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Ethiopian Civil Service University
Building Capacities in the public Service

ETHIOPIAN CIVIL SERVICE UNIVERSITY

COLLEGE OF FINANCE, MANAGEMENT, AND DEVELOPMENT

DEPARTMENT OF DEVELOPMENT ECONOMICS AND MANAGEMENT

DETERMINANTS OF HOUSEHOLD FOOD SECURITY IN ADDIS ABABA CITY ADMINISTRATION

A Thesis Submitted to department of Development Economics Program, College of Finance, Management, and Development, Ethiopian Civil Service University, in partial Fulfillment of the Requirements for the Degree of MASTER OF SCIENCE IN DEVELOPMENT ECONOMICS.

By

ESTIBEL DAGNE

ECSU1902287

Advisor: Amanuel Kussie(PhD)

June, 2022

Addis Ababa, Ethiopia

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Determinants of Household Food Security in Addis Ababa City Administration

MSc. Thesis

By

Estibel Dagne Mekonnen

ECSU1902287

Advisor:

Amanuel Kussie (Assistant Prof)

A Thesis Draft Submitted to the Development Economics Department, College of Finance, Management and Development Studies, Ethiopian Civil Service University, in partial fulfillment of the Requirements for the Degree of Master of Science in Development Economics.

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DECLARATION

I, Estibel Dagne Mekonnen, Registration Number/I.D. Number ECSU1902287, do hereby declare that this thesis is my original work and that it has not been submitted partially; or in full, by any other person for an award of a degree in any other university/institution.

Name of Participant……. Signature……. Date…….

This Thesis has been submitted for examination with my approval as College supervisor.

Name of Advisor……Signature……. Date……

APPROVAL

Ethiopian Civil Service University

School of Graduate Studies

The undersigned certify that they have read and hereby recommend to the Ethiopian Civil Service University to accept the thesis submitted by Estibel Dagne with ID number ECSU1902287, and entitled "Determinants of Household Food Security in Addis Ababa City Administration", in partial fulfillment of the requirements for the award of a Master's Degree in Development Economics.

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Name of Chairman Signature Date

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Name of Internal Examiner Signature Date

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Name of External Examiner Signature Date

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Name of Department Head Signature Date

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ACRONYMS

CI	Confidence Interval
CSA	Central Statistical Agency
ECA	Economic Commission of Africa
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HDDS	Household Dietary Diversity Score
HFIA	Household Food Insecurity Access
HFIAP	Household Food Insecurity Access Prevalence
HFIAS	Household Food Insecurity Access Scale
HH	Household
HRP	Humanitarian Response Plan
IPC	Integrated Food Security Phase Classification
IFAD	International Fund for Agricultural Development
MLE	Maximum Likelihood Estimation
NGO	Non-Governmental Organization
NMA	National Meteorological Agency (Ethiopia)
OLS	Ordinary Least Square
OAU	Organization of Africa Unity
UNICEF	United Nation International Children's Emergency Fund
UPSNP	Urban Productivity Safety Net Programme
USAID	United State Agency for International Development
USD	United State Dollar
VIF	Variance Inflation Factor
WFP	World Food Programme
WHO	World Health Organization

ABSTRACT

In recent years, the prevalence of undernourishment was 30 percent for sub-Saharan Africa, compared with 16 percent for Asia and the Pacific (Ali, 2011). In Ethiopia, almost 40 percent of the total population in the country and 57 percent of Addis Ababa population lives below the international poverty line of US$ 1.25 per day (UNICEF, 2009). This study aims to analyze the determinant of household food secrity in Addis Ababa city administration. Primary data were collected from a survey of 256 households in the selected sub-city, namely Addis Ketema, Arada, and Kolfe Keranio, in the year 2022. Both Purposive and multi-stage cluster random sampling procedures were employed to select study areas and respondents. Descriptive statistics and order logistic regression model were used to test the formulated hypotheses. The result reveals that out of the total sampled households, 25% them were food secured, 13% were mildly food insecure, 26% were moderately food insecure and 36% were severely food insecure. The study indicates that household family size, house ownership, household income, household food source, household asset possession, household awareness on inflation, household access to social protection program, household access to credit and saving and household access to training and supervision on food security have a positive and significant effect on the likelihood of household food security status. However, marital status of household head, employment sector of household head, dependency ratio and household's nonfood expenditure has a negative and significant influence on household food security status. The study finally suggests that the government in collaboration with financial institutions and NGO should work on sustaining household food security by creating awareness, providing credit, facilitate rural-urban linkage between producer and consumer and work on urban infrastructure improvement. Moreover, the governments also work closely and monitor consumer good suppliers, if possible find a way to subsidize consumable goods to more insecure households and make them to be food secured. Last but not least, keeping this country's peace will play a crucial role to sustain food security.

Key word: Determinants, Household, Food Security, Order Logit Model, Addis Ababa

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Household food security exists when families have adequate physical, social, and economic access to enough, safe, and nutritious food to meet their members' dietary needs and food preferences for an active and healthy life (Smith & Kassa, 2017). According to FAO (2019), one of the underlying causes of all forms of malnutrition, including insufficient quantity, poor quality, and continuity of diet, remains a major challenge around the world.

Hunger began to rise in the mid-2010s, dashing hopes of an irreversible decline. Worryingly, hunger increased in absolute and proportional terms in 2020, outpacing population growth: 9.9 percent of all people are estimated to be undernourished, up from 8.4 percent in 2019. More than half of all undernourished people (418 million) live in Asia, more than one-third (282 million) in Africa, and a smaller proportion (60 million) in Latin America and the Caribbean. The sharpest rise in hunger, however, was in Africa, where the estimated prevalence of undernourishment – at 21 percent of the population – is more than double that of any other region (FAO, IFAD, UNICEF, WFP, WHO, 2021). According to the FAO, IFAD, UNICEF, WFP, and WHO (2021) joint report, hunger will not be eradicated by 2030 unless bold action is taken to accelerate progress, particularly actions to address inequality in food access. If all else remains constant, approximately 660 million people may face even greater challenges in 2030, owing to the pandemic's long-term impact on global food security.

While the global prevalence of moderate or severe food insecurity has been gradually increasing since 2014, the estimated increase in 2020 was equal to the previous five years combined. Nearly one-third of the world's population (2.37 billion) did not have adequate food in 2020, an increase of nearly 320 million in just one year. In 2020, nearly 12% of the global population was food insecure, representing 928 million people-148 million more than in 2019 (FAO, IFAD, UNICEF, WFP, 2021).

Today, the world is facing a potential food security crisis as a result of a growing population and a lack of secure supply of safe, nutritious, and sustainable high-quality food with lower inputs, as well as other environmental changes and diminishing resources as a result of global climate change (Weingärtner, 2009; Bremner, 2012; and Fróna et al., 2019). Despite some progress, most countries are not on track to achieve the goal of eradicating poverty and hunger, and rising population growth makes eradicating hunger

even more difficult. Food security requires that sufficient quantities of adequate food are regularly available, that individuals have adequate incomes or other resources to purchase or exchange for food, that food is adequately prepared and stored, that individuals have sound knowledge of nutrition and childcare that they use, and that individuals have access to adequate health and sanitation services (Weingärtner, 2009; Bremner, 2012; and Fróna et al., 2019).

Over the last two decades, Ethiopia has made significant development gains by reducing poverty and increasing investments in basic social services. However, food insecurity and malnutrition continue to stymie economic growth. WFP supports the Government's Productive Safety Net Programme (PSNP), which provides predictable, multi-year assistance to millions of chronically food-insecure households in order to help them transition away from relying on chronic emergency food assistance.

According to the Humanitarian Response Plan (HRP) for 2021, an estimated 13.2 million Ethiopians are food insecure. Drought and failed harvests have left a negative legacy for many families, who have lost livestock and other productive assets. The Somali region remains the epicenter of drought and has also been prone to flash floods. In addition to natural disasters, conflict and unrest have recently contributed to increased food insecurity in Northern Ethiopia, as fighting uproots families and negatively impacts agricultural harvests and planting. The country has the continent's second-largest refugee population, with over 795,000 registered refugees from Eritrea, Somalia, South Sudan, and Sudan. Despite these challenges, the Government's five-year Growth and Transformation Plans aim to move the country to middle-income status by 2025 by sustaining rapid growth and hastening structural transformation. The World Food Programme (WFP) contributes to this goal through a variety of life-saving and resilience-building activities aimed at vulnerable populations experiencing acute and chronic food insecurity (including refugees and internally Displaced Persons) and those at risk of malnutrition.

