ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF ECONOMICS

DETERMINANTS OF HOUSEHOLD FOOD SECURITY IN ADDIS ABABA CITY

BY
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Determinants of Household Food Security in Addis Ababa City

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DECLARATION

I hereby declare that this MSc thesis entitled as "***Determinants of Household Food Security in Addis Ababa City***" was carried out by me for the masters of economics under the guidance and supervision of Dr. Teferi Daba, Addis Ababa University, College of Business and Economics, Department of Economics. The interpretations put forth are based on my reading and understanding of the original texts and they are not published anywhere in the form of books, articles and reports. The other books, articles and websites, which I have made use of are acknowledged at the respective place in the text. For the present thesis, which I am submitting to the University, no degree or diploma or distinction has been conferred on me before, either in this or in any other University.

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Chair of department or graduate program coordinator

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LISTS OF ACRONYMS

HFIAS	Household Food Insecurity Access Scale
ESS	Ethiopian Statistics Service
FAO	Food and Agriculture Organization of the United Nations
WFS	World Food Summit
MDGs	Millennium Development Goals
SSA	Sub-Saharan Africa
ICESCR	International Covenant on Economic, Social and Cultural Rights
UDHR	Universal Declaration of Human Rights
DIKCAL	Daily Individual Kilocalorie Acquisition
SEXHH	Sex of Household Head
AGEHH	Age of Household Head
YLID	Years Lived in the House
MSHH	Marital Status of the Household Head
EDLHH	Education Level of Household Head
AMEHH	Adult Male Equivalent (for Household Head)
AME	Adult Male Equivalent
FMSZ	Family Size
PSFCE	Food Consumption Expenditure
HMONP	Home Ownership
HH INCOME	Household Income
FCT	Food Composition Table
DIKCAL	Daily individual kilo calorie

ABSTRACT

The purpose of this study was to examine household food security and its determinants in Addis Ababa by using household socio economic survey data collected by ESS and logistic regression method. The logistic regression results revealed that the sex and education level of household head, adult male equivalent, share of food consumption expenditure and household income are significant factors of food security. Accordingly male-headed households are significantly more likely to achieve kilocalorie sufficiency, with an odds ratio of 1.79 ($p = 0.010$). The results revealed that a thousand unit increases in income raises the likelihood of being food secured by approximately 2.97 times, holding other variables constant. Therefore income is found to be a strong positive association with calorie sufficiency. Another strong factor is education of household. A change in in education level give raise to the odds of kilocalorie sufficiency by 27% ($p = 0.016$). on the other hand, family composition has negative association with food security such that each additional adult equivalent decreases the odds of sufficiency by 39% ($p < 0.001$) implying the chance of large adult equivalent families for greater strain on financial and food resources. In this study a percentage increase in the share of expenditure on food raises the odds by 3% ($p < 0.001$), implying the more food budget the more likely to achieve dietary adequacy and the lower the income the more vulnerable the households are. Each unit increase in log of household income raises the odds by 8% ($p = 0.011$) revealing better financial capacity in ensuring access to adequate and nutritious food. Therefore, a policy option of supporting female-headed households, promotion of educational and enabling access to income-generating initiatives could help to improve food security.

Key Words: food, security, insecurity, vulnerability, household, determinant, variable, logistic regression.

CHAPTER ONE

INTRODUCTION

In this chapter basic frameworks are presented in order to undertake the study. It contains background of the study, statement of the problem, objective of the study, the importance of studying and the scope it covers. These sub contents are presented accordingly:

1.1. Background of the Study

Food is any substance consumed by an organism for nutritional support. It is usually of plant, animal, or fungal origin and contains essential nutrients such as carbohydrates, fats, proteins, vitamins, or minerals. The substance is ingested by an organism and assimilated by the organism's cells to provide energy, maintain life, or stimulate growth (FAO, 1997).

Human food is food that fits for human consumption and that humans are willing to eat. Not everything that can be eaten constitutes human food. Food is a basic necessity of life and humans usually seek food as an instinctive response to hunger. Humans consume a wide variety of substances for energy, entertainment and nourishment. The food types are usually derived from plants, animals, or fungi and contain essential nutrients such as carbohydrates, fats, proteins, vitamins and minerals (SAPEA, 2020). Poverty and hunger have created big influence on the access of food for households across the globe.

This covered a shadow on food security situation of the people. For about the last 50 years dozens of definitions have been articulate that were supposed food security or insecurity (Hamad et al., 2016). For this study, the most accepted definition, that of the World Food Summit's (WFS) definition is used. It explains that - *"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"(FAO, 1996).*

A household is deemed to be food secure when it possesses the means to obtain the necessary food for its members to maintain food security (Pinstrup-Andersen, 2009). Food security means that a country's inhabitants are provided with sufficient and

healthy food, everywhere and at any time, including in crisis situations (Matuschke & Kohler, 2014). Hungry people are not hungry by choice. They are hungry because they face multiple constraints - economic, social and political - that leave them trapped in hunger. Some people are hungry because of disability or misfortune. Policy responses to hunger must be multi-faceted and should aim at helping the hungry and poor to break out of the hunger trap. Responses should create opportunities for the hungry, equip them to take advantage of these opportunities, and protect them if they are unable to feed themselves by reason of misfortune (Skoet & Stamoulis, 2006).

As Martin Luther King Jr., one of the 20th century political figures once said: "when I die, do not build a monument to me. Do not bestow me degrees from great universities. Just clothe the naked. Say that I tried to house the homeless. Let people say that I tried to feed the hungry"(Dando, 2012). Such a speech portrays that the researchers, policy makers, developments experts all have to put effort to make people food secured.

In case of food insecurity households use different strategies to cope up with the problem of food. For example, they might choose to reduce the variety of food eaten as a primary strategy to reduce the impacts of food insecurity (FAO, 2015). But, governments of nation had undergone different agreements to well feed their people. The first goal of eight millennium development goals (MDGs), which the leaders of 189 countries signed in September 2000, was "to eradicate extreme poverty and hunger". The leaders agreed to reduce by half the global percentage of the population living under extreme poverty and hunger till 2015. However, the achievements have been uneven. The MDGs expired in 2015 and the discussion of a post-2015 agenda continues (Norton, 2014). Therefore this research has investigated the determinants of household food security in Addis Ababa.

1.2. Statement of the Problem

When the issue of food security is considered, rapidly urbanizing countries with the lowest levels of human development are most at risk of food insecurity (Szabo, 2016). According Macalou, the main cause of urban dwellers' food insecurity is low and irregular income which affects their access to and affordability of food. Urban areas are now more affected by food insecurity phenomena (Macalou, 2023).

At global level, cities were home to just over half of the world's population in 2015 and virtually all of the 1.1 billion increase in global population projected till 2030 years is expected to occur in urban areas (Cohen, 2015). With regard to Africa, about 800 million Africans will either migrate to, or be born in, urban areas in the next four decades. Over the next 40 years, Africa will have the fastest growing cities in the world, making the continent could be home to up to 15 mega-cities of more than 10 million inhabitants by 2050. The cities and towns will house nearly 1.5 billion people, 60 percent of the region's projected population (Racki, 2014).

Sub-Sharan Africa (SSA) is expected to experience rapid urban population growth over the next three decades. The urban population of SSA is forecasted to reach 840 million in 2050. While most of this growth is expected to occur in large cities, peri-urban areas (i.e., small and medium-sized cities and neighborhoods on the outskirts of large city centers) are also on the rise (Gustafson, 2021). This distinction is important, the study emphasizes, because smaller urban areas are tied to rural economies in different ways than large cities. Thus, Addis Ababa, a capital for Africa needs special attention as the immediate connection with rural economies might be limited. It is apparent that Addis Ababa is a fast growing city. Ethiopian population growth is estimated 2.7% in 2018/19, with unemployment rate of 2%, urbanization rate 4.98% in 2019 (WorldBank, 2023).

We have made review on researches conducted by (Gebre, 2012; Sisay, 2012) revealed that household size, age of household head, household head education, household income, ownership of bank account and income from remittance and gift, access to credit, household asset possession, and access to employment were found to be significant determinants factors for urban food security.

And to advise proper mitigation plans it is better first to know the level of urban household food security and to list down critical factors for food insecurity. There are also other studies made on household food security related issues in Addis Ababa in different times. Many of the researches are only confined to vary narrow part of the city (Firew, 2021; Gashaw, 2020; Simegn, 2020) and almost all Ethiopian urban centers household food security studies are based on smaller size data. Further some of the above mentioned studies are done on specific issues (Fasil, 2020; Guesh, 2020; Jemal, 2020; Tadesse, 2021; Tsion, 2019).

The present study has an advantage of larger representative sample, incorporation of new variable such as sustainable housing, and advantage of very recent data collected by a country level authorized for data collection and provision (the ESS). Therefore, this study is conducted to assess the level of food security and its determinants in Addis Ababa.

1.3. Research Questions

The problems identified above generate Based on the above specific objectives, the research attempted to answer the following questions:

A. What is the food security status of households with in the study area?
B. What type of relationship does sustainable housing has with food security
C. What are the factors influencing food security of the households?

1.4. Objectives of the Study

1.4.1. General objective

The general objective of this study was to assess the determinants of household food security in Addis Ababa using the data collected by 2021/22 (ESS, 2023; WFP, 2021).

1.4.2. Specific objectives

The study was conducted to accomplish the following specific objective:

- To investigate food security status of households in Addis Ababa.
- To investigate the relationship between sustainable housing and food security
- To identify the determinants of food security in the study area

1.5. Significance of the Study

The study of urban food insecurity is of paramount importance due to its far-reaching implications on public health, social equity, and economic development. As urbanization accelerates globally, understanding the determinants of food insecurity in urban areas becomes crucial for policymakers, researchers, and practitioners to develop effective interventions and policies.

