant variance with the fitting full probit model given significantly lesser iterations. Hence no need to adopt a robust standard error while estimating the final model.

Figure 4.2: Heteroscedasticity Test through Residual Plot Analysis



4.3.2 Correlation Analysis

The research determined the strength of the correlation between the variables under evaluation. The research determined from Appendix 1 that all pairs of factors were moderately associated, with employment, distance, marital status, and desire for additional children being negatively

associated with stunting. The rest of the variables were positively correlated. In all the correlations, none was higher than 0.5 levels.

4.5 Determinants of stunting among children aged 6-23 months in rural Arid and Semi-Arid (ASAL) counties in Kenya

The second purpose of the research was to examine the determinants of socioeconomic factors on stunting among children aged 6 to 23 months in ASAL rural regions in Kenya. The evaluation of the suggested Probit model and its corresponding indices yielded the results shown in Table 4.2. The total $p_{\text{-value}}$ from the model estimate was less than the 5% level of significance (Prob > chi2 for the model was 0.0852), indicating that the socioeconomic factors found (including demographic characteristics) adequately characterized the dependent variable (stunting among children). In addition, the pseudo R2 of 8.52 % shows the proportion of explanatory variables that explained children healthcare use for models one,

Table 4.2: Probit Regression Results

Probit regression No of observation = 1183 LR chi2(16) = 203.75 Prob > chi2 = 0.000 Log likelihood = -1273.9182 Pseudo R2 = 0.0852						
Stunting	Coefficient	Std. Err.	t	P>t	[95% Conf. Interval]	
Age of the mother	-0.0510**	0.0255	2.00	0.046	0.0010	0.1009
Age Squared	-0.0004**	0.00004	-12.35	0.000	-0.0005	-0.0004
Age of child (months)	-0.0121	0.0118	1.02	0.036	-0.0111	0.0354
Marital status	-0.4109**	0.0384	10.71	0.000	0.3357	0.4862
Education levels						
Primary	-0.4440**	0.1267	3.50	0.000	0.1955	0.6925
Secondary	-0.4934**	0.1355	3.64	0.000	0.2277	0.7591
Tertiary	-0.4847**	0.1608	3.01	0.003	0.1694	0.8000
Wealth Index						

Poorer	-0.0253**	0.0072	3.53	0.000	0.0113	0.0393
Middle	-0.0282**	0.0074	3.83	0.000	0.0138	0.0427
Rich	-0.0352**	0.0077	4.57	0.000	0.0201	0.0502
Richest	-0.0565**	0.0089	6.32	0.000	0.0390	0.0740
Awareness levels	-0.2436**	0.0718	3.39	0.001	0.1029	0.3843
Distance (1 = >4 km)	-0.6044**	0.1322	-4.57	0.000	-0.8634	-0.3454
Residence (1=urban)	-0.2436**	0.0718	3.39	0.001	0.1029	0.3843
Religion	-0.0542	0.0126	4.302	0.032	0.0372	0.0631
Desire for More Children	0.2612**	0.0397	6.59	0.000	0.1835	0.3389
Constant	6.1220	0.0581	105.39	0.000	6.0082	6.2359

From the regression findings in table 4.2; the age of the mother, age of the child, marital status, level of education, wealth index, status of employment, medical insurance, religion, awareness levels, residence and distance of more than 4 Km were found to be negatively link with stunting among children. Moreover, these links were statistically significant at 5% levels of significance. While, variables such as age of the mother squared, and desire for more children were found to be significant predictors but had a positive link with stunting among children aged 6-23 months.

Age of the respondent was shown to have a negative and significant effect on stunting. An additional year to the age of the respondent led to a lower probability (β=-.0510; p=0.046) of optimizing stunting among children holding other factors constant by 0.0510 points. Also, age of the respondent squared (β= .0004; p=0.128) was shown to have a positive and significant effect on stunting among children by 0.0006 points. This shows a nonlinear link between age and stunting. The child age coefficient was found to be negative and statistically significant at the 5% level (= -.0121, p =0.036). This implies that each additional month of a child's age decreases the likelihood of stunting by 0.0121 points.