Despite several efforts made in Ethiopia to improve overall food insecurity, it remains a major issue since a long time (Moroda et al., 2018). As of May 2021, 5.5 million people (61 percent of the population) are experiencing acute food insecurity: 3.1 million are in Crisis (IPC Phase 3) and 2.1 million are in Emergency (IPC Phase 4). This is despite significant humanitarian food assistance reaching up to 5 million people in recent months (IPC, 2021). Ethiopia's government has a long-term strategy of agricultural development-led industrialization that continues to address the country's food insecurity and is

supplemented by Ethiopia's Food Security Programme, which includes the Productive Safety Net Programme, the Household Asset Building Programme, and others designed to ease households out of food insecurity (Boere et al., 2018).

As a result, it is critical to identify the determinants of food security at the household level using a household-based cross-sectional study in order to design appropriate strategies to help reduce the problem. This study attempted to identify the determinants of food security in Addis Ababa, Ethiopia.

Statement of the Problem

Although the majority of the world's poor now live in rural areas, the urban poor are significant and cannot be ignored. In 1993, 19 percent (247 million people) of the 1.3 billion people living in extreme poverty (i.e., on less than US $1 per day) lived in cities. By 2002, the number of people living in extreme poverty had fallen to 1.2 billion, but the urban share had risen to 25%, and the number of poor urban residents had risen to 300 million (Cohen & Garrett, 2010).

Despite the fact that Asia and the Pacific have the greatest number of undernourished people (578 million), Sub-Saharan Africa has the highest prevalence of malnutrition. In 2005–2007, the prevalence of malnutrition in Sub-Saharan Africa was 30%, compared to 16% in Asia and the Pacific (Ali, 2011). Food insecurity is rapidly worsening in Eastern Africa- an estimated 81.6 million people including internally displaced people, refugees and host communities in rural and urban areas are facing high acute food insecurity. This represents about 39 percent increase from the 58.6 million recorded in November 2021. As per WFP Regional Food Security and Nutrition Update (2022), Ethiopia (20.4 million people), Sudan (9.8 million people) and South Sudan (7.74 million people) recorded the largest number of people affected by acute hunger. In Ethiopia, nearly 40% of the total population and 57 percent of the population of Addis Ababa live below the international poverty line of US$ 1.25 per day (UNICEF, 2009). The average daily energy intake is estimated to be 16-20% lower than the accepted minimum, while diseases caused by vitamin A, iron, and iodine deficiencies are widespread (Naylor & Falcon, 2010). Recently, climate shocks, conflict, insecurity coupled with a deteriorating economy continue to worsen humanitarian needs in Ethiopia, which has the largest share of food insecure population in the Eastern Africa region (38 percent). According to World Bank macro poverty outlook (2022), 45.2% of Kenya’s population was below the international poverty line in 2019. This number has declined to 34.4% in 2021 and 34.3% in 2021.

According to WFP Regional Food Security & Nutrition Update (2022) report, domestic food price inflation as of February 2022 remained high (above 5 percent) in six out of the ten Eastern African countries, which is equivalent to 60 percent of the countries, four of which experiencing double-digit food inflation (13 percent in Somalia, 16 percent in Burundi, 42 percent in Ethiopia and 258 percent in Sudan). Over 80% of Ethiopian urban households (HHs) are market dependent, and food access is a function of household income and market price, which together determine purchasing power. Since August 2004, the Ethiopian food price index has consistently outperformed the global index (Ulimwengu et al., 2009). In large urban areas of the country, such as Addis Abeba, market-based household food supply, rising food and nonfood commodity prices can exacerbate households' food security status.

Ethiopian researchers have conducted research on food security. Birhane (2012) used binary logistic regression to investigate the determinants of household food security and nutritional status of women in Addis Ababa (Bole, Addis Ketema, and Nifas Silk Lafto). He discovered that the gender and age of the HH head, as well as family size, have no significant relationship with food security status. He also discovered that increasing the educational level of HH heads reduced household food insecurity. Households headed by uneducated people with primary education experienced more food insecurity than those headed by people with a diploma or higher. HHs living in Kebele rental houses were more likely to be food insecure than those living in their own private house, whereas those living in government rental houses were less likely to be food insecure than those living in their own private house.

Derso et al. (2021) used logistic regression to investigate the status and determinants of food insecurity among Urban Productive Safety Net Program beneficiary households in Addis Ababa (nine woredas from Arada, Lideta, and Yeka subcities). They came to the conclusion that households with four or more family members were more likely to suffer than households with fewer than four family members. Similarly, households with a high dependency ratio were more likely to be food insecure than households with a low dependency ratio. Households with no access to credit services were more likely to experience food insecurity than households with credit services. Food insecurity was more likely among those with a low household income than among those with a high household income.

Onyango and Crush (2021), conducted a research regarding determinants of food insecurity in Addis Ababa city. Tobit model employed by Onyango and Crush (2021)revealed that household size, household income, household head age, household head education, ownership of bank account and income from remittance and gift were found to be significant determinants of food insecurity in the study area. Here, food insecurity of household has been measured through calorie consumption of a specific household.

Birhane (2012) concluded that family size has no significant association with food security status, which contradicts the conclusion of Derso et al., (2021). Birhane (2012) target group included households with at least one woman in the reproductive age group, for no apparent reason. He did not include households with no women of reproductive age at all. However, food security is an issue that affects everyone in the household, regardless of gender or age. Derso et al. (2021) focused their research on households that received assistance through the safety net program and included only a few variables such as education level, family size, dependency ratio, access to credit, and household income. While variables such as the gender and age of the household head, marital status, occupation of the household head, housing ownership, and access to credit may affect households' food security, which are not included in Derso et al., (2021). Unlike Birhane (2012) and Derso et al. (2021), this study included all household members and variables not included by Birhane (2012) and Derso et al. (2021), such as the gender and age of the household head, marital status of the household, occupation of the household head, housing ownership, access to credit, access to training and supervision, participation in equib and edir, and membership in social protection programs. Despite above gaps (gap in variable inclusion and target group selection), this study used order logit model as HFIAS category required the dependent variable to have more than two threshold limits. Moreover, the researcher strongly believes that a study on the determinants of household food security help to identify the mechanisms for stabilizing food security by improving productivity and ensuring more equitable distribution of resources and to recommend practical policy-related solutions to problems of food security by households.

1.3 Research Questions

This study addressed the following research question?

1. What is the status of household’s food security in the study area?
2. What are the major determinants of household food security in the study area?

1.4 Research Objectives

1.4.1 General objective

The general objective of this study is to examine the determinant of household food security in Addis Ababa.

1.4.2. Specific objectives

The specific objectives of the study are:

- To assess the food security status of households in the study area
- To examine the main determinants of households' food security in the study area

1.5 Scope of the study

Even though food security is a global issue which is measured multidimensionality from different perspective, this research is emphasis on households in Addis Ababa. There are about 11 sub-cities in Addis Ababa. However, this study was limited to three sub-city administrations because of the constraints of time, cost, and availability of energy made it impossible to extend the study away from these. Thus, this study focuses on the Addis Ketema, Kolfe Keranio and Arada sub-city. These sub cities are selected based on their higher number of beneficiaries as per Addis Ababa city government of productivity safety net program draft report (2016). This study covers the time period between 2021/2022 and employee secondary and cross-sectional data. A detailed description of the study area is included in chapter three.

1.6 Limitations of the Study

The first and most significant limitation is that the study was limited to methods suitable for use at the household level, implying that it was not fully representative of Addis Ababa. Second, there is a lack of adequate and up-to-date quantitative and qualitative information, as well as a lack of adequate sources and information in proper recording and keeping of documents and files among selected woredas as well as the city municipality. Third, because the study relied heavily on cross-sectional primary data, some respondents were reluctant and unwilling to give the necessary information. Furthermore, the responses of the sample households and key informant interviewers may contain personal bias. Despite all of these challenges, I have worked hard and taken precautions to minimize those limitations and achieve the study's objectives.

1.7 Significance of the study

The study findings aimed to be relevant in equipping policy makers and regulators in food and agricultural organizations with information that will empower them to be in a position to integrate stakeholders in areas relating to enhancing food availability and ending hunger. It is intended that the findings from this study will generate knowledge for the academic community, policy makers and gaps from the study will create room for further research regarding food security and related issues.

1.8 Definition Keywords or Terms

Household: consists of a person or groups, irrespective of whether related or not, who normally live together in the same households and housing units, and have common cooking and eating arrangements (CSA, 2012).

Head of households: is a person who provides economic support or manages the household. The head of the household is related by household members for his age or respect regardless of their sex(CSA, 2012).

Household size: the total number of members of a household (CSA, 2012).