Researches like this would be an addition to previous urban food security studies which are fewer than the rural. It was assumed that the research would give complete

picture of what urban food security in Addis Ababa looks like. This was because many of the previous researches were either narrower in sample and district specific or old to consider to date. This research would be the most recent research done with the data collected in between the political upheaval that prevails following the coming of prosperity party to power. It would help us to consider the role of government policy actions on the urban poor. It could be a part of series for complete city-wide researches to be done in the future. It was expected come up with strategies that the urban governments would implement for better and sustainable food security reassurance. It would serve as motivational resource to open the knowledge on food security about urban food security and help researchers to conduct further researches.

1.6. Scope of the Study

The focus of study was on investigating the determinants of household food security in Addis Ababa. It would give a focus on one of the standard measurements of food insecurity that is average household calorie intake (acquisition). It is a variable calculated through various steps of calculation based on food items consumed, calorie (energy) contribution of each food item and the adult male equivalent of households. The sample size used in the present study is larger than those used in other studies so far. The data is also the most recent data available as a source by the Ethiopian Statistics Service (ESS). Therefore, this might make it convenient to use study outcomes for intervention programs.

1.7. Organization of the Study

The study consisted of five major chapters. The first chapter is an introductory part. The second chapter is a review related literature. The third chapter dealt with the description of the study area and research method. Analysis and finding are presented in the fourth chapter, with discussion following each sub section. The conclusion and recommendations explained in the final chapter.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Food security, defined as the availability, accessibility and affordability of nutritious food for all individuals, is a fundamental aspect of human well-being and development (FAO, 2008). Urban food insecurity, a complex phenomenon influenced by various factors, has garnered significant attention from researchers and policymakers alike. Understanding the determinants of urban food insecurity is crucial for developing effective arrangements to address this pressing issue. This literature review is aimed to synthesize existing research on the key determinants contributing to urban food insecurity. It explores the economic theories underpinning food security, identifies key determinants, examines empirical evidence, and discusses policy implications (FAO, 2008; Mekonen, 2023).

2.1. Theoretical Framework of Food Security

Theoretical frameworks provide a foundation for understanding the multifaceted nature of food insecurity, offering insights into its causes, consequences, and potential solutions. This literature review aims to examine key theoretical perspectives that have been employed to analyze food insecurity, encompassing socioeconomic, ecological, and health dimensions.

2.1.1. Evolution of food security as a subject

The notion of food security has evolved over time. Initially it was focusing on ensuring an adequate food supply at country level to meet the nutritional needs of populations. This historical perspective underscores the transition from food security being synonymous with food production to a broader understanding encompassing access, utilization, and stability (Simon, 2012). Though time it becomes global issue. The Universal Declaration of Human Rights (UDHR) recognized in Article FS in article 25 in 1948. In 1966, the subject was incorporated in Article 11 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) (Mechlem, 2004).

Traditionally, discussions on food security were predominantly centered on food

conditions of rural areas where agriculture played an essential role in food production. However, with the rapid urbanization witnessed globally, attention has shifted towards understanding and addressing food insecurity within urban contexts (Dersolegn, 2023). Furthermore, the dynamics of urbanization, characterized by rapid population growth, changing dietary patterns, and unequal distribution of resources, have exacerbated food insecurity in urban areas. Factors such as poverty, unemployment, inadequate infrastructure, and food deserts have contributed to the emergence of food security in towns and cities as a critical public health and social justice issue (Acquah, 2016).

2.1.2. Theories of food security

Food security has wide coverage in many disciplines. Various theories have their own outlook about food security:

I. **Structural theory**: it emphasizes systemic inequalities and institutional factors as root causes of food insecurity. This perspective highlights the role of poverty, unemployment, income inequality, and inability to access schemes like social safety nets in perpetuating food insecurity among vulnerable populations (Coleman-Jensen et al., 2022; Thomas et al., 2019).

II. **Individual-level theory**: Individual-level theories focus on the socio-demographic characteristics and household dynamics that contribute to food insecurity. Factors such as education, household composition, employment status, and luck of being involved in social support networks are examined to understand variations in food security status among individuals (Coleman-Jensen et al., 2022).

III. **Ecological Theory**: this theory explores the relationship between environmental factors, agricultural practices and food security. Climate change, land degradation, water scarcity, and loss of biodiversity are among the environmental challenges that can affect food production, distribution, and access (Burlingame & Dernini, 2012; Friel et al., 2014).

IV. **Health Theory**: it examines the health consequences of food insecurity, including malnutrition, chronic diseases, and mental health disorders. Poor nutrition, inadequate access to healthcare, and stress associated with food insecurity contribute to adverse health outcomes among affected populations (Gundersen & Ziliak, 2015; Seligman et al., 2010).

V. **Economic Theories**: the dynamics of food security is more of the issue of economics. There are different economic theories presenting different views regarding food insecurity. Accordingly the central points of the views in these theories are presented in Table 1 below.

Appendix 1: The Dynamics of Food and Economic Theories

Economic Theory	Perspective on food Security	Reference
Neoclassical Economics	emphasizes supply & demand forces, price mechanisms, and market efficiency in determining food availability and access	(Bardhan, 1999)
Institutional Economics	focuses regarding the significance of institutions, property rights, and governance structures in shaping agricultural markets and guaranteeing food security	(Barrett, 2010)
Development Economics	highlights the importance of income distribution, poverty alleviation, and social protection programs in enhancing food access and reducing vulnerability	(Deaton, 2013)
Environmental Economics	Examines the sustainability of agricultural practices, natural resource management, and the effect of altering whether patterns on food production and distribution.	(Stern, 2006)

Source: constructed by the student

2.2. Components of Food Security

Even though food security has various components; the most commonly used are three. The first one is the availability and affordability[1] of food known as access to food. It encompasses the ability to obtain sufficient, safe, and nutritious food for an active and healthy life. The second component is availability of food. It is about the physical presence of sufficient quantities of food in a given area to meet the needs of the population foods (Djan, 2023). According to scholars like Morgan, utilization of food is among the very third components. It is about an effective use of food for nourishment and health. In urban areas, issues such as food safety concerns, lack of nutrition education, and cultural preferences influence food utilization patterns. Additionally, competing demands on time and resources may impact individuals' capacity to prepare and consume nutritious meals (Morgan, 2009).

There are various manifestations of food insecurity. These could include: stress about the cost of food, eating a limited variety of foods, eating less than we would like to eat or less frequently than we want to do or eating low cost food for compromising saving, worrying about the food staff at hand may run out before having money to buy and avoiding meals because we lack of food as well as money to buy all could be experiences of food insecurity (Burg, 2008). The classification of food insecurity may vary based on whether we consider from household perspective or community[2] perspective (Samim & Zhiquan, 2020).

2.3. Types of Household Food Insecurity

The household level food security takes food insecurity from time perspective. There are four types of food security at the household level. These are:

I. **High food security**: highly food secured households have no worries about regularly obtaining sufficient food. This level indicates a stable and reliable food supply, where individuals are able to meet their dietary needs without any worry (Nord, 2011).

[1] Some scholars consider availability and affordability as different components.
[2] Form community perspective it is classified as prolonged, acute and transitory type of food insecurity. The community level and wider area food security studies consider the issue form scale and duration perspective.

II. **Marginal food security**: this is the issue of occasional problems of adequate food access, while nutritional quality and quantity of food eaten are not substantially reduced. However, there is little or no change in the food consumed (Coleman-Jensen et al., 2022). Households may skip meals or reduce meal quantity occasionally but do not consistently reduce food intake (Nord, 2014).

III. **Low food security**: it involves reduced nutritional quality and amount variety demand, but small or no indication of fall consumption. Households at this level consuming less nutritious food (Coleman-Jensen et al., 2022). It has adverse health outcomes due to poor dietary quality, which can contribute to chronic diseases (Gundersen & Ziliak, 2015).

IV. **Very low food security**: in this category, the eating habits of one or more household members were disturbed and food consumption decreased due to the household's lack of money and other resources for food. It resulted in physical hunger (Coleman-Jensen et al., 2022). Health impacts include increased stress, significant weight loss, anxiety, and higher prevalence of malnutrition (Gundersen & Ziliak, 2015). From the literature, we understand that Household food insecurity reflects the direct experience of individuals or families, while community-level food insecurity addresses systemic and structural factors affecting larger populations.

We used the term food security and food insecurity interchangeably unless specified. This happened because there is a tradeoff between food-security versus food-insecurity. The following table presented a brief summary of food aspects and food conditions:

Appendix 2: Comparison of Food Security Vs Food Insecurity

Food Aspect	Food Security	Food Insecurity	Reference
Definition	When "*all the people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life."*	The condition of lacking dependable access to an adequate amount of affordable, nutritious food.	(Rao, 1997)
Availability	Consistent access to enough food.	Inconsistent access to enough food.	(Djan, 2023)
Economic Access	State of being able to pay for food	State of being unable or face difficulty to afford	(FAO, 2015)
Utilization	When food is used effectively and safely	When food is not used effectively or safely	(G. WorldBank, 2023)
Stability	Need food stable access of food over time	Prevail when food access fluctuates over time.	(FAO, 2015)

Source: prepared by the candidate

2.4. Empirical Literature

2.4.1. Measurements of food security

There are multiple indicators used to assess food security. Different schools used different estimates to measure food security. Some of these measures include the percentage of household expenditure of food (Smith, 2019), the average dietary energy supply per capita and the variety of foods consumed over a certain period (Pinstrup-Andersen, 2009). There also other measure like coping strategies index (CSI) which measures the regularity and intensity of coping mechanisms employed by

households. when they do not have enough food (Musafiri, 2014). The measure is numerous mainly according to the focus given and department involved in the study.