The study found that marital status of the respondent (β= -.4109, p=.0.000) decreases the likelihood of stunting. It was revealed that being married had lower probability of enhancing stunting among children compared to their counterparts who were married by 0.4109 points holding other factors constant. The effect was statistically significant. On educational levels, the study assessed primary, secondary and tertiary education with no education being the base variable. The respondent who had either of education level had lower likelihood of stunting among children compared to a respondent with no education level. The effect was statistically significant. The findings revealed that having primary education (β=-.4440, p=0.000) significantly decreased the probability of stunting among children by 0.4440 points compared to having no education holding other factors constant. Also, having secondary education (β=0.4934, p=0.000) significantly decreased the probability of stunting among children by 0.4934 points compared to having no education holding other factors constant. Further, having a tertiary education (β=-.4847, p=0.003) reduced the likelihood of stunting among children.

Children's stunting was also shown to be significantly influenced by socioeconomic status as defined by the wealth index. The research examined the wealth quintiles of respondents. As a reference point, the first wealth quintile was used. The coefficient for the 2nd quintile of wealth was -0.2105 and was statistically significant (p = .001). With all other factors held constant, this indicates that children in the poorer wealth quintile were 0.2105 points less likely to be stunted than those in the first wealth quintile. The coefficient for the 3rd wealth quintile was -0.2315 (p= .000), showing that children in the 3rd wealth quintile were 0.2315 points less likely to be stunted than those in the 1st wealth quintile, all other factors being held constant. The coefficient for the 4th wealth quintile was -0.2791 and statistically significant (p = .000) at the 5% level. Children in the 4th wealth quintile had a 0.2791 point reduced chance of being stunted than those in the 1st wealth quintile, when all other factors were held constant. Similar to the coefficient for the 4th wealth quintile, the coefficient for the 5th wealth quintile was negative

and statistically significant at the 5% level (ß = -0.4113, p = 0.000). This showed individuals in the 5th wealth quintile in rural arid and semiarid regions in Kenya were 0.413% less likely to be stunted than those in the first wealth quintile.

The effect on employment was negative and statistically significant at 5% (β= -.4850, p = 0.000). The findings indicate that being employed lowered the risk of stunting by 0.4851 percentage points, assuming that all other variables were held constant. This study demonstrates that individuals with work are more likely than those without employment to pay the cost of stunting and other associated expenditures. The coefficient on medical insurance was found to be negative and statistically significant at 5% (β= 0.328, p value = 0.000). Results indicate that respondents with medical insurance were 0.3282 points less likely to have children with stunted growth, holding other factors constant.

The coefficient on level of awareness was measured by the respondent having access to radio, TV or newspaper. The coefficient was statistically significant and also found to have a negative and significant effect on stunting among children (β = -.2436, p=.001). The findings means that respondents who had access to mass media had a significant decrease in stunting among children at 5% level by 0.2436 points compared to individuals who were not exposed of listening to radio, Tv or newspaper holding all other factors constant. This indicates that persons with more access to health-related information are more likely to be aware of the effects of stunting.

The coefficient on distance to the nearest healthcare facility was negative and statistically significant at 5% (β= -0.6044, p=0.000). An extra kilometre to the nearest health facility had a negative impact on child stunting by 0.6044 percentage points. The coefficient on the desire for additional children was positive and statistically significant at 5% (β= .2612, p = 0.000).

Results indicate that the desire for an extra child had a positive impact on stunting among children.

To assess the Probit findings for policy concerns, the research determined the marginal effects of factors used to define stunting. Table 4.3 shows the results for marginal effects.

Table 4.3: Average Marginal Effects (Stunting)

Probit regression Number of observation = 138,743 Wald chi2(9) = 84.35 Prob > chi2 = 0.0000 Log pseudolikelihood = -281.55881 Pseudo R^2 = 0.2065					
Stunting	**ME (Robust Std. Err)**	**z**	**P>z**	**[95% Conf.**	**[95% Conf.**
Age of the mother	-0.0275** (.0023)	11.89	0.000	0.0230	0.0321
Age of the children	-0.0121 (.0119)	1.02	0.036	-0.0111	0.0354
Age Squared	0.0004** (.000)	-12.35	0.000	-0.0005	-0.0004
Marital status	-0.0584** (.0054)	10.66	0.000	0.0476	0.0691
Education levels					
Primary	-0.0528** (.0070)	7.50	0.000	0.0390	0.0666
Secondary	-0.0480** (.0082)	5.89	0.000	0.0320	0.0640
Tertiary	-0.0684** (.0114)	6.00	0.000	0.0461	0.0908
Wealth Index					
Poorer	-0.0253** (0.0072)	3.53	0.000	0.0113	0.0393
Middle	-0.0282** (0.0074)	3.83	0.000	0.0138	0.0427
Rich	-0.0352** (0.0077)	4.57	0.000	0.0201	0.0502
Richest	-0.0565** (0.0089)	6.32	0.000	0.0390	0.0740
Employment status	-0.3621** (.1124)	3.22	0.000	0.1118	0.4412