Household food Security: means families having adequate physical, social and economic access to sufficient, safe and nutritious food to meet the dietary needs and food preferences of its members for an active and healthy life (Smith & Kassa, 2017).

Food secure HH: Household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely(Coates et al., 2007).

Mildly food insecure (access) HH: worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. But it does not cut back on quantity nor experience any of three most severe conditions(Coates et al., 2007).

Moderately food insecure HH: sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions(Coates et al., 2007). HH face moderate food insecurity when they are uncertain of their ability to obtain food and have been forced to reduce, at times over the year, the quality and/or quantity of food they consume due to lack of money or other resources.

A severely food insecure HH: has forced to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food,

going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely(Coates et al., 2007).

1.9 Ethical Consideration

This study takes participants' privacy and willingness into account. Participants in the study have been informed about the study's objectives, which emphasize that the data will be used solely for academic purposes. The data was collected using structured questionnaire techniques with the participants' full consent. There was a clear instruction stating that participation is entirely voluntary and that it is not advised to include their names, phone numbers, and so on the questionnaire. Furthermore, this study paid close attention to respecting the participants' rights, needs, and values, as well as maintaining data confidentiality and acknowledging the source of information. The information gathered has only been used for this purpose.

1.10 Organization of the study

The thesis is organized into five chapters. Chapter one contains introduction, statement of the problem, objective of the study, scope and limitation of the study and significant of the study. Chapter two is literature of the study. Chapter three contains methodology which includes research design, sample size determination, data source and methodology. Chapter four is result of the study, analysis part, and chapter five contains conclusion and recommendations.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1 Conceptual Issues

Food security is defined differently by international organizations and researchers; however, the basic concept remains the same. Food security, according to the FAO, is defined as ensuring that all people have both physical and economic access to the food they require at all times (Commodities and Trade Division, 2003). The World Bank defined it as all people having access to enough food at all times to live an active and healthy life (World Bank, 1986). Braun (1992) defined food security as all people having access to the food they need at all times to live a healthy life. Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life, according to the World Food Summit in 1996.

Food insecurity is defined similarly to food security by various researchers and international organizations. According to the World Bank, food insecurity is defined as the inability to produce food and to provide access to enough food for all people at all times for an active and healthy life (World Bank, 1986). Food insecurity, according to Hamilton, is defined as the limited or uncertain availability of nutritionally adequate and safe foods, as well as the limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Bickel et al., 2000). Food insecurity exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development, as well as an active and healthy life, according to the World Food Summit in 1996. This is one of the most widely accepted definitions of food security. This definition incorporates food stability, access to food, nutritionally adequate food availability, and biological food utilization. As a result, for the purposes of this study, the World Food Summit (1996) definition of food security was used as a working definition, and the household level is regarded as the key unit of food insecurity analysis. To establish a comprehensive definition of food security, first define food: a substance one eats and/or drinks to support life and body development (Gordillo & Jeronimo, 2013). Second, it is useful to consider the dimensions of food security, of which there are four conceptually, according Gross et al. (2000): categorical, socio-organizational, managerial, and situation-related.

2.1.1 Dimension of Food Security

Food security dimension is commonly divided into four categories: availability, access, utilization, and stability (Gordillo & Jeronimo, 2013). To achieve food security, each of these four pillars must be met at all times, without favoring one over the others. As a result, it is critical to investigate each pillar. Each pillar can and should be viewed through three lenses: individual, household, and national/regional food security. These are critical distinctions because it is entirely possible (and often the norm) for a nation or region to be considered "food secure" while simultaneously experiencing food insecurity among households and individuals within that nation or region (Gross et al., 2000).

Individuals and households can also be food secure when a nation or region is not, as is frequently the case in highly unequal economies. Each of these pillars (particularly the first three) is a function of the physical, social, and policy environments. They have a direct impact on food security, particularly at the household level. Extreme weather (for example, floods and droughts), insufficient roads and transportation, social conflict, and ineffective government policy can all limit the ability to produce, distribute, and/or access food, as well as its stability. Such fluctuations have an impact not only on current production and availability, but also on the loss of productive assets such as land, livestock, equipment, and infrastructure, affecting individual households, regions, and even entire nations. This loss of productive capacity is not always easily recovered and usually takes a long time to recover, potentially posing long-term challenges to achieving food security (Weingärtner & KLENNERT, 2005).

Food availability: Riely et al. (1999) define availability as the physical presence of (potentially obtainable) food, either from own farm produce or purchased from off-farm sources (eg, from markets). This definition makes it clear that, particularly in the case of self-production, land and other means of production such as funds, workforce, knowledge, and skills are critical components of availability and, thus, food security. At the national level, food availability is determined by a combination of commercial production, household production, food imports, international donations, and domestic food stocks. Food availability is most commonly used to refer to food availability at the household or regional level. Individually, it is rarely considered. Food availability at these three levels is influenced by and is influenced by national food availability. However, as previously stated, a household can be food and nutrition secure even if a region or nation is not. As a

result, determining food availability is complicated, and it is frequently difficult to distinguish between household food availability and national or regional food availability. Of course, food availability alone does not imply food security because it represents only potentially accessible food in a society. The availability of food does not necessarily imply that individual households or individuals within households can access, use, and utilize the food (Riely et al., 1999).

Food accessibility: The state of households and individuals within households having sufficient means and/or resources to obtain the food required for a nutritiously complete diet is referred to as accessibility (Weingärtner & KLENNERT, 2005). Physical accessibility and financial accessibility are the two most important aspects of food access. The availability of resources such as capital (to pay for the food), human mobility (to physically obtain the food), and knowledge determines accessibility (to enable decisions about accessing the food). This implies that adequate food access is determined not only by households' ability to produce food, but also by their ability to get to and purchase food from the market. Thus, even if a household can produce food, its ability to generate income is critical to achieving food and nutrition access. Simply put, food accessibility ensures that people can obtain food, both physically and economically, through a variety of methods such as growing, purchasing, gifts, food aid, and bartering or trading (Riely et al., 1999)). I chose the food accessibility dimension of food security to measure food security status using HFIAS.

Food utilization: Food utilization is defined as a person's body's ability to assimilate nutrients from consumed food. A person's optimal calorie and nutrient consumption is the result of good care and dietary habits, food preparation, diet variety, and intra-household food distribution. All of these factors, when combined with good biological utilization of food consumed, determine an individual's nutritional status (Prices, 2008). Another aspect of food utilization is the socioeconomic aspects of food, which include knowledge, habits, and decision-making (which are greatly influenced by culture and education levels) about what food to buy, how to prepare it, and, most importantly, who in the household consumes what food and when—with an eye toward fair distribution (World Overview of Conservation Approaches and Technologies, 2018). Because HFIAS does not include nutrition data, I am unable to adopt this dimension of measuring food security.

Stability/ Sustainability: The time frame over which food security is considered is referred to as stability/sustainability (Weingärtner & KLENNERT, 2005). There is always the possibility that food security could be lost or gained at any time (United States Agency for International Development, 2007). This implies that, even if one's food consumption is optimal today, one may still be food and/or nutrition insecure if access to the appropriate food cannot be sustained for the duration required. In particular, intermittent access to (appropriate) food is linked to poor nutritional status. To sustain food security stresses and shocks such as climatic conditions, conflicts arising from an unstable political environment, and economic attributes (e.g., unemployment, rising food prices) must be managed as they may have an impact (directly or indirectly) on food security status (Prices, 2008). As a result, the need to put in place means stabilizing all of the factors that impact food security stability.

Utilization is only possible if food is available, which is only possible if food is available. The stability of each of the three pillars is critical. To achieve nutrition security, the availability of the appropriate food must be stable, as must access to that food and utilization of that food. Food availability is self-evidently stable. The physical and monetary means to access food must be stable for access to be stable. And the consistency of utilization implies, at the very least, the stability of the body's health to assimilate the required nutrition and the consistency of food preparation to ensure it consistently delivers the required nutrition. Furthermore, the complex nature of each of the three pillars' stability and the dynamic relationship among the four pillars suggest that food security is not the responsibility of a single entity or agency, but rather requires coordination and collaborative efforts from various stakeholders and role players throughout the food system to ensure food security at all levels (Weingärtner & KLENNERT, 2005).

2.2. Theoretical Review

According to World Food Programme the main determinants of food insecurity in urban context are: food availability, food supplies in to market, food access, purchasing power and access to market and food utilization, health and morbidity status (World Food Programme, 2009). Braun (1992) denoted that food security is composed of availability of food, access to food, and risks related to either availability or access. Variation in national, regional or local availability of food can contribute to food insecurity. (Garrett & Ruel, 1999) suggested that access that a household has to food depends on whether the household

has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its own food.