2.4.2. Determinants of household food in-security

Scholars used different ways of categorizing the determinants of household food insecurity. The most frequently applied category takes the form as demographic, socio-economic, political, environmental and climatic factors. For the case of our review it is better to explain as much factors as possible separately. These include;

1) **Marital status**: various studies have shown that marital status has an influence household food security. For instance, single-parent households may face higher risks of food insecurity due to reduced income and resources compared to two-parent households (Ruel et al., 1998). Studies further strengthen the prevalence of inverse relation and stated that single-headed households, particularly those headed by women, tend to experience higher levels of food insecurity in relation to married or cohabiting households (Mwaura, 2022).

2) **Gender of household head**: Gender dynamics within households can impact food security. Female-headed households, especially those led by single mothers, often experience higher rates of food insecurity due to lower income levels and limited access to resources compared to male-headed households (Dinku et al., 2023). There is also a review and by Negesse and his associates which revealed that female-headed households had a 1.94 times higher odds of experiencing food insecurity compared to male-headed households, in Ethiopia (Negesse et al., 2020).

3) **Age of household head:** Age can impact household food security through its association with income, employment status, and health status. Older household heads might encounter difficulties in generating sufficient income or accessing nutritious food due to retirement or declining health (Loopstra et al., 2019; Mango et al., 2014). But, other researches share the conditionality of age of household. They argue for example that older household heads on one hand have more experience, accumulated knowledge and skills to manage resources and

income properly so that they can have stable income sources. In contrast, these household heads may face health issues and physical limitations which in turn negatively affect their ability to work and generate income, expose them higher medical expenses and flip them to the range of food insecurity (Awoke, 2022).

4) **Education level of the household head**: Education is a significant determinant of household food security. Greater levels of education are related to better employment opportunities and income levels, which in turn can improve access to food and nutrition (Mango et al., 2014; Mutiah & Istiqomah, 2017). For instance a research conducted in Kenya found that the level of household food security was improved as the education attainment of the household head increased (Kara, 2020).

5) **Family size/ Adult male equivalent**: Larger household sizes often require more resources to meet food needs, increasing the risk of food insecurity, especially if income is limited (Kakota et al., 2015; Mutiah & Istiqomah, 2017). Recent scholars used adult male equivalent (AME) instead of family size because it helps to better account for the different nutritional requirements and consumption habits within households (Weisell & Dop, 2012). Some scholars agreed that AME of the household has direct relation with food security and high AME implies better food security outcomes due to higher income levels and more stable employment (Guirindola et al., 2023).

6) **Asset ownership**: In urban areas common asset is home (house) ownership (Dinku et al., 2023). Possession of savings is also a type of asset. These entitlements can serve as buffers against food insecurity by providing opportunities for income generation or as a means of accessing food during periods of scarcity (Giller, 2021). For example studies regarding home ownership asserted that there is positive effect. Because owning a home can provide financial stability and reduce housing costs, which can positively affect household income security. Accordingly home ownership is correlated to better levels of income and wealth accumulation, contributing to greater economic stability (Boehm, 2008).

7) **Household income**: Income level is a fundamental determinant of food security. Insufficient income can limit the capacity of households to acquire a sufficient amount and diversity of nutritious food (Gundersen & Ziliak, 2015; Kakota et al., 2015; Mutiah & Istiqomah, 2017).

8) **Household expenditure**: Patterns of household spending can affect food security by influencing the amount allocated to food purchases relative to other expenses (Loopstra et al., 2019; Mebrie & Ashagrie, 2023). According to Ruel, a household's spending on nonfood items adversely and significantly impacts its food security status (Ruel et al., 1998). On the other hand, the correlation between food security and the share of expenditure on food is **negative** general. A higher share of expenditure on food indicates greater economic vulnerability and higher risk of food insecurity. When a large portion of a household's budget is spent on food, it leaves less room for other essential expenses, making the household more prone to food insecurity (Russell et al., 2018).

9) **Other sources of income**: the diversification of income sources, such as remittances, informal work, or social assistance, can help mitigate food insecurity by providing additional resources to purchase food (FAO, 2019).

10) **Access to credit**: Limited access to credit or financial services can constrain households' ability to invest in productive activities or cope with income shocks, thereby exacerbating food insecurity. The availability of credit services positively shake household food security (Assefa, 2020).

11) **Access to social protection programs**: Participation in social protection programs, such as cash transfers or food assistance initiatives, can improve household food security by enhancing purchasing power and providing a safety net during crises (Beegle, 2018). Social support networks are essential in mitigating urban food insecurity by providing assistance during times of financial hardship. Robust social connections and community resources contribute to resilience against food insecurity (Coleman-Jensen et al., 2022).

12) **Employment status**: Employment status affects household income and, consequently, food security. Unemployment, underemployment, or informal employment with low wages can increase the risk of food insecurity (Ruel et al., 1998). These factors contribute to urban food insecurity by limiting individuals' purchasing power. Job instability and inadequate wages hinder households' capability to satisfy their nutritional requirements (Loopstra et al., 2019).

2.5. Food Insecurity Coping Mechanisms

Coping mechanisms for urban food insecurity can vary widely depending on the context, resources available, and the magnitude of the problem. The Livelihood Coping Strategies – Food Security (LCS-FS) is a metric employed to assess households' capacity to manage medium and long-term challenges stemming from food shortages or financial constraints to purchase food, as well as their resilience in overcoming these difficulties future. It refers to survival skills or methods used by households to survive when confronted with unanticipated livelihood failure or shocks (O'Connor et al., 2017).

There are different alternative measures that urban households take to cope up with the food insecurity they face. These include;

- **Income generation activities**: Engaging in income-generating activities, such as small-scale entrepreneurship or informal labor, can provide individuals with the means to purchase food when they are unable to access it through other means (Moseley, 2001). According to (Maxwell, 1999), Petty trading, and street food preparation and vending long women's occupations have both seen a rise in recent years. There are other more informal activities including selling local beer, gullit, enjera & kitta selling, yebokolo eshet (green maize), kitta (bread), kollo (toasted grains) and ashuki (toasted and boiled beans), engaging in informal jobs for earng such as wage labour, shoe shinning and as weyela (taxi drivers) (Melese, 2021).

- **Diversifying income base:** households diversify their income base by strengthening saving, asset sales and income response and household consumption adjustment or consumption decline to survive (Webb, 1992). According to

(Companion, 2008), Selling off less critical assets and nonproductive capital, working as day laborers, increasing petty trading activities.

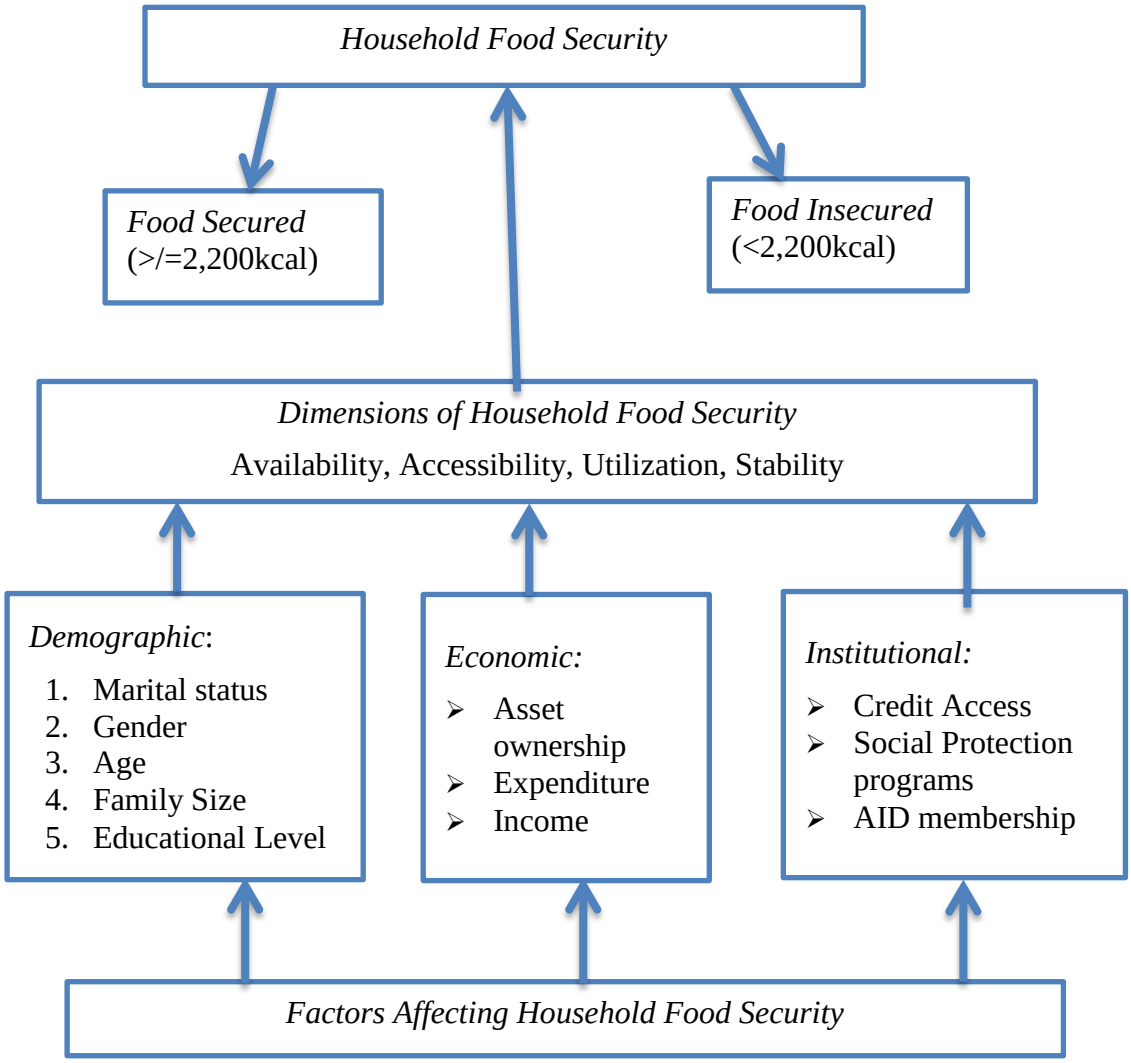
- Local governments' especially urban centers launch productive safety net programs and livelihood improvement schemes. The needy and food insecure households actively take part in such programs to attain food security and reduce the risk of sever poverty (Beegle, 2018).