Medical insurance	-0.2787** (.1207)	2.31	0.022	0.0890	0.4464
Religion	0.1965 (.1144)	1.72	0.099	0.1277	0.3208
Awareness levels	-0.0480** (.0082)	5.89	0.000	0.0320	0.0640
Distance (1 = >4 km)	-0.3786** (.1544)	-2.45	0.014	-0.6813	-0.0759
Desire for more children	0.0371 (.0056)	-6.59	0.000	-0.0481	-0.0261

As shown in Table 4.3, the findings reveal that age of the mother, age squared of the mother, age of the child, marital status, level of education, wealth index, employment, health insurance, awareness levels, distance of more than 4 Km and desire for more children were statistically significant. However other factors such as religion was not statistically significant at 5% level.

4.6 Discussion of the results

Age of the respondent was shown to have a negative and significant effect on stunting among children. An additional year to the age of the respondent led to a lower probability (β=-0.0275; p=0.000) of optimizing stunting among children by 2.75 % holding all other factors constant. Also, age of the respondent squared (β= .0004; p=0.128) was shown to have a positive and significant effect on stunting among children. This implies a nonlinear link between age and stunting. At the 5% significance level, the coefficient on child age was determined to be negative and statistically significant (β= -.0121, p =0.036). This implies that additional month of a child's age decreases the likelihood of stunting by 0.0121 points. This is in line with the results of Demissie and Worku (2013), who shown that wasting was more frequent among younger children, but stunting and underweight were more prevalent among older children.

The study found that marital status of the respondent (β= -0.0584, p=0.000) decrease the likelihood stunting. It was revealed that being married had lower probability of enhancing

stunting among children compared to their counterparts who were not married by 5.84% holding other factors constant. The findings were in line with Demissie and Worku (2013) who found a negative association been stunting among children and respondent being married.

On educational levels, the study assessed primary, secondary and tertiary education with no education being the base variable. A respondent who attained either level of education had lower likelihood of stunting among children compared to a respondents with no education level. The effect was statistically significant. The findings revealed that having primary education (β=-.05281, p=0.000) significantly decreased the probability of stunting among children by 5.28 percent compared to having no education holding other factors constant. Also, having secondary education (β=-0.0480, p=0.000) significantly decreased the probability of stunting among children by 4.8 percent compared to having no education holding other factors constant. Further, having a tertiary education (β=-0.0684, p=0.003) decreased the likelihood of stunting among children by 6.84 percent. The finding concur with Abeway et al. (2018), who found out that educational status of the mother revealed negative link with stunting among children.

Children's stunting was also shown to be significantly influenced by socio-economic status as defined by the wealth index. The research examined the wealth quintiles of participants. As a reference point, the 1st wealth quintile was the reference point. The coefficient for the 2nd quintile of wealth was -0.0253 and statistically significant (p = 0.0072). Holding other factors constant, this indicates that children in the poorer wealth quintile were 2.53 % less likely to be stunted than those in the first wealth quintile. The coefficient for the 3nd wealth quintile was -0.0282 (p= .0074), showing that, everything else being equal, children in the 3nd wealth quintile were 2.82% less likely to be stunted than those in the 1st wealth quintile. The 4th wealth quintile had a coefficient of -0.0352, which was statistically significant at the 5% level (p = .000) and implied that children in the 4th wealth quintile were less likely to be stunted. Compared to