2.2.1 Main approaches to food security

1. Food availability Approach

The first and most influential approach to food security is the food availability approach. It is unquestionably the oldest and most influential. Although the essential ideas of this technique may be traced back to Venetian thinker Giovanni (1588) it was popularized by Thomas Malthus (1789), and it is now known as the Malthusian approach. The concept focuses on the (dis)equilibrium between population and food: in order to maintain this balance, food availability should not expand faster than population growth. As a result, food security is just an issue of aggregate (per capita) food supply in this perspective. In a closed economy, food production and stocks are the most important factors, however in an open economy, food trading can also be important. The food balance sheet is now the tool used to assess food availability (FAO 2001). A food balance sheet depicts the pattern of a country's food supply during a given time period. Each food item is listed on the food balance sheet. i.e. the availability of each major commodity for human consumption, as well as the sources of supply and usage. The supply available during the reference period is calculated by adding the total quantity of foodstuffs produced in a country to the total quantity imported and adjusting for any changes in stockpiles that may have occurred since the beginning of the reference period. On the usage side, a distinction is made between quantities exported, fed to livestock, and used for seed, as well as food sources available for human consumption. The per capita supply of each such food item available for human consumption is then calculated by dividing the quantity by the population that actually consumes it. Data on per capita food supplies are expressed in terms of quantity and, for all primary and processed goods, in terms of dietary energy value, protein, and fat content, using suitable food composition variables (FAOSTAT, 2011).

Before moving on to the next steps, it's vital to highlight a methodological component that'll help with the analysis. The units of analysis are a key feature of any approach to food security. In general, the unit of analysis might be anything from the entire world to a country, a region, a community, a household, or a single person. Furthermore, from an economic standpoint, the strategy can be focused on a particular sector, a group of sectors (for example, the food system or chain), or the entire economy. Given these qualities, the

country (and its food balance sheet) or the world, as well as the agricultural sector, are the most common units of analysis in the food availability method (its production and productivity).

2. Income - based Approach

The long-held notion of food security as a problem of scarcity has been revisited in the context of a more macroeconomic perspective. Economists have criticized the focus on the food sector, which began with solely agricultural production and eventually expanded to include food trading, as being too concentrated on one single economic sector. Food security cannot be considered as a challenge exclusive to the agricultural/food sector, given that the economy is made up of many interdependent sectors. As a result, the first attempt to extend the discipline was actually an attempt to move the focus of research to the entire national economy. This necessitated the inclusion of analysis variables such as Gross Domestic Product (GDP), economic growth, and food production, which is inevitably, but not always, highly dependent on food production. A stronger economic structure in a market economy might allow the import of items such as food. This macroeconomic framework was also more consistent with old and influential economic theories like Ricardo's comparative advantages, which states that each country must specialize in the sector in which it has a competitive advantage based on the abundance of a specific productive asset or lower production costs. This entire method could be viewed as a way to incorporate national "means" to boost aggregate food availability into the food security framework.

However, the most significant transition was from macro-level food availability to micro-level income (Haq, 1976; Reutlinger & Selowsky, 1976; Griffin & Khan, 1977; Bank, 2015). The method is remarkably similar to the one used to quantify poverty in the past. While poverty is defined as a lack of sufficient income to purchase a bundle of goods sufficient to ensure a person's survival (or minimum standard of living), food insecurity is assumed to be a sub-category of poverty (often referred to as food poverty), i.e. a lack of sufficient income to purchase the amount of food required under the circumstances (Sibrian, 2008). The varied foods are transformed into calories (food characteristics): people are considered food insecure if their calorie availability is less than a criterion set by international nutritionists. It is theoretically possible to estimate the amount of food consumed using household surveys that provide information on income, assuming that

poorer households spend a larger proportion of their income on food. If the household's calorie availability is less than the necessary minimum, some or all of the members are food insecure. The assumption of a given income-calorie elasticity is the unique difficulty with this method. Taking an elasticity measured in the same country in prior investigations, for example, necessitates the formulation of very strong hypotheses.

More useful are the household expenditures surveys, from which it is possible to sort out the amount of expenditures on a (limited) number of food items. Many applied economists have estimated the calorie contents of each food item and then aggregate them in order to have the total amount of calories available for household members. The main shortcomings of both these procedures are the several assumptions made to move from income to food security: 1) from income/expenditure to food though price per unit information; 2) from food to calorie through equivalence tables; 3) from calorie availability to food security/insecurity depending on the threshold. With respect to the unit of analysis, potentially income could be estimated for individuals. However, there are issues with children, whose food security is similarly dependent on the income of adults. Furthermore, all of the above-mentioned surveys are carried out at the home level. For all of these reasons, I believe household head is the appropriate unit of study in my research method. This entails assuming a given distribution among the members, usually equal distribution or distribution based on biological needs. Finally, in an ideal market economy, where no one works in subsistence agriculture, this strategy may be more appropriate. Given that these measures are frequently taken in rural areas of low-income countries, where subsistence agriculture is the main source of income, the method is not very dependable. Food expenditures are generally underestimated in expenditure surveys, as Frankenberger (1992) argues, because the value of food produced at home or obtained locally is frequently not reported. Moreover, this approach is applicable for rural food security than urban, as a result I have declined to adopt this approach of measuring food dimension.

3. Basic needs Approach

The International Labour Organization (ILO) introduced a new model of development in the second half of the 1970s called the basic needs approach, with the goal of embracing non-economic aspects of development as well (ILO, 1976). Poverty, unemployment, and underemployment were the key drivers of the policy shift, which occurred during periods

of increased economic expansion. Later, two economists, Streeten (1981) and Stewart (1985), helped to revive the concept.

The advocates of the basic needs approach saw development as a process aimed at ensuring that everyone's basic needs are met. Basic necessities were met as a prerequisite for a "full-life" constituted of material and nonmaterial aspects (Stewart, 1985). Given the practical nature of this approach, a minimal interpretation of the whole life was required, i.e., a modest list of essential demands that governments and development organizations could meet. Despite the fact that each author's list differed significantly, the majority of them included food, as well as shelter and clothing (Denton, 1990). Food, according to Magrabi et al.(1991), is a basic need — perhaps the most basic of all. Authors in many areas, such as Maslow (1943) in psychology and authors in the human rights literature, came to similar findings. Many authors have largely included the human right to enough food Kent because of Shue (2020)) definition of basic rights as those necessary for the enjoyment of all other rights. This discussion in development literature may have a significant impact on the debate over food security, giving rise to the so-called food first perspective (Maxwell & Smith, 1992; Maxwell, 1996). This approach focuses directly on whether people eat enough food, and it helped to take the study from the macro to the micro level one step further. Food is regarded as the most important (and most likely the sole) aspect of food security. This is the perspective that underpins the definition of food security as consumption of less than 80% of WHO average daily calorie intake Reardon & Matlon, (1989) and as the ability to meet food consumption needs for a normal healthy existence at all times (Sarris, 1989).

With this paradigm, there are various approaches to analyze food security in a cohesive manner. The first is a food frequency evaluation, which may be done by simply asking people how many meals they eat per day or how frequently they consume particular foods. These surveys are simple to perform; however, focusing on frequency rather than amount makes calculating the calorie equivalent more difficult. The second strategy is based on direct food consumption monitoring. During meals, all members of the household are observed in order to obtain direct information on all food consumed. The ultimate calorie availability is calculated by weighing and aggregating the food items according to their nutritional composition. Recently, some indicators based on diet quality and diversity have been developed, which can be used in conjunction with the food first strategy (Hoddinott & Yohannes, 2002). For example, the dietary diversity score represents the number of

different food categories consumed on a regular basis (usually 24 hours or 1 week). This was a significant step toward moving away from a sole concentration on food consumption quantity.

The food-first method is entirely compatible with the individual unit of analysis. Food frequency assessments, on the other hand, are typically carried out at the household level, whilst direct observation and diet assessments are frequently carried out at the individual level (also for children). As a result, in the last two circumstances, it is not essential to assume a household food distribution function. This is particularly essential since we cannot presume that women obtain the same amount of food as males unless we observe their conditions firsthand. Many developing countries have this problem, which is commonly referred to as gender bias in the development and food security literature (Chen et al., 1981; Gupta, 1987; Harriss, 1990). The fundamental advantage of the food first approach to assessing food security over the (micro) income-based approach is the ability to focus directly on the commodity we are interested in (food) rather than the income required purchasing it. This way, I don't need to know the current unit pricing and, at the same time, I do not have to wonder if the person has any physical or social issues when it comes to acquiring food. Finally, by focusing on what is really eaten, the food first method implicitly recognizes (and does not dismiss) food grown at home rather than purchased in the market. As a conclusion to this brief assessment, this method emphasizes short-term food security: it determines if households have enough food to feed all of their members in a given period of time, or in the past. It doesn't give much information on future food shortages.