- **Migration and Remittance**: food households with the risk of food insecurity and poverty send their families to search for better job in remote locations. The migration of girls and women to the Middle East is good example of these. They receive remittances from their family member. To escape continuous food insecurity, households invest the remittance in business that increases alternative streams of income, going beyond spending on consumption. Moreover, remittances exhibit a potential multiplier effect, being linked to a 4% decrease in poverty (Nanziri, 2023).

- **Involvement in "undesirable" activities**. There are certain activities that are acceptable to those who survive on them but that are deemed "undesirable" by other segments of society. These include commercial sex, theft, begging, etc. Although it was not possible to communicate directly with individuals who survived on such activities in both areas, we did learn that they existed (Tolossa, 2010).

- **Hunting and gathering** served as the cheapest source of family feeding in south Sudan. Hunter-gatherer culture is a subsistence lifestyle dependent on hunting and fishing for animals, as well as foraging for wild plants and other natural resources like honey, for sustenance. (Sassi, 2021). **Wild foods** collected through gathering and hunting play a considerable role to bolster household resilience against food insecurity in Benishangul-gumuz region (Guyu, 2015). These coping mechanisms are often interconnected and can be more effective when implemented in combination. Additionally, it's important to recognize the role of structural factors such as income inequality, employment opportunities, housing affordability, and access to healthcare in shaping the experiences of food insecurity in urban areas.

2.6. Conceptual Framework



Source: prepared by the student

CHAPTER THREE

METHODOLOGY

This chapter discusses the study area, data source, data collection methods, sample size, research design, techniques, variable description and econometric models used in the study.

3.1. Description of the Study Area

Addis Ababa was established as a royal encampment in the late 1800s during Emperor Menelik II's reign (1889-1913). Since then, it serves as capital the country and plays a central political, economic and symbolic role in Ethiopia. Here under we have discussed profile of the city.

3.1.1. Administrative and political role

Addis Ababa is one of the two self-governing chartered cities in Ethiopia with the status of a special autonomous region within the national federal government system. Being the capital of a non-colonized country in Africa, it has been playing a historic role in hosting the regional organizations such as the African Union, and the Economic Commission for Africa, which contributed to the decolonization of African countries, and later bringing Africa together (UN-Habitat, 2008b).

Its Council is accountable both to the city voters and the federal government. The city is divided into 10 sub-cities and 116 districts (sub-divisions within each sub-city) administratively the lowest units known as woredas.

3.1.2. Location and climate of Addis Ababa

The absolute location of Addis Ababa is 9º2’N latitude and 38º45’E longitude (UN-Habitat, 2008a). It is located at the heart of Ethiopia, on a plateau and surrounded by hills and mountains including Mt. Entoto in the north, Mt. Wechecha in the west, Mt. Furi in the south, and My. Yerer in the east (Gebremariam, 2018). This gives the city with an average altitude of 2,400 meters above sea level and the highest elevations at Entoto Hill to the north reaching 3,200 meters, Addis Ababa ranks among the world's high-altitude capital cities (Woldegebrael, 2021). Addis Ababa has a subtropical highland climate with a mix of alpine climate zones. Temperatures can vary by up to 10 °C (18 °F) depending on elevation and wind patterns.

3.1.3. Population

Addis Ababa, which hosts 30% of Ethiopia's urban population and serves as both the nation's capital and Africa's diplomatic hub, is among the continent's fastest-growing cities. Attracted by its strategic location and status, many individuals migrate to the city seeking employment and services. The population of Addis Ababa nearly doubles every decade, with an annual growth rate ranging between 2% to 4%. Approximately 40% of this growth is due to rural-urban migration. The city's life expectancy at birth is 65.7 years, and the infant mortality rate stands at 50.3 per 1,000 live births (Karadimitriou, 2022). According to one of the global statistics center (https://www.macrotrends.net/) the estimated population of Addis Ababa is more than 5.7 million in 2024.

3.1.4. Economy

Addis Ababa is the largest, fast growing, and demographic, economic and political center of Ethiopia, leading the country's socio economic development. The city's economy has grown rapidly over the past two decades, and it accounts for 29% of Ethiopia's GDP. But, Addis Ababa faces significant challenges such as youth unemployment, poor housing and infrastructure, sanitation management, and insufficient transportation infrastructure. In 2022, the youth unemployment rate in Addis Ababa was 30%, which was the highest in the country (ESS, 2023). High commodity price, continuous inflation and factors such as dependency and unemployment are assumed to be worsening the food insecurity of the residents. Thus this study is conducted in order to identify the major determinants of food insecurity in Addis Ababa (Eshetu, 2021).

3.2. Design of the Study

Both descriptive and econometric methods were employed. A Socio-Economic Panel Survey of the year 2021/22 was collected by the Ethiopian Statistics Service (previously known as the Central Statistics Agency of Ethiopia) in collaboration with the World Bank is supposed to be used (WorldBank, 2023). This was the 5^{th} panel survey and the data collected during this time included agriculture data, community data, household data and livestock data. Thus, we used household socio-economic survey data for this research.

3.3. Type and Source of Data

The data employed in the research is a primary data taken from the Ethiopian Statistical Service.

3.4. Methods of Data Analysis

Different methods of data analysis which are substantiating to one another were employed in the data analysis to explore the level and the key determinants of food security. Different methods have been used in the literature to measure the nature and extent of food security but none can be taken as far single best method. The choice of appropriate method primarily depends on the particular aspect of food security that is being focused i.e. availability, access or utilization. As the present study is on assessment of household food security condition and identifying its determinants, food insecurity experience measurement technique has been employed to categorize food secure and insecure households.

Regression models for ordinal response variables are designed for just this situation and are extensions of the logistic regression model for dichotomous data. The complexity in fitting ordinal regression models arises in part because there are so many different possibilities for how "success," and the consequent probability of "success," might be modeled (O'Connell, 2006).

3.5. Econometric Model Specification

There are three types of logistic regression. These are binary logistic regression, ordinal logistic regression and multinomial logistic regression. The latter two are the extensions of the first one. The ordinary logistic regression model is more preferable when response category is ordered (O'Connell, 2006) and the multinomial (polytomous) logistic regression model is used when the dependent variable has more than two nominal or unordered categories (Bayaga, 2010).

In the case of our study, the dependent variable is dichotomous meaning sample households are either food insecure or food secure. Since the proportional odds assumption is not fulfilled, binary logistic regression models are used for dichotomized response variables based upon cumulative probabilities. In addition, model building, investigating goodness-of-fit, and interpretation of the results is much

easier for binary responses. The careful application of separate binary logistic regressions represents a simple and adequate tool to analyze ordinal data with non-proportional odds (Bender, 1998). With reference to (Gujarati, 2014), the commutative logistic model can be econometrically written as below:

$$P_{i=}E(Y = 1\backslash X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_i X_i)}} \dots\dots\dots\dots\dots\dots (1)$$

Following necessary steps and using the Chernoff method we arrived at:

$$\frac{P_i}{1 - P_i} = e^{z_i} \quad \dots\dots\dots by\ Chernoff\ method \dots\dots (2)$$

Now, $(\frac{P_i}{1-P_i})$ is the ratio of the probability of a household being food insecure to the probability of not being food insecure. More specifically, it represents simply the odds ratio in favor of food insecurity. Then, taking the natural log of equation (5), we obtain:

$$L_i = \ln\left[\frac{P_i}{1 - P}\right] = Z_i = \beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n \dots\dots\dots\dots\dots (3)$$

Where; P_i is a probability that household ***i*** of being food insecure and ranges from 0 to 1; Z_i is a function of ***n*** explanatory variables (X) which can also be expressed as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + U_i \dots\dots\dots\dots\dots\dots\dots (4)$$

Where; β_0 is an intercept, β_1, β_2,…, β_n are slopes of the equation in the model, L_i is log of the odds ratio, which is not only linear in X_i but also linear in the parameters, X_i is vector of relevant household characteristics, and U_i the disturbance term .

3.6. The Expected Influence of Variables

As we observed from the related literature in the previous section there are many indicators for food security analysis. There is no single gold indicator. But the access perspective is adapted by many individuals and institution due to universally accepted measurements. Therefore we have sorted the predictors which have sufficient data to conduct the city wide analysis. The variables are presented below.