individuals in the 1st wealth quintile, individuals in the 2nd wealth quintile had a higher ted level by 3.52 %, holding all other factors constant. Similar to the coefficient for the 4th wealth quintile, the coefficient for the 5th wealth quintile was negative and statistically significant at the 5% level (ß = -0.0565, p = .000). This found that individuals in the fifth wealth quintile in rural arid and semi-arid areas in Kenya were 5.65 % less likely to be stunted as compared to those in the 1st wealth quintile. According to (Urke, Bull & Mittelmark, 2011), the chances of stunting were significantly greater in the poorer WI quintile than in the wealthiest. The coefficient on employment was negative and statistically significant at 5% (= -0.3620, p = 0.000, p = 0.000). The data indicate that employment reduced the chance of stunting by 36.20 %, holding other factors constant. This finding implies that employed respondents are more likely to bear the cost of reducing child stunting and other associated expenses than unemployed respondents. The findings are consistent with (Urke, Bull & Mittelmark, 2011), who found that the risk of stunting was considerably lower among children of mothers who worked at home compared to those whose mothers had professional jobs.

The medical insurance coefficient was shown to be negative and statistically significant at 5% (β= -.2787, p value=.022). The findings show that respondents who had a medical insurance cover were less likely to be stunted by 27.87 percent holding other factors constant. The results agree with Darteh et al. (2021) who found out that individuals who were enrolled to a health insurance were more likely to having children who are stunted since they can acquire the health services easily.

The coefficient on level of awareness was measured by the respondent having access to radio, TV or newspaper. The coefficient was statistically significant and also found to have a negative and significant effect on stunting among children (β = -.0480, p=0.000). The findings means that respondents who had access to mass media had a significant decrease in stunting at 5% level by 4.8 percent compared to individuals who were not exposed of listening to radio, TV

or newspaper holding other factors constant. This means that individuals, who have frequent access to health related information, are more likely to be informed on significance of effects of stunting among children. The findings correlate with studies done by (Nkunzimana, 2020), who noted that awareness and sensitizations led to decreased stunting among children.

The coefficient on distance to the nearest health facility was negative and statistically significant at 5% (β= -.3786405, p value=.000). The findings show that an additional Kilometre to the nearest health facility had a negative effect on stunting by 37.86 percent. The result was supported by the findings of Kimani et al. (2016), who indicated that distance correlates to decreased use of health services. Muriithi (2013), who investigated health-seeking behaviour, found that distance had a significant negative impact on the selection of health services in Nairobi slums. Lastly, the coefficient on desire for more children was positive and statistically significant at 5% (β= .0371, p value=.0056). The findings revealed that a desire for an additional child had a positive effect on stunting among children by 3.71% aged 6-23 months in rural ASAL counties in Kenya. Considering this finding, Kimani et al. (2016) who found that the correlation between poverty and desire to have more children vanishes in Pakistan when the size elasticity of the cost of living.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of the research, as well as the conclusion and recommendations. The conclusion is consistent with the study's aims and research questions, while the recommendations are based on the study's results.

5.2 Summary of the findings

The level of undernutrition in Kenya is strikingly similar to that of the rest of the globe. Of the 7.22 million children under the age of 5, about 1.8 million are stunted (26%), 290,000 are wasting (4%), and 794,200 are underweight (11%). Nutrition is a critical constituent in the development and maintenance of human health. The health and wellbeing of children, their capacity to learn and grow, their potential to become productive members of society, and the economy as a whole are all linked to nutrition. Every year, 3.5 million people die as a result of maternal and child malnutrition (WHO, 2021). Malnutrition is thus, and still among leading causes of illness and mortality in children all across the world.

The objective of this research was to get a better knowledge of the determinants of stunting among children aged 6-23 months in rural ASAL counties in Kenya, where stunting is a recognized cause of under-five mortality. Specific objectives included determining the trends of stunting and determining the impact of socioeconomic determinants on stunting among children aged 6–23 months in rural Arid and Semi-Arid (ASAL) counties in Kenya. The KDHS was established in 2014 to collect data on Kenya's population and health. Descriptive and logistic regression approaches were utilised to analyze the data.

The dependent variable was stunting among children aged 6-23 months which a binary variable is given identified characteristics in stunted children from the reviewed literature. The following variables were examined: age of the mother, age squared, age of the child, marital

status, level of education, wealth index, status of employment, medical insurance, access to information, and distance to health facility, religion, and desire for more children. Probit regression analysis was utilised to estimate the parameter of the coefficients. Diagnostic tests were carried out. This is to ensure that the actual estimation done thus hold the model assumptions. STATA version 15, statistical software was used to conduct further estimations.