4. Entitlement Approach

For a long time, the argument over hunger and famine has been profoundly influenced by Malthus' food availability perspective. Amartya Sen's entitlement approach only contributed to challenging this perspective in the early 1980s, shifting the focus from national food availability to people's access to food. The entitlement method focuses on each person's entitlements to commodity bundles, including food, and sees starvation as the outcome of not being entitled to any bundle with enough food (Sen, 1981). Entitlements are based on two factors: 1) personal endowments, which are the legally owned resources such as a home, cattle, land, and nontangible items (Osmani, 1995); and 2) the set of commodities that a person can access through trade and production, i.e. the exchange

entitlement mapping (Sen, 1981). A fall in endowments can obviously lead to famine, starting from a position where an individual has just adequate means of sustenance. With the same endowments, however, a person can still fall into the hunger trap due to a decline in the exchange entitlement mapping; for example, a significant decrease in the price of the product that the individual produces due to external reasons limits its capacity to buy food.

Furthermore, entitlement failure can manifest itself in a variety of ways. Given an economy in which each group, for simplicity, produces one commodity (including labor), and given a food exchange rate (commodity price/food price), any group risks to starve due to an entitlement failure either because of a reduction of food production for personal consumption or because of a fall in the food exchange rate (Sen, 1981). In the first case, there is a direct entitlement failure, in the second case a trade entitlement failure. This distinction is particularly relevant to examine which group is at risk of starvation if something changes. Food producers experiences direct entitlement failure as a result of lower production; groups that produce other than food experience trade entitlement failure as their terms of change fall or as the total availability of food decreases. Furthermore, those groups who rely on the produced good (e.g., beef) for both consumption and sale to obtain other food are at danger of both direct and trade entitlement failures. This method was developed and tested largely for famine analysis, but the same logic applies to regular hunger and chronic malnutrition.

By downplaying the impact of aggregate food availability and emphasizing the importance of people's socio-economic circumstances, the entitlement approach helped to redress the problem of hunger and famine. Starvation is defined as a situation in which some people do not have enough food to eat, rather than a situation in which there is a scarcity of food (Sen, 1981). As a result, incorporating the access factor has had a substantial impact on the concept of food security. Amartya Sen's work may be seen in two key food security definitions: all people have physical and economic access to the fundamental foods they require at all times, and all people have enough food to live an active, healthy life at all times (FAO, 1983).

At the national level, having adequate food per capita is a necessary but insufficient requirement for food security. As a result, it is preferable to broaden the informational base in order to complete a food security assessment. Variables relating to people's endowments, such as productive and non-productive assets, with a focus on employment and non-

tangible resources like education or association membership, as well as wage and other pricing of food and non-food products, should be fully taken into consideration. Dreze and Sen extend the analysis from food entitlements, i.e., the set alternative bundles of food items over which a person can have command, to broader entitlements, i.e., the set alternative bundles of commodities such as drinkable water or services such as sanitation and health care over which a person can have command, in their book Hunger and Public Action (1989). This more recent contribution emphasizes the importance of considering not only food access, but also access to these other products and services that have a direct impact on hunger and food security. Individuals and families are referred to as the unit of analysis in this approach. However, as with the income-based approach, it is preferable to examine the entire household when analyzing the means by which children can get food and other food-security-related commodities. The investigation has concentrated on more macro elements, calling attention to occupational groupings, in the specific application of the entitlement approach to famine.

Given all of the aforementioned concerns, using this approach rather than the prior ones improves the assessment from a variety of perspectives. The comparison with the food availability method has already been made, and there is ample evidence of widespread food insecurity and malnutrition even in nations with plenty food per capita. The distance between the income-based strategy and the income-based approach is shorter, as income is a key means of gaining access to food. According to Sen (1983), the concentration on incomes, while flawed, is not wholly disastrous in dealing with poverty and hunger. Of course, this is preferable to focusing on overall food output and population size. In most cases, the weighting system of real income and cost of living pays enough attention to food in a poor community to make real income a moderately good proxy for entitlement to food. However, given that income is not the only or even the most important instrument for gaining access to food, and given that income is rarely measured in developing-country rural areas, a focus on entitlements is preferable. Furthermore, income reflects an individual's or household's short-term economic situation, whereas the total set of assets provides more information on long-run wealth and vulnerability to food insecurity. When compared to the food first approach, the entitlement approach allows for the prediction of future food deprivation: a lower amount of assets, for example, indicates that the person may have more difficulties in the future accessing enough food. Then, by examining a large entitlement set, it is recognized that issues such as safe drinking water and health care

are as important for food security as food itself. As a result, I've shifted from a food-first mindset to an entitlement mindset.

2.3 Empirical Review

2.3.1 Evidence from Developing countries

Bonnard (2000) discovered that a household's ability to achieve food security in an urban area is derived from the household's human, material, and institutional resource bases, which are often referred to collectively in the literature as food security factors. Educational and employment status, household demographics, urban agriculture, assets, saving, formal social assistance or direct transfer, informal social networks, access to clean water and sanitation, and cost of living are among these factors. According to the Urban Livelihoods and Food and Nutrition Security Study in Greater Accra, Ghana, household food availability is influenced by food prices, household demographics, and household tastes and preferences Maxwell, 2000). According to Mucavele (2001), the main factors affecting food security in urban Maputo, Mozambique, are poverty, low family income, a lack of general alimentation at the family level, floods, family crises, high unemployment levels, low levels of schooling and training, and the lack of a social security system to alleviate urban shocks. Braun (1992) stated that employment and wages, along with prices and incomes, play a critical role in determining urban households' food security status. According to FAO (2021) report, prevalence of severe food insecurity is highest in Central Africa (35.8 percent), but for moderate food insecurity the prevalence is higher in Eastern and Western Africa (36.6 and 39.5 percent, respectively) (See figure 2.1 below). The latter two sub regions account for 71 percent of the moderately food insecure on the continent.

Figure 2:1 Prevalence of food insecurity (percent) in Africa

	Moderate food insecurity			Severe food insecurity			Moderate or severe food insecurity		
	2014	2019	2020	2014	2019	2020	2014	2019	2020
World	14.3	16.5	18.5	8.3	10.1	11.9	22.6	26.6	30.4
Africa	29.6	32.3	33.7	17.7	21.9	25.9	47.3	54.2	59.6
Central Africa			34.2			35.8			70.0
Eastern Africa	34.0	37.4	36.6	23.7	26.0	28.7	57.7	63.4	65.3
Northern Africa	19.5	20.1	20.7	10.2	8.8	9.5	29.7	28.9	30.2
Southern Africa	24.9	25.1	27.0	18.9	19.2	22.7	43.8	44.3	49.7
Western Africa	30.6	34.6	39.5	8.6	19.6	28.8	39.2	54.2	68.3

Source: FAO, 2021

In a study of food insecurity in urban India, the M.S.Swaminathan Research Foundation and the World Food Programme discovered that factors such as unemployment, illiteracy, infant mortality rate, lack of toilet facilities and safe drinking water, social discrimination, and little political attention for urban areas determine food insecurity in urban India (Swaminathan, 2002). Anand et al. (2019) investigated food security determinants in Bengaluru and discovered that non-income dimensions are important in understanding urban food security. Using HFIAS and HFIAP scores, they examined the relationship between food security and household structure, household size, housing type, employment, access to water, education level of the household head, migration status of the household head, and access to the Public Distribution System. According to their findings, households without piped water who obtain their water from a community tap, tankers, or water cans are the most likely to be severely food insecure and have the highest mean HFIAS score. In general, households without piped water are less food secure than those with piped water, regardless of whether the latter receive a piped supply from the city or rely on privately provided water tankers or bottled water.

Similarly, those whose workplace is their own home or an associated structure are significantly more likely to be food insecure than other groups. They also found significant differences between households based on their employment status. They assessed the nature of employment using two variables: whether the household head earns a formal wage income or an informal wage income, and the location of the workplace. This latter has been identified as having a significant impact on job security (Anand et al., 2019). According to Anand et al. (2019), both variables are strongly related to food security. Income influences the food on one's plate in another way: lower income implies lower monthly food expenditure. When compared to the rest of the city, they found a higher likelihood of food insecurity in informal settlements. Furthermore, households living in certain typologies, such as room in house/flat, are more likely to be food insecure. When looking at the food-insecure households in this group more closely. They discovered that these are mostly female-headed households led by older women. Food security is closely linked to infrastructure deprivation, such as a lack of an adequate supply of clean water, in addition to housing typology. Food-insecure households have a lower ability to cope with risks because they are also deprived of infrastructure and other necessities.