3.6.1. Calorie sufficiency (the dependent variable)

$Z_i =$ Daily individual kilocalorie acquisition (DIKCAL) or calorie sufficiency: It was chosen because it is internationally agreed that even though it didn't exactly capture the nutrition value or variety of food, it can better show the availability or shortage of food and it is important when research is done using many factor variable rather than

manly relying on the effect of income. The amount of available calories was calculated from a seven days food items consumption of different food items with different measurement units. To generate the variable it was mandatory to convert different measurement units to a common measuring unit (grams or kilograms). Next the researcher gathered the calorie value of each food item from African food composition table (Leung et al., 1968). The African FCT was preferred from the Ethiopian FCT (EHNRI, 1998) because it is more up-to-date than the Ethiopian FCT. It is an average of the global FCT and that of the Ethiopian. Further, more the Ethiopian FCT lacks fullness of the food items those urban households acquired, but the African has complements. Thus, it was generated at household level.

Next it required to calculate the adult male equivalent (AME)[3] for each household (Banks et al., 1991; Weisell & Dop, 2012). The AME is calculated by adding the adult equivalent of every family member. The logic behind is that being female, being under 18 years old and being older than 59 years old reduced food energy requirement. Thus every member's AME is the multiplicative result of respective adult calorie weight. Finally the AME of household members was summed up to generate the household AME.

As we said above, the calorie previously calculated was the household's seven days calorie acquisition. To get the daily household calorie acquisition the data was divided to seven. Then to get the daily individual kilocalorie (DIKCAL), the single day household KCAL was divided to the respective household AME. In such process the dependent variable (DIKCAL) was generated. The latest conventional minimum calorie consumption per adult per day is 2,200kcal (Cole & Ogungbe, 1987). Based on this amount the continuous data was changed to dummy such that a food secure person who got >/=2,200 kcal per day and food insecure person who got <2,200 kcal per day (Goshu et al., 2013).

3.6.2. The independent variables

X_1= **Sex of household head (SEXHH)**: Female-headed households are often more food insecure compared to male-headed households. Gender disparities in income and

[3] In economics, particularly in agricultural and resource studies, it is applied as "adult equivalent (AE)" while in in food security and nutrition studies it is used as "adult male equivalent (AME)"

employment opportunities can increase food insecurity in female-headed households (Quisumbing, 2003). Other said that women headed households are secured than male headed ones (Egah, 2023). The motive of this research is to prove which direction of relationship exists in the case of Addis Ababa households.

Appendix 3: The categorical variable description and expected values

Variable Description	Coding of Variables	Type of data	Expected Relation
Dependent Variable			
Food Security Status (DIKCAL)	Food secured = 1 Food in secured = 0		
Independent Variables			
Sex of household (SEXHH)	Male = 1 Female = 0	Binary	+/-
Age of the household head (AGEHH)	Young (20-40 years old) Adult (41-64 years old) Old (65-74 years old) Elder (>75 years old) (Reference)	categorical	+/-
marital status of the household (MSHH)	never married Widowed Separated or Divorced Married	categorical	+/-
Education level of the household head (EDLHH)	Alternate/informal/Grade 1-4 Grade 5-12 Certificate of diploma Degree and above Never educated	categorical	+
Telephone ownership (PHONP)	Has phone = 1 Hasn't phone = 0	binary	+

Source: Summarized from review of literature

X_2= **Age of household head (AGEHH)**: Older household heads may have lower food insecurity due to accumulated resources and experience. Age can bring stability and resource accumulation, reducing food insecurity (Swindale, 2006). This variable is a continuous variable by nature. But for the sake of convenience depending on the type of model and topic it could be changed to categorical variable of either standardized (Danso, 2020).

X_3 = **Marital status of the household head (MSHH)**: Married household heads are expected to have a lower probability of food insecurity. Marriage often provides economic stability and shared resources, which can reduce food insecurity (Hanson, 2007).

X_4= **Education level of household head (EDLHH)**: Higher education levels are associated with lower food insecurity. Education increases employment opportunities and income, which can mitigate food insecurity (Smith, 2007).

X_5= **Adult male equivalent (AMEHH)**: this is an important variable which is used to weight kilocalorie consumption. It is also weighted family size. When we observe the relationship with family sizes, AME<FMSZ (AME=FMSZ only when all family members are adult men). Previous research indicated that is has positive relation with food security (Guirindola et al., 2023).

X_6= **Food consumption expenditure (PSFCE)**: one ways of accessing food is through purchasing. So the share of households' expenditure on food is one variable that is expected to have impact on food security. According to Russel, higher household expenditure is associated with lower food insecurity (Ruel et al., 1998).

X_7= **Years the household lived in the house (YLIH):** Home ownership generally thought to have a direct correlation with food security. Owning a home can provide stability and reduce housing costs, allowing households to allocate more resources towards food and other essential needs (Bogale, 2025). But in this study we are going to see the relationship between the number of years a household has been living in the house (sustainable housing) and food security condition.

Appendix 4: The continuous variable description and expected values

Variable Description	**Coding of Variables**	**Type of data**	**Expected Relation**
Years lived in the house	YLIH	continuous	+/-
Adult male equivalent of the household	AMEHH)	continuous	-
Share of food consumption expenditure	PSFCE	continuous	+
Household income	LogHHY	continuous	+

Source: Summarized from review of literature

X_8= **Household Income (LogHHY)**: Higher household income is associated with lower food insecurity. Increased income improves the ability to purchase adequate food, reducing food insecurity (Nord, 2011).

With the effort to incorporate all the variables expected to have an influence on food security condition, the data on factors such as access to credit has not been included because of absence during report by the collecting authorities. The ESS reported, in the "Basic Information Document" that such data is not included in the data file and might be incorporated in the future (ESS, 2023).

Therefore, with the addition of the disturbance term (U_i) where the above 9 explanatory variables are part of the model the binary logistic model looks the following the form:

$$DIKCAL_i = \beta_0 + \beta_1(SEXHH) + \beta_2(AGEHH) + \beta_3(MSHH) + \beta_4(EDLHH) + \beta_5(AMEHH) + \beta_6(PSFCE) + \beta_7(YLIH) + \beta_8(INCHH) + \beta_9(PHONP) + U_i \ldots\ldots(7)$$

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents, analyzes, and interprets the data collected for the study. The objective of the research is to assess the level of household food security and to examine the determinants. Food security is expressed by household kilocalorie acquisition. Both descriptive and inferential statistical analyses are conducted to provide a comprehensive understanding of the study results.

4.1. Descriptive Analysis

Appendix 5: Summary of key characteristics categorical factor variables

Variables name	Variable Category	Status of food security in nos.(%)			Percentage of	
		Secured 200 (31.35%)	Insecured 438 (68.65%)	Total (Xi)	(Xi/638) *100	The Secured
Sex of the HHD	Male	131	250	381	59.72	34.38
	Female	69	188	257	40.28	36.85
Age of the HHD (in years)	Young (20-40)	96	186	282	44.20	34.04
	Adult (41-64)	81	188	269	42.16	30.11
	Old (65-75)	21	44	65	10.19	32.31
	Elder (>75)	2	20	22	3.45	9.09
Marital status of the HHD	never married	25	55	80	12.54	31.25
	Widowed	26	69	95	14.89	27.37
	Separate/divorced	25	48	73	11.44	34.25
	Married	124	266	390	61.13	31.79
Education level of the HHD	Uneducated	15	52	67	10.50	22.39
	Up to grade 4	17	60	77	12.07	22.08
	Grade 5-12	106	219	325	50.94	32.62
	Certificate/diploma	31	46	77	12.07	40.26
	Degree & above	31	61	92	14.42	33.70
phone access of HHD	Has phone	155	380	533	83.54	29.08
	Hasn’t phone	47	58	105	16.46	44.76

Source: Computed by the student based on the (ESS, 2023)

In the table above, descriptive statistics are presented to summarize the key characteristics of the sampled households. Among the households only 200 (31.35%) where found to have sufficient calorie acquisition of 2,200kal per adult equivalent per day. The majority 68.65% (438) where found to be food insecure. This finding highlights the widespread prevalence of food insecurity within the study area. It has high standard deviation of indicating substantial variation in kilocalorie acquisition among households.

For the sex of household head, the data revealed that 381 (59.72%) of households are male-headed, confirming a male-dominated household structure. This distribution reflects traditional gender roles in the region, where men often assume the role of primary decision-makers within households. Among males (381 total), 34.38% are food secure, while 65.62% are insecure. On the other hand 36.85% of females food secure while 63.15% are insecure. Females appear slightly more food secure compared to males.

The age of household head indicates that the young and the adult household heads accounted for 283 (44.2%) and 269 (42.16%) respectively. This demonstrates that household heads predominantly belong to the younger and middle-aged groups, with relatively few household heads in the older categories (65 years and above). In the dominant age group mean and standard deviation are approximately equal revealing that there is less variability. The young headed households are found to be more food secures (34.04%) while those among the elder headed households s only 9.09% food secure. This revealed that age is inversely related with food security.

In the descriptive table the analysis of marital status of the household head indicated that the majority of household heads are married, constituting 390 (61.13%) of the households. Married household heads form the dominant group while the rest three groups share the about 39% of marital status. Separated, divorced and never-married heads are less common, which may influence household dynamics and resource allocation patterns. Separated and divorced individuals show slightly better food security (34.25%) than other marital statuses, while the widowed were found to be with high level of food insecurity (72.63%).