5.3 Conclusion

From the results, it was notable that stunting was more pronounced in Arid areas compared to semi-arid areas at 58.6 and 41.4 percent respectively. In arid and semi-arid rural areas, stunting trends at 38.4 percent and 28.9 percent respectively compared to urban where it trends at 20.6 percent compared to 12.6 percent respectively. From the model estimation; age of the mother, age squared of the mother, age of the child, marital status, level of education, wealth index, status of employment, health insurance, awareness levels, distance of more than four KM and desire for more children were statistically significant. However other factors such as religion was not statistically significant at 5% level. It is more likely that addressing these variables would enhance the status of nutrition of children aged 6 to 23 months in Kenya's rural ASAL areas.

5.4 Recommendations of the Study

Stunting is the linear growth indicator known as the height for age index. Long-term malnutrition results in stunting, which commonly causes mental retardation. Poor socioeconomic circumstances and early exposure to harmful factors like illness and/or improper eating habits are connected to high levels of stunting. Based on the study's results, the following suggestions were made: Since mother predictors of stunting among children are more personal, civic education would be the most effective government intervention.The line ministries should engage in campaigns and broad campaigning to reverse the effects. The

government may collaborate with the private sector to give a few more weeks of maternity leave to breastfeeding mothers. In addition, a national effort should be undertaken to develop regulations compelling companies to embrace childcare practices by creating a favorable work environment for mothers who want to bring their children to the workplace.

To address regional differences in child malnutrition, national governments should increase spending on rural healthcare in arid and semiarid regions. Specifically, they should increase financing for hospital- and community-based nutritionists and dietitians. In other words, child nutrition should be more closely integrated with Mother and Child Health (MCH) care as opposed to being left to nurses and nutrition specialists. Women with higher levels of education are more likely to be in the modern workforce, where they may play a crucial role in enhancing the nutritional status of children. Therefore, the government must reform the curriculum and include instruction on the significance of adequate nutrition for children aged 6 to 23 months. It is essential to recognize that education programs may enhance awareness of the significance of adopting a healthier diet, allowing people to make educated choices.

5.5 Areas for Further Studies

This research used the child who is aged between 6 and 23 months in any of rural ASAL counties and has a SD pf less than -2 or is stunted as the measure of stunting among children. Thus, future research should emphasize the use of additional indicators of stunting, such as the wasting anthropometric indices measure, which was omitted due to a lack of resources. All of the data utilized in this research were secondary, meaning they were collected for reasons other than determining the nutritional status of ASAL children. For this reason, data on key factors that are known to impact the nutritional health of children were not included in the analysis. As a result, there is a need for more research to be conducted utilizing primary data and to include variables that were not obtained.

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APPENDICES

Appendix 1: Correlation Matrix

Variables	Stunting	Age of the mother	Age of the child	Marital status	Education	Wealth	Employment	Insurance	Awareness	Distance	Residence	Religion	Desire for More Children
Stunting	1.0000												
Age of the mother	0.0708	1.0000											
Age of the child	0.1831	0.1157	1.0000										
Marital status	-0.0052	0.0099	0.3435	1.0000									
Education	0.2752	0.2477	-0.1101	0.0007	1.0000								
Wealth	0.0787	0.1033	0.0158	0.0355	-0.0004	1.0000							
Employment	-0.1579	0.6960	0.3885	0.300	-0.2966	0.1316	1.0000						
Insurance	0.4075	-0.0607	0,1290	-0.0330	0.4042	-0.0058	-0.3633	1.0000					
Awareness	0.3720	-0.0174	-0.0329	0.0010	0.3056	-0.0071	-0.3378	0.5192	1.0000				
Distance	-0.1076	0.3048	-0.6158	0.0457	-0.1424	-0.0413	0.5249	-0.1981	-0.2070	1.0000			
Residence	0.1593	-0.0743	-0.0549	0.0638	0.1531	-0.0468	-0.2269	0.2599	0.4539	-0.1945	1.0000		
Religion	0.2718	0.0347	0.0503	0.0190	0.2168	0.0140	-0.1161	0.3998	0.2319	-0.0659	0.1501	1.0000	
Desire for more children	-0.1081	-0.6158	-0.0348	-0.2009	0.0944	0.0212	-0.2929	-0.0471	-0.0222	0.4212	0.1290	0.1161	1.0000

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