The prevalence of moderate or severe food insecurity in Asia and the Pacific was 25.7 percent in 2020, up from 18.7 percent in 2014. Much of the increase came in 2020 when COVID-19 and its economic repercussions contributed to an increase of 3.3 percentage points. The increase was particularly large in Southern Asia, where the prevalence increased from 37.6 percent in 2019 to 43.8 percent in 2020. Below figure (figure 2.2) for the Asia-Pacific region is lower than the global average of 30.4 percent. Across the four sub regions, Southern Asia had the highest prevalence (43.8 percent) in 2020, compared to 18.8 percent in South-eastern Asia, 12 percent in Oceania and 7.8 percent in Eastern Asia. Several countries had prevalence above 30 percent: Afghanistan, Bangladesh, Cambodia, the Islamic Republic of Iran, Kiribati, Nepal and the Philippines. The prevalence of severe food insecurity in the Asia-Pacific region in 2020 was 10.3 percent, up from 7.7 percent in 2014. The sub regional pattern was similar to that for severe or moderate food insecurity. Southern Asia had the highest prevalence (19.9 percent), followed by 3.3 percent in South-eastern Asia, 2.6 percent in Oceania and 2 percent in Eastern Asia.

Figure 2:2 Prevalence of food insecurity (percent) in Asia-Pacific

	Moderate food insecurity			Severe food insecurity			Moderate or severe food insecurity		
	2014	2019	2020	2014	2019	2020	2014	2019	2020
World	**14.3**	**16.5**	**18.5**	**8.3**	**10.1**	**11.9**	**22.6**	**26.6**	**30.4**
Asia and the Pacific	11.0	13.3	15.4	7.7	9.1	10.3	18.7	22.4	25.7
Eastern Asia	3.3	3.6	4.0	0.6	0.8	0.8	3.9	4.4	4.8
East Asia excluding China	5.2	6.1	5.8	0.8	1.3	2.0	6.0	7.4	7.8
Oceania	8.9	9.8	9.4	2.5	3.8	2.6	11.4	13.6	12.0
South-eastern Asia	13.0	14.2	15.5	2.4	2.6	3.3	15.4	16.8	18.8
Southern Asia	15.7	19.3	23.9	15.9	18.3	19.9	31.6	37.6	43.8
South Asia excluding India	27.7	26.6	27.0	12.5	13.6	14.3	40.2	40.2	41.3

Source: FAO, 2021

2.3.2 Evidence in Ethiopia

As of April 2021, 22.4 million people in Ethiopia lacked sufficient food for consumption. The number of inhabitants in the food insecurity situation increased by 33.3 percent compared to the previous month. Overall, the prevalence of food insecurity in Ethiopia was measured at 20.5 percent of the population in April 2021. The situation in Addis Ababa is not different to that in other developing countries. According to the World Food Programme (2009), the following factors are common causes of household food insecurity in the country's urban areas: household size, age of the household, gender of the household

head, marital status of the household, education level of the household, dependency ratio, access to credit, ownership of a savings account, total income per adult equivalent, expenditure level (food and non-food), asset possession, access to social services, owner of a home garden, and access to food banks. According to the results of Derso et al. (2021), the odds of food insecurity among those with a low household income were nearly 5 times higher than those with a high household income; additionally, households with a medium income were 10 times more likely to experience food insecurity than households with a high income at the 95 percent confidence interval. He concluded that households headed by an uneducated person were 2.56 times more likely to be food insecure than households headed by individuals with an education above the secondary level, and the odds of food insecurity among households headed by a person with a completed secondary-level education were 3.22 times greater than those headed by someone with an education above the secondary level. This study had 607 participants out of a total of 624. The average age of the head of the household and the average family size were 44.6613.16 and 4.041.75, respectively. A female headed nearly two-thirds (382, or 62.9 percent) of households. One-quarter of the 154 (25.4%) household heads were illiterate. There were 83 (13.7 percent) households with a high dependency ratio. Just over half of the 317 participants in the study (52.2 percent) were married. The UPSNP safety net was the only source of income for 379 households (62.4 percent). The average monthly household income was USD 65.131.18. For 431 (71 percent) of households, the proportion of household income spent on food and food-related items was greater than 75%. The proportion of households concerned about a lack of food was 528. The majority of the 456 households (75 percent) reported being unable to eat their preferred food in the four weeks preceding the interview due to a lack of resources. Due to a lack of resources, 462 households had eaten a limited variety of foods in the four weeks preceding the interview (76.1 %). Households that had eaten less at a meal or fewer meals than preferred in the four weeks preceding the interview numbered 426 (70.2%) and 383 (63.1%), respectively. Furthermore, the number of households that responded positively to the severe conditions of going to bed hungry or going a whole day and night without food was (36.1%) and 39 (6.4%), respectively.

According to Birhane (2012), household food security varies significantly across the three sub-cities. Households in Bole have less food insecurity than other sub-cities, whereas the risk of food insecurity is 1.93 times higher in Nefas-Silk-Lafto than in Addis Ketema. The magnitude of household food insecurity was higher (84.8 percent) among HHs with 9 or more family members compared to those with 4 or fewer. The proportion of households

experiencing food insecurity was higher (81%) among HHs headed by older people (65+) than among those headed by young people (24 years or less) (70.6 percent). However, using binary logistic regression, the gender and age of the HH head, as well as family size, have no significant association with food security status (p values = 0.8, 0.3, and 0.4, respectively).

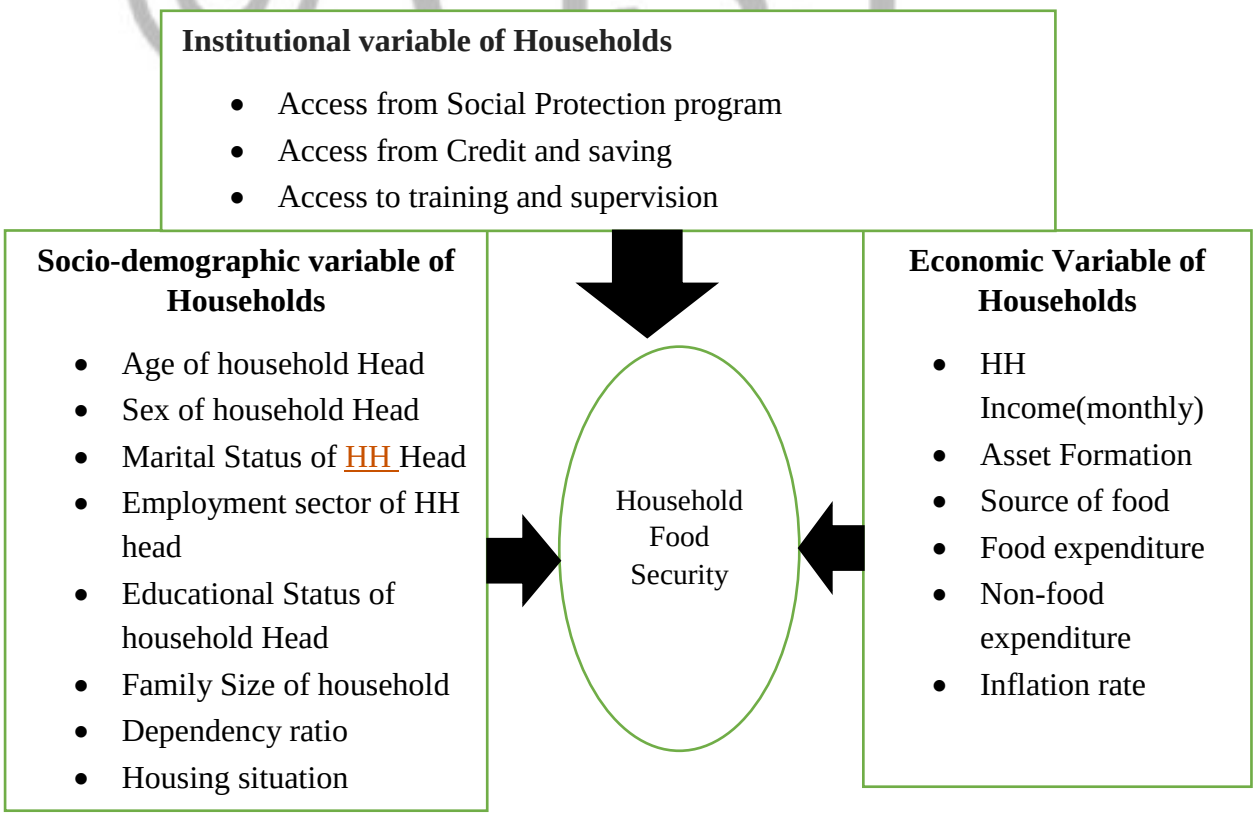
He revealed that as HH heads' educational level increased, the likelihood of household food insecurity decreased. Households headed by uneducated people and those with primary education were more FI than those headed by people with a diploma or higher. The magnitude of food insecurity ranges from 56.2 percent among HHs led by merchants to 90 percent among those led by daily wage earners. HHs headed by merchants had lower odds of food insecurity than HHs headed by unemployed or pensioners. HHs headed by daily laborers, on the other hand, had 3.5 times the food insecurity as those headed by unemployed heads. Other factors associated with HH food security status included housing and asset ownership. HHs who live in Kebele rental houses were 1.8 times more likely to be food insecure than those who have their own private house (95 percent CI=1.09-2.93), while those who live in government rental houses were 0.3 times (95 percent CI=2.03-14.3) less food insecure. The odds of household food insecurity were higher among asset poor HHs (95 percent CI=1.64-4.67) than among asset rich HHs, while asset medium HHs were twice as likely as asset rich HHs (95 percent CI=1.33-3.24). The poorest HHs were more likely than the richest HHs to be food insecure (95 percent CI=3.4-13.57).