The table disclose that 325 (50.94%) of the household heads have qualification of at most grade 12 completions and at least have passed to grade 5 which is moderate educational attainment. On the other hand, fewer individuals have advanced education, such as diplomas or degrees. The households with the uneducated head group are least food secured (22.39%). Conversely, the households headed by certificate and diploma heads are relatively high food secure households (40.26%) followed by those who attained at least first degree. This finding underscores the importance of education policies aimed at enhancing literacy and skills development.

Regarding cell phone or fixed line telephone ownership, table exposed that about 533 (83.4%) of the household heads have either cellphone or fixed line telephone. Only the remaining 16.46% does not have this property. Form telephone ownership outlook, those who own either fixed line telephone or cell phone only 29.08% food secure. But might be a surprise those households without phones far better with 44.76% food security.

Food security is generally low across the population (31.35% secured). Education plays a critical role, with those holding certificates and diplomas showing the highest security. Older individuals and the uneducated are most vulnerable in terms of food security. Interestingly, phone ownership does not correlate positively with food security.

Appendix 6: Summary of mean and standard deviation of continuous variables

Variable name	Food secured (200)		Food insecure (438)	
	mean	**Std. dv**	**mean**	**Std. dv**
Household Size (AMEHH)	3.05	1.45	4.21	1.76
Share of expenditure on food (PSFCE)	72.50	13.22	65.69	15.49
Years lived in the same house (YLIH)	14.33	15.65	14.37	14.74
Household INCOME	135,859.50	1,601,500.00	18,124.80	38,318.35

Source: prepared by the candidate

This table provides a summary of the mean and standard deviation for four continuous variables - Adult Equivalent of the Household (AMEHH), Share of Expenditure on Food (PSFCE), Years Lived in the Same House (YLIH), and Household Income (INCOME)—across two groups: food-secured and food-insecure households.

Household composition (AMEHH): The adult male equivalent of the household, representing household size, has a mean value of 3.05 in the food secured category while the mean is 4.21 for food insecure group which may increase the demand for resources and contribute to food insecurity. This showed that the lesser the family size the greater the more the household is found being food secured.

Household expenditure on food (PSFCE): Food-secured households spend a larger proportion of their expenditure on food (72.50%) than food-insecure households (65.69%). This could indicate that food-secured households prioritize food purchases, or that food-insecure households struggle to allocate sufficient funds to food.

Stability in housing (YLIH): The number of years households have lived in the same house is similar between the two groups (14.33 vs. 14.37 years). The close means and relatively high standard deviations suggest that housing tenure does not significantly differ between food-secured and food-insecure households.

Household income (INCOME): Food-secured households have a much higher average income (135,859.50) compared to food-insecure households (18,124.80). The standard deviation is very large for food-secured households (1,601,500.00), indicating high variation in income levels. This confirms that higher income is strongly associated with food security, as food-insecure households earn significantly less on average.

In conclusion, the descriptive statistics reveal meaningful patterns in the dataset. The demographic and socioeconomic characteristics of households, including age, marital status, education, and expenditure patterns, provide the foundation for further inferential analysis, which examines the relationships between these variables and kilocalorie sufficiency.

4.2. Regression Results[4]

The logistic regression results provide detailed insights into the factors influencing daily individual kilocalorie acquisition. The dependent variable in this analysis is whether households achieve kilocalorie sufficiency (1 = Secured, 0 = Insecured). Independent variables include demographic, economic, and household characteristics, enabling an exploration of their respective impacts. For each predictor variable, we have the odds ratio, standard error, z-value, p-value, and 95% confidence interval.

Sex of household head (SEXHH): the variable represents the gender of the household head, where male-headed households are coded as 1 and female-headed households are coded as 0. The odds of food security occurring are approximately 1.62 times higher for males compared to the female headed households. The p-value is 0.050, which is borderline significant at the 0.05 level. This finding reflects potential gender disparities in access to resources and decision-making authority, emphasizing the need for targeted interventions to support female-headed households.

Age of household head (AGEHH): this variable is arranged into four customized categories. The categories are young, adult, old (early pension) and elderly. Taking the elderly (above 75 years old) as a reference the dummies of all the earliest age groups are found significant variables. The logistic regression revealed how the age categories affect the likelihood of food security.

The odds of young household heads (10.679) showed that there is 10.68 times chance of being food secured in the young age group compared to the elderly household heads. The p-value of 0.009 indicates that there is strong evidence that the young category significantly impacts the odds of the occurrence of food security. A household lead by young household head has higher chance of being food secured ($p<0.05$). The odds ratio for adult category is 11.7834. It meant that the occurrence of food security is approximately 11.78 times higher for individuals in the adult category compared to the elderly category. The p-value of 0.006 indicates that this result is highly statistically significant at the 0.05 level. This showed that there is a substantial association between being in the adult category and food security.

[4] Before regression was done, the logistic regression model has passed through appropriate diagnostic tests and the result revealed that model fits the data well. The detail is presented in Annex A.

Appendix 7: Logistic Regression Results

Variable of the household head	Specific Variables	Coefficient	t-value	p-value	Sig
Sex	Male headed	1.62	1.96	.05	*
Age	Young (20-40 years old)	10.68	2.60	.009	***
	Adult (41-64)	11.78	2.76	.006	***
	old (65-75 years old)	10.92	2.61	.009	***
Marital Status	Widowed	1.88	1.43	.153	
	Separated/divorced	1.67	1.22	.222	
	Married	2.52	2.77	.006	***
Education Level	Never educated	1.35	2.06	.039	
	Grade 5 – 12		2.63	.009	
	Certificate & diploma	3.00	2.14	.033	***
	Degree and above	2.46	0.64	.52	**
Telephone access	Have telephone	0.52	-2.60	.009	***
Family size	Adult equivalent	0.56	-7.19	0	***
Percentage share of Expenditure on food	from total Expenditure	1.03	3.98	0	***
Sustainable housing	Years lived in the house	1.02	2.29	.022	**
Income	Household income	2.97	2.89	.004	***
	Constant	0.01	-4.07	0	***

Logistic Regression		Number of obs	638
		LR Chi-square (16)	138.129
Log likelihood	-327.67975	Prob > chi2	0.000
		Pseudo r-squared	0.174

**** p<.01, ** p<.05, * p<.1*

Source: Logistic regression output

The third category of household heads old category (odds ratio: 10.9167) the occurrence of food security is 10.92 times higher for the old category. The p-value of 0.009 indicates that this result is statistically significant at the 0.05 level. Even though lesser when compared to the young age category, being in the pensioner (old age group) plays a significant role in the likelihood of the being food secured.

In general, the significant p-values (all below 0.05) indicate that these age categories (young, adult, and old) have a meaningful and statistically significant impact on the likelihood of ensuring food security. These results suggest age is an important predictor of the outcome in your logistic regression model.

Marital status of the household head: has four customized categories. These are never married, married, separated or divorced and widowed. He never married category was taken as a reference and the impact of marital status on food security. But the impact of being separated or being divorced household heads on food security is not statistically significant ($p = 0.222$), suggesting no strong evidence of an effect. Likewise lead by the widowed household head is not statistically significant ($p = 0.153$).

But one of the marital status categories, married household (odds ratio: 2.52) has significant impact on food security. This means that the odds of the dependent variable food security occurring are approximately 2.52 times higher for individuals in the married category compared to those in the never married category. The odds ratio indicates a proportional increase in the odds of occurrence. The p-value (0.006) suggests that this result is highly statistically significant at the 0.05 level, indicating strong evidence that being married significantly impacts the odds of being food secured.

Education level of household head: This variable has five categories consisting no education, attained up to grade 4 only, and learned from grade 5 to grade 12, certificate and diploma and degree and above education levels. Education category of those who learned alternative and informal education and formal education up to grade 4 only have been taken as reference. Based on these the impact of households' level of education on their food security status was regressed. The no education

category is not statistically significant (p = 0.520). All education level above grade 5 is found statistically significant.

Education level of grade 5-12 (odds ratio: 2.05): The odds of food security occurring are approximately 2.05 times higher for those household heads who at least learned up to grade 5 and at most took grade 12 exam in comparison with informal or alternative of primary level first cycle educated household heads. The p-value of 0.039 indicates that this result is statistically significant at the 0.05 level. This result suggests that this particular education level is associated with a higher likelihood of the food security.

Household heads with certificate or diploma education level (odds ratio: 2.996): The odds of occurrence of being food secured are approximately 2.996 times higher for certificate or diploma holders as compared to the lower level educated household heads. The p-value indicates that this result is highly statistically significant at the 0.05 level. In other worlds individuals that have certificate and diploma are significantly more likely to experience food security compared to less educated group. This result suggests a strong association between this education level and the outcome.

Education level of degree and above (odds ratio: 2.46): The odds of food security occurring are approximately 2.46 times higher for the households who are qualified first degree and above. The p-value indicates that this result is statistically significant at the 0.05 level. This result highlights a notable association between this education level and the food security. In general, understanding these education-related effects can be crucial for targeted interventions, policy-making, and resource allocation. This underscores the transformative role of education in improving household nutrition, likely due to enhanced decision-making skills and access to economic opportunities. Policies that promote educational attainment, particularly for vulnerable groups, can have far-reaching effects on food security.

Access to Phone (odds ratio: 0.5233): The odds of calorie sufficiency occurring are approximately 52.33% lower for those household heads who have a phone telephone. The p-value of 0.009 indicates that this result is statistically significant at the 0.05 level. Having a phone is associated with a significantly lower likelihood of food

sufficiency which might be either due to extra telephone expenses or and food budget shortage. This result may is unlikely to be due to random chance, given its statistical significance.