Birhane (2012) concluded that family size has no significant association with food security status, which contradicts the conclusion of (Derso et al., 2021). Birhane (2012) target group included households with at least one woman in the reproductive age group, for no apparent reason. He did not include households with no women of reproductive age at all. However, food security is an issue that affects everyone in the household, regardless of gender or age. Derso et al. (2021) conducted research on households that received assistance through a safety net program and included only a few variables, including education status, family size, dependency ratio, access to credit, and household income. While variables such as gender and age of the household head, marital status, occupation of the household head, housing ownership, and access to credit may affect households' food security, they are not included in Derso et al. (2021) research.

2.4 Conceptual Framework

Based on the objectives of this study and reviewed existing literature regarding the determinants of household food security, I have developed this conceptual framework that is expected to explain the decision for household food security status in the study area. In this study, factors which determine food security like demographic, institutional and economic are listed in the below figure. Moreover, variables like household income, asset formation, access from social protection program, access from credit and saving, access to training and supervision will be expected to have positive relation with status food of security. While variables like food and non-food expenditure, inflation rate, age household head, family size and dependency ratio will be expected to have negative relationship with status of food security. Variables like sex of HH head, employment sector of HH head, housing situation, education level of HH head, food source and marital status of HH head will be expected to have either positive or negative relationship with status of food security. The figure showed the relationship between independent and dependent variables in the study. The dependent variable is the household food security and it's the value is determined by independent variables.

Figure 2.3: Conceptual framework



Source: Own Construction, 2021

CHAPTER THREE

3. METHODOLOGY

3.1 Introduction

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

3.2 Description of the Study Area

Below is a brief description of the research area in Addis Ababa.

a) Physical Geography and Political Aspect

Addis Ababa City Administration covers an area of 540 square kilometers in Ethiopia's heartland. Ethiopia's capital and largest city is Addis Ababa. The African Union's headquarter is in Addis Ababa, Ethiopia, where its predecessor, the Organization of African Unity (OAU), was based. It also serves as home to the United Nations Economic Commission for Africa (ECA) and a number of other regional and international organizations. Because of its historical, diplomatic, and political importance to the continent, it is also known as the political capital of Africa. Apart from being Africa's political capital, Addis Ababa has the status of both a city and a state, with a charter approved by the Federal Government. The city is currently divided into 11 sub-cities and over 117 woredas.

b) Climates and rainfall

Addis Ababa is located at 9°1′48″N 38°44′24″E and has an elevation of 2,300 meters (7,500 ft). The city is located at the foot of Mount Entoto, which rises to 3,000 meters in the north. It has a subtropical highland climate with a year-round moderate temperature of around 23°C average high and 11°C average low. Kiremt, the main rainy season, lasts from June to early October, with a brief period of rain between early March and mid-April known as Belg. The average annual rainfall is around 1,200 mm, with nearly 80 percent falling during the main rainy season (NMA, 2017).

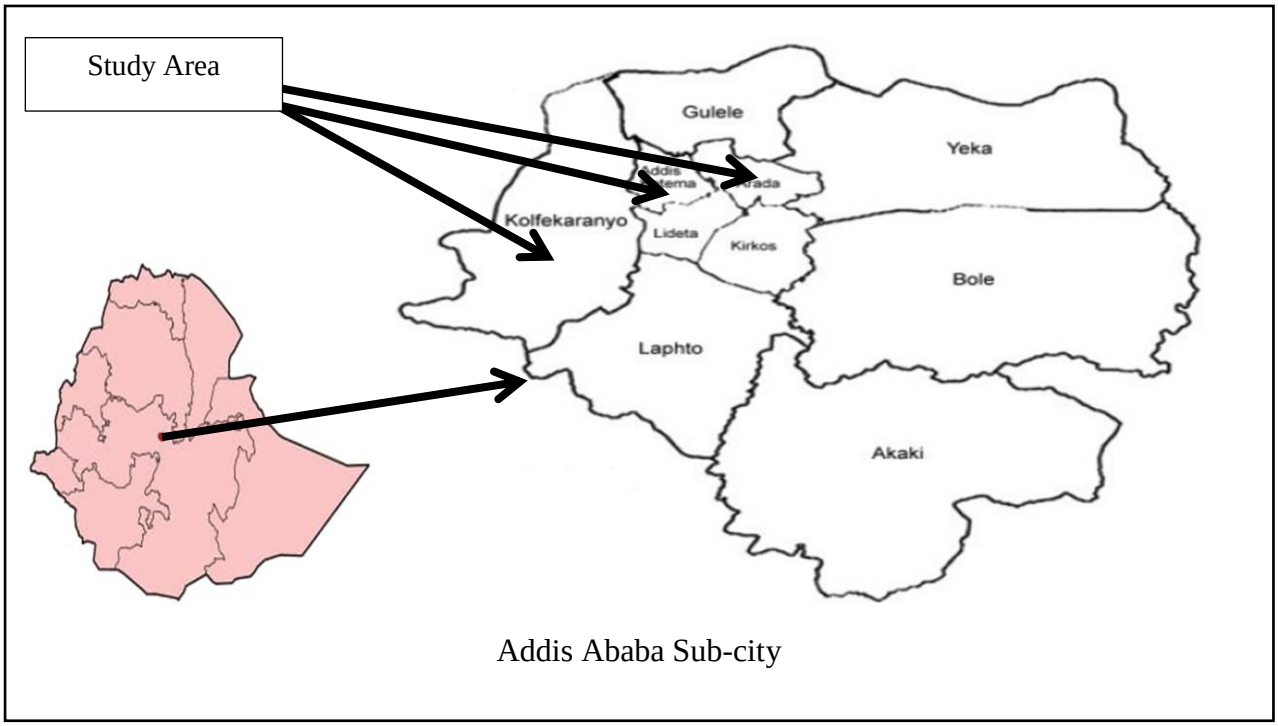
c) Demographic characteristics

In terms of population, Addis Ababa is Ethiopia's true primal city. The city has a total population of 3,194,999 people, of which 1,679,998 are females and 1,515,001 are males (CSA, 2013). Female residents are slightly higher than male residents, according to the estimate. There are 628,984 housing units in the city, with 662,728 households, resulting in an average of 5.3 people per house (CSA, 2007). The average life expectancy at birth is 65.7 years, with an infant mortality rate of 50.3 deaths per 1000 live births (CSA, 2013).

d) Employment and Economy

Approximately 119,197 people work in trade and commerce, 113,977 in manufacturing and industry, 80,391 different types of homemakers, 71,186 in civil administration, 50,538 in transportation and communication, 42,514 in education, health, and social services, 32,685 in hotel and catering services, and 16,602 in agriculture. Addis Ababa's economy grows at a rate of 14% per year. The city alone contributes approximately 50% of the national GDP, highlighting its strategic role in the country's overall economic development due to its diverse manufacturing and commercial sectors. Addis Ababa has a higher concentration of financial institutions, transportation, storage, communication, construction, and real estate than other urban centers. Despite the country's strong economic growth, Addis Ababa faces significant development challenges. For example, Addis Ababa's unemployment and poverty rates remain high, at 23.5 percent and 22 percent, respectively. More than one in every four households has an unemployed adult, compared to one in every ten in other urban areas (World Bank, 2015).