Adult male equivalent: The odds of calorie sufficiency occurring are approximately 44.06% lower for each unit increase in weighted household size (AMEHH) ($p < 0.001$). The negative association between AMEHH and kilocalorie sufficiency highlights the challenges of resource distribution in larger households. Larger households may experience greater strain on financial and food resources, necessitating targeted support for such households to ensure equitable access to nutrition. Higher assets or monthly expenditure may indicate better financial stability, leading to a lower risk of calorie sufficiency.

The percentage share of expenditure on food positively impacts kilocalorie sufficiency, with each percentage point increase in food expenditure raising the odds by 3% ($p < 0.001$). This finding indicates that households prioritizing food in their budgets are more likely to achieve dietary adequacy. It also underscores the vulnerability of low-income households, for whom food constitutes a significant portion of their expenditure.

Number of years household lived in the house: The odds ratio is 1.017. This shoes that there is a positive impact of years lived on calorie sufficiency. The log of odds ratio for calorie sufficiency increases by 0.017.

Household income: is another significant predictor, with higher income associated with better kilocalorie sufficiency. A thousand unit increase in income raises the likelihood of being food secured by approximately 2.97 times, holding other variables constant. In other words, the independent variable has a strong positive association with calorie sufficiency. This finding reflects the essential role of financial capacity in ensuring access to adequate and nutritious food. Income-generating initiatives and social safety nets could help bridge gaps in food security for low-income households.

4.3. Core Findings of the Study

Although variables such as age of household head, marital status, and home ownership were not statistically significant, their indirect impacts on food security

should not be dismissed. For example, marital status may influence household stability, while homeownership can contribute to long-term economic security. Future studies could explore these relationships further.

As the study is on urban center three out of the five theories of food are very important. These are the structural theory which emphasizes systemic inequalities and institutional factors such as unemployment and income inequality, the individual-level theory that focuses on socio-demographic characteristics such as education, and economic theory that focuses on all economic factors. According to our data analysis factors covered in the present study have the following impact on food security.

Gender and food security: according to literature, female- headed households were found to be more prone to food insecurity. The current data conform with literature such that Male-headed households are 1.62 times more likely to achieve food security compared to female-headed households ($p = 0.050$). This may call especial intervention or affirmative economic action to support female headed households.

Age and food security: in the study the adult age household heads have the highest likely hood of being food secured (11.78 times higher than the elderly) followed by the very young age group of household heads (10.68 times higher likelihood of food security). In the literature part, some wrote the positive relation between food security arguing that as age increase people got lots of experience and lesson, they accumulate wealth and get the expertise to well manage resources. Those who argue about the opposite relationship stated that older people are more prone to health and medical expenses, they are less powerful to fully generate income and therefore they older age is the cause to food insecurity. According to our study, the young and adult age groups are safer from food security and the focus of support should be on the elderly and old group in order of proneness.

Marital status and food security: the married household heads are 2.52 times higher likely to be food security compared to never married ($p = 0.006$). Groups like widowed or separated and divorced have no significant impact on food security. Being two than being single might have big role of cumulative wealth management knowledge, and resource generating power. This finding conforms to the literature.

Education and food security: We found that education has strong impact on food security condition. In our study, the odds ratio of certificate or diploma holders is 2.996 while the odds of the first degree and above group is 2.46 times that of lower primary educated group. This result holds to literature. Previous works stated that greater levels of education are related to better employment opportunities and higher income levels. Thus, the attention of authorities and policy makers should be on improving the access to and quality of education.

Family size (adult male equivalent) and Food Security: the average the weighted average household size is 3.848 in our study area. It is a moderate household size. According to literature, both positive and negative relation was revealed. In our study, each unit increase in household size reduces the likelihood of kilocalorie sufficiency by 44.06% ($p < 0.001$). This conveys that most of larger family households are prone to food insecurity. So public discourses and family planning policies are better towards having food secured urban households.

Expenditure on food[5] and food security: The regression result revealed that each percentage point increase of the expenditure on food raises the likelihood of kilocalorie sufficiency by 3% ($p < 0.001$). But, the descriptive statistics showed that households spend 67.823% of their income on food, underscoring economic vulnerability. We discovered through literature review that totally higher expenditure affects food security by increasing vulnerability to food insecurity.

Household income and food security: A thousand unit increases in income raises the likelihood of being food secured by approximately 2.97 times, holding other variables constant. In other words, the independent variable has a strong positive association with calorie sufficiency.

Telephone ownership and food insecurity: we found a negative relation between food security and telephone ownership. Households with a phone are 52.33% less likely to achieve kilocalorie sufficiency ($p = 0.009$). The descriptive statistics indicated that only 16.6% of households did not haven cell phone or fixed line telephone. It might be due to operating expenses like utility payments that reduce the ability to afford food security. Some literatures argued for positive relationship

[5] Expenditure on food is the share of total household expenditure that is disbursed on food items.

because telephone access increases information communication and access to chipper life. It may require further and detail study. Expend

Sustainable housing and food security: This is one of the variables which are not assessed many times. Studies focus on where a household have own house or rented house or free house than sustainable living. It was found in our research that each additional year in the same living house increases the likelihood of kilocalorie sufficiency (odds ratio: 1.017). Therefore, urban authorizes shall focus on providing sustainable living houses to their people.

To conclude, the regression results highlight the multifaceted determinants of kilocalorie sufficiency, emphasizing the importance of marital status, age, education, household size, income, sustainable housing and expenditure priorities. These findings underscore the need for integrated policies that address the diverse drivers of food security, ensuring that all households have the resources and knowledge needed to meet their dietary needs.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

In this chapter the summary of the research findings and policy options are presented. This study was conducted in order to investigate the household food security status of Addis Ababa and to identify determine factors. A survey household data was used and based on the nature of the subject under study and the available data logistic regression model was employed.

5.1. Conclusion

This study examined the status household food security and its determinants in Addis Ababa by using a comprehensive econometric analysis. The findings reveal that food insecurity remains a significant challenge (covering 68.65%) for many urban households, influenced by multiple socio-economic and demographic factors. The descriptive and regression analyses highlighted key determinants of food security, including gender, education, household size, income levels, and food expenditure patterns.

Specifically, households headed by males, those having young and adults households heads were more likely to be food secure. In the same manner, households headed by married household heads, those with higher education levels and those with earning higher income indicated to have better chance of being food secure. The study also revealed that households living sustainably in the same house and those who did not own telephone are in a position to stay food secured.

In contrast, household headed by female heads, those having larger household sizes and earning lower income were associated with increased vulnerability to food insecurity. Households lead by heads found in the old and elder age group was found to have higher probability of being food insecure. Getting separated or divorced and staying being single is also among the vulnerability factors towards food insecurity. Households experiencing temporary residence fashion have higher probability of being food insecure.

The findings of the research regarding the impact of gender on food security agreed with the theoretical as researches like that of (Dinku et al., 2023; Nafees et al., 2021).

Education tested having strong influence of food security goes like what the literature agreed (Mango et al., 2014; Mbuthia et al., 2017). Income of the household was found another significant factor. Higher income groups were found having better kilocalorie acquisition level. The finding agreed with previous food security study findings (Mutiah & Istiqomah, 2017).

Interesting finding that deviates from the theoretical part is the inverse relation between weighted household size (adult equivalent) and food security. It was explained having positive association (Guirindola et al., 2023). But our finding is negative association revealing additional adult equivalent decrease the odds of sufficiency by 39% ($p<0.001$).

5.2. Recommendations

From the descriptive part we understand that the highly prevailing household food security is very serious when we look from gender perspective. We have seen that only 34.5%are females in the food secured group but they are 42.29% in the food Insecured group. Therefore, interventions targeting female headed households should be designed and implemented. Intervention mechanisms might be those income rising mechanisms like job creation, special subsidies and related women empowerment programs.

Age of the household head has a crucial impact on food security condition. Households leads by the pension age group old and elders household heads were found being vulnerable to food security. This might be due to either lesser rate of pension or lack of income generating capacity or frequent medical expenses. Thus, it might be important to improve the capability of households to get health insurance coverage, to increase income generating alternative sources and in the long run to improve the pension rate.

The study also underscores the importance of education, as households led by individuals with higher educational attainment demonstrated better food security status. This suggests that education can lead to improved employment opportunities and better financial management, thereby enhancing food access and affordability. Improving access to education and awareness is also crucial in addressing food insecurity. Educational programs that promote financial literacy and household budget

management can help families make informed economic decisions and prioritize essential expenditures. Additionally, integrating nutrition education into school curricula can equip future generations with knowledge about healthy dietary habits.

The marital status of the household head has very meaningful impact on food security. Only being married was found to be significant. Being two than being single, the shared power to generate and implement ideas, to search for and engage in alternative income generating activities, being socially respected and guaranteed in traditional social support institution like Idir might have a role for married households than those never married or those who got separate or divorced from their partner or those lost their partner. This might need further research. But, in any case it is important that our advocacy should be supporting of getting married and staying married. Costs of marriage might be revised and special encouragement might be implemented for young who planned to get married.

Another significant food security determinant is household income. Household income has a strong positive association with calorie sufficiency. The recommendation here comes what could improve the income of the household? Income-generating initiatives and social safety nets could help bridge gaps in food security for low-income households. Local policy designers might consider on creating job opportunities, enabling access to small scale trade and provision of fund to the vulnerable segment of the households.

Sustainable housing is also a significant predictor of housing. Accordingly households who lived longer in the same house were found to be more likely food secured. Thus, developing policies that support affordable housing schemes, such as subsidized rental programs and cooperative housing models, can reduce financial pressures and enable families to allocate more resources towards food security. Homeownership provides stability and reduces vulnerability to economic shocks, thereby enhancing long-term food security prospects for urban residents.

Expenditure priorities played a crucial role in determining food security, with households allocating a greater share of their income on food exhibiting higher security levels. But this might indirectly show the vulnerability and lack of asset bearing investment. It might call for further research.

The access to telephone was found to be negatively related. The researcher believed that it might be due to higher telephone expenses. This variable is a necessary variable in life as we are in the era of information technology. Thus, it is better to study whether families are using the phone for basic information access or the household head themselves or their family members use it for games and useless chats. Detailed study matters but access to phone will continue to be encouraged. What matters must be the purpose the phone is used for.

In general pro-poor policies and strategies such as social protection programs, income diversification strategies, those focusing on enhancing economic stability, and improving access to education can significantly improve food security outcomes in Addis Ababa. To further improve food accessibility and market stability, small and medium enterprises (SMEs) by providing financial and technical support to enhance their productivity and sustainability. Encouraging household-level urban farming and establishing community gardens can improve food sources and reduce dependency on market-bought produce.

The complete absence of data on access to credit and the limitations on the data on access to productive safety net programs (therefore not incorporated in this research) were the limitations of this study. Researchers who conduct incorporating such variables might bring their own result on the issue covered in this research.

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APPENDICES

7.1. Diagnostic Test of the Econometric Model

7.1.1. Maximum likelihood estimation (MLE)

The maximum likelihood estimation (MLE) method is appropriate to estimate the unknown coefficients (parameters) included in the model. MLE is preferred due to this less restrictive nature of the underlying assumptions. It is a method for estimating the parameters of the logistic regression model.

Decision rule and interpretation: The estimates are considered good if they maximize the likelihood function. Interpret the coefficients as the log odds of the dependent variable being 1 for a one-unit change in the independent variable.

Appendix Table 1: Logistic Regression MLE output

Variable Name	DIKCAL	Coef.	p-value	Sig
Sex of household head	Male headed	.482	.05	*
Age of household head	Young	2.368	.009	***
	Adult	2.467	.006	***
	Old	2.39	.009	***
Marital Status household head	Widowed	.633	.153	
	Separated/ divorced	.51	.222	
	Married	.923	.006	***
Education level of household head	Grade 5 to 12	.718	.039	**
	Certificate & diploma	1.097	.009	***
	Degree & above	.9	.033	**
	Never Educated	.297	.52	
Phone Access	Have Phone	-.648	.009	***
Family composition (AMEHH)		-.581	0	***
Food Consumption Expenditure (PSFCE)		.029	0	***
Sustainable Housing (YLIH)		.017	.022	**
Household Income (HHY)		.084	.004	***
Constant		-5.118	0	***
The loglikelihood = -327.679795				
Pseudo r-squared	0.174	Number of obs	638	
LR Chi-square (16)	138.129	Prob > chi2	0.000	
*** p<.01, ** p<.05, * p<.1				

Source: Stata Test Output

Test results and implications:

Log likelihood: -327.67975 - Indicates the fit of the model; higher values (less negative) indicate a better fit.

LR chi2 (16): 138.13 - The Likelihood Ratio chi-square test statistic with 9 degrees of freedom.

Prob > chi2: 0.0000 - The p-value associated with the chi-square statistic.

Pseudo R2: 0.1741 - Indicates the proportion of variance explained by the model.

Hypothesis:

$\mathbf{H_0}$: All coefficients in the model are equal to zero (i.e., the model with only the intercept is as good as the model with the predictors).

$\mathbf{H_1}$: At least one of the coefficients is different from zero.

When the p-value (Prob > chi2) is compared to the significance level (typically 0.05), the p-value (0.0000) is less than 0.05, we **reject the null hypothesis (H0)**.

Thus, the logistic regression model is statistically significant, meaning that at least one of the predictors significantly contributes to the model.

7.1.2. Variance inflation factor (vif) test

The VIF test is conducted to check the prevalence of multi-collinearity. Accordingly the following hypothesis was tested:

- **H0**: There is no multi-collinearity among the predictor variables.
- **H1**: There is multi-collinearity among the predictor variables.

The multi-colliniarity test gives the following output. Accordingly:

Appendix Table 2: Variance Inflation Factor (VIF) test output

Variable	VIF	1/VIF
Age of household young	9.768	.102
Age of household adult	8.677	.115
Age of household old	3.677	.272
Educated from grade 5 to 12	2.744	.364
Married household head	2.708	.369
widowed household head	2.432	.411
Educated degree and above	2.151	.465
Certificated & diploma educated	1.911	.523
Divorced/separated household	1.897	.527
Never educated	1.736	.576
Male headed household head	1.591	.629
Sustainable housing	1.379	.725
Household composition	1.264	.791
Food consumption expenditure	1.129	.886
Household income	1.067	.937
Having Telephone access	1.02	.98
Mean VIF	2.822	.

Source: Stata Test Output

We see from the stata output of VIF test that the maximum VIF = 9.60, mean VIF = 2.86 Therefore, the model is fit. So there is no multicollinearity and the model is fit. The criterion for model fit is based on the general rules of thumb for interpreting Variance inflation factor (VIF) values is:

1) VIF = 1: No correlation among the predictor variables.
2) 1 < VIF < 5: Moderate correlation, generally considered acceptable.
3) VIF > 5: High correlation, indicating potential multicollinearity problems.
4) VIF > 10: Serious multicollinearity, which may require correction.

Based on this rules, the dummies from age of household have resulted in high correlation. But this is not greater than 10 and therefore we fall to reject the null

hypothesis. The mean VIF is 2.86, which enable the researcher to conclude, on average, the level of multicollinearity across all variables is moderate. On the other hand, low tolerance which is the reciprocal of VIF (1/VIF) must be below 0.1. we have tolerance range to accept not to reject H0.

7.1.3. Omnibus test results

The Omnibus test is used to determine if the logistic regression model as a whole is statistically significant. Hypothesis:

- **H0**: All coefficients in the model are equal to zero (i.e., the model with only the intercept is as good as the model with the predictors).
- **H1**: At least one of the coefficients is different from zero.

The Omnibus test output table is the same as the MLE output (see table ..). During the Omnibus Test we have to compare the p-value of the Omnibus Test to the significance level (usually 0.05). The decision rule follows as, (i) if p-value < 0.05 to reject the null hypothesis; if (ii) if p-value = 0.05, the model is at the threshold of statistical significance and if p-value > 0.05, then the model as a whole is not statistically significant.

From table 5, we observed that the p-value associated with the chi-square statistic is 0.0000 which is less than the significance level (0.05), we reject the null hypothesis (H0).

- The logistic regression model is statistically significant, meaning that at least one of the predictors significantly contributes to the model. This model provides valuable insights into the factors affecting food security in urban households in Addis Ababa, Ethiopia.

7.1.4. Hosmer-lemeshow test

We have set a null hypothesis such that

- **H0**: The model fits the data well.
- **H1**: The model does not fit the data well.

Note: observations collapsed on 10 quantiles of estimated probabilities.
Goodness-of-fit test after logistic model.

Appendix Table 3: The Stata Output for the Hosmer - Lemeshow Test

Variable	DIKCAL
Number of observations	638
Number of groups	10
Hosmer–Lemeshow chi2(8)	4.99
Prob > chi2	0.7590

Source: Stata Test Output

The dataset used in the logistic regression model has 638 observations. The observations were grouped into 10 quantiles based on the estimated probabilities. Hosmer-Lemeshow chi2 (8) = 4.99. The p-value associated with the chi-square statistic is 0.7590. The Hosmer-Lemeshow goodness-of-fit test compares and measures the deviation between observed and expected frequencies of the outcome in different quantiles of the predicted probabilities.

A lower chi-square value indicates a better fit of the model. The chi-square value of 4.99 suggests that the observed and expected frequencies are quite similar. A higher p-value (typically greater than 0.05) suggests that the model fits the data well. Since the p-value (0.7590) is much greater than 0.05, we fail to reject the null hypothesis that the model fits the data well. This indicates that there is no significant difference between the observed and expected frequencies, suggesting a good fit.

Conclusion: The logistic regression model fits the data well. The model's predictions are in good agreement with the observed outcomes.

Appendix Table 4: Logistic Regression Results

Logistic Regression		Number of obs	638
		LR Chi-square (16)	138.129
Log likelihood	-327.67975	Prob > chi2	0.000
		Pseudo r-squared	0.174

Variable name	DIKCAL	Coef.	t-value	p-value	Sig
Sex of household head	Male headed	1.62	1.96	.05	*
Age of household head	Young	10.679	2.60	.009	***
	Adult	11.783	2.76	.006	***
	Old	10.917	2.61	.009	***
Marital Status household head	Widowed	1.883	1.43	.153	
	Separated/ divorced	1.665	1.22	.222	
	Married	2.517	2.77	.006	***
Education level of household head	Grade 5 to 12	2.05	2.06	.039	**
	Certificate & diploma	2.996	2.63	.009	***
	Degree & above	2.461	2.14	.033	**
	Never Educated	1.346	0.64	.52	
Phone Access	Have Phone	.523	-2.60	.009	***
Family composition (AMEHH)			-7.19	0	***
Food Consumption Expenditure (PSFCE)			3.98	0	***
Sustainable Housing (YLIH)			2.29	.022	**
Household Income (HHY)			2.89	.004	***
Constant		.006	-4.07	0	***

**** p<.01, ** p<.05, * p<.1*

Source: Logistic regression output