Figure 3:1 Map of Addis Ababa city Administration



Source: Adopted from Google Map

3.3 Research Approach and Design

The quantitative research method was used to collect and analyze data for the study. The rationale for using quantitative approaches was to gain a better understanding of the research problem and because the research questions were about households. This study employed both descriptive and explanatory research designs. The descriptive research method was used because the study's goal is to assess the status of household food security and compare the demographic and socioeconomic characteristics of households in the study area that are or are not food secure. The main determinants of household food security were investigated using an explanatory approach in this study. The study was cross-sectional in the sense that relevant data was gathered at a single point in time.

3.4 Sources of Data

To conduct this study, data was collected from both primary and secondary sources, the former from a field survey and the latter from various sources. As a result, the primary source of data was collected from households in the selected sub-city of Addis Ababa at one point in time using a structured questionnaire.

3.5 Sample Design

3.5.1 Target population of the Study

Addis Ababa city administration comprises of 11 sub-cities. However, the population of this study includes all households in the purposefully chosen sub cities. This study includes Addis Ketema, Kolfe Keranio, and Arada. These sub cities are selected based on their higher number of beneficiaries as per Addis Ababa city government of productivity safety net program draft report (2016).

3.5.2 Sampling Technique and Procedures

According to Kothari (2004), sampling method is the procedure for selecting a sample of units from a population. The heads of households serve as the sampling unit in this study. In order to select a sample from the population, both purposive and multistage cluster sampling techniques were used. First, Addis Ababa city administration is divided into different clusters based on geographical or administrative characteristics (sub-city). Three sub-cities were chosen at random from among those clusters: Addis Ketema, Kolfe Keranio, and Arada. Second, the administration of the sub-cities is divided into woredas, and two woredas are chosen, followed by a simple random sampling technique (lottery method) from each of the three sub-cities. Finally, because households are the smallest sampling unit in this study, a representative of household heads is randomly selected from each woreda using a simple random sampling technique and with a probability proportional to size. Furthermore, the formula was used to determine the maximum number of respondents (Kothari, 2004, pp 175).

3.5.3 Sample Size Determination

The target population of 37,190 household heads was taken from the three sub-city administrations. Terms used for sample size determination: -

1. Margin of error (e) =6.1%.
2. To get maximum sample size p=0.5, $q = 1 - p = 0.5$
3. The degree of confidence level is 95%, with significance level α=0.05, Zα /2=1.96
4. Target population (N)= 37,190

To calculate sample size, the following formula is used (Kothari, 2004, pp 175).

$$n = \frac{Z^2.p.q.N}{e^2(N-1) + Z^2.p.q} = 256$$

The sample size in each woreda based on proportional to the size of its household is determined as follows.

Table 3:1 Sample size in Sub cities

Sub-city's	Woreda	Number of households	Sample size
Addis Ketema	W4	4,897	34
	W6	5,667	39
Arada	W3	5,355	37
	W4	4,623	32
Kolfe Keranio	W7	8,099	56
	W9	8,549	59
Total		37,190	256

Source: Computed from CSA, 2007

A total of 256 samples of the household head [73 from Addis Ketema, 69 from Arada, and 115 from Kolfe Keranio sub city] were selected using proportional simple random sampling across the six woredas in this study because it is provided that all households with an equal chance of being included in the sample.

3.6 Method of Data Collection

A questionnaire-based interview with the family's HH head/care giver was conducted to obtain information on household food security (preferably mothers). To determine household food security status, a standardized set of questions derived from version 3 of the Household Food Insecurity Access Scale (HFIAS) measurement guide was used (Coates et al., 2007). The FANTA guide, developed by USAID, consists of nine occurrence questions that represent the severity of food insecurity (access) in general, and nine frequency-of-occurrence questions that are asked as a follow-up to each occurrence question to determine how frequently the condition occurred.

3.6.1 Household Food Insecurity Access Scale (HFIAS)

The HFIAS method was used in this study to evaluate the degree of food security in the HH over the last four weeks. The HFIAS is made up of two types of questions. An occurrence question is the first type of question. There are nine occurrence questions that ask if a specific condition associated with food security has ever occurred in the previous four weeks (30 days). Following each severity question is a frequency-of-occurrence

question, which asks how frequently a reported condition occurred in the previous four weeks. Each occurrence question is made up of three parts: the stem (the timeframe for recall), the body of the question (which refers to a specific behavior or attitude), and two response options (0 = no, 1 = yes). Each "no" response option also has a "skip code." When a respondent says "no" to an occurrence question, this code instructs the researcher to skip the related frequency-of-occurrence follow-up question. Each HFIAS frequency-of-occurrence question asks how frequently the condition reported in the previous occurrence question occurred in the previous four weeks. There are three response options that represent a frequency range (1 = rarely, 2 = occasionally, 3 = frequently). Appendix A shows the detailed HFIAS question structure (section 2).

3.7 Methods of Data Analysis

To achieve the objectives of the study, I have employed both descriptive and econometric methods of analysis.

3.7.1 Descriptive Analysis

This is a method or procedure used to present, organize and summarize the masses of the numerical data into a meaningful form. These methods are used to address the research questions. Various descriptive indicators such as frequency distributions, averages, and percentages were used to report and present from the field survey data. Household demographic characteristics, socioeconomic and welfare profiles and information was examined using descriptive analysis.

3.7.2 Econometrics Model Specification

The empirical studies on determinants of household food security have been modeled using two alternative approaches. The first approach employs logit models to examine the probability of households being food secured, mildly food insecure, moderately food insecure or severely food insecure. The second alternative approach using censored regression called Tobit Model. However, the Tobit specification has its own drawbacks; because it is actually used in cases where the dependent variable is not observed for some sample households this due to censoring and not due to individual decisions i.e. Tobit specifications can assume negative values, but actually take zero for some censored observations. So, in this study, the first approach was chosen. Since the household food security decision is the dependent variable, which is taking on four values, one for

households with “food secured”, two for households with “mildly food insecure”, three for households with “Moderately food insecure” and four for households with “severely insecure”. Estimation of this type of relationship requires the use of qualitative response models. In this regard, the linear probability models, logit, and probit models are the possible alternatives. However, several estimation problems arise particularly when Ordinary Least Squares (OLS) regression and linear probability models are employed; instead, an ordinary logistic regression model was employed as a tool to identify the determinant factors of household food security.

An Ordinary logistic regression model is more preferable when response category is ordered (Agersti, 2002). Ordinary logit model is a way of estimating the probability that an event occurs or not, by predicting dependent outcome from a set of independent variables (Gujarati, 2004). It is employed to explore the relationship of the dependent variable with independent variables. When the dependent variable in the regression is binary the analysis could be conducted by using a linear probability model. But the result of the linear probability model may generate predicted values less than zero or greater than one, which violates the basic principles of probability (Non-fulfillment of $(0 \leq E(y_i/x_i) \leq 1)$. Also, there is a problem of heteroscedasticity and the Ordinary Least Square estimates of the parameter will not also be efficient. Consequently, hypothesis testing and construction of confidence intervals become inaccurate and misleading. To alleviate these problems and produce relevant empirical outcomes, the most widely used qualitative response models are the logit and probit models.

3.7.2.1 Ordinary logit model

The Ordinary logit model in the form of regression is used when the dependent variable is taking more than two value and the independent variables are of any type. The maximum likelihood estimation method is appropriate for estimating these model parameters due to its less restrictive nature of assumptions. Mathematically, the ordered logit model is specified as per below.

$$P(Y_i > j) = \frac{exp(a_j + \beta_j X_i + \varepsilon_i)}{1 + exp(a_j + \beta_j X_i + \varepsilon_i)} \quad , j = 1,2, \dots \dots \dots , M-1 \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (1)$$

$$P(Y_i > j) = \frac{exp(a_j + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \cdots + \beta_K X_{Ki} + \varepsilon_i)}{1 + \exp(\beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \cdots + \beta_K X_{Ki} + \varepsilon_i)} \quad , j = 1,2, \dots \dots \dots , M-1 \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (2)$$

From the above, it can be determined that the probabilities that Y will take on each of the values 1 up to M-1 are equal to

$$P(Y_i = 1) = 1 - \frac{exp(a_j + \beta_j X_i + \varepsilon_i)}{1 + exp(a_j + \beta_j X_i + \varepsilon_i)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

$$P(Y_i = j) = \frac{exp(a_j + \beta_{j-1} X_i + \varepsilon_i)}{1 + exp(a_j + \beta_{j-1} X_i + \varepsilon_i)} - \frac{exp(a_j + \beta_j X_i + \varepsilon_i)}{1 + exp(a_j + \beta_j X_i + \varepsilon_i)} \quad j = 2, \dots, M-1 \dots\dots\dots\dots\dots\dots (4)$$

$$P(Y_i = M) = \frac{exp(a_j + \beta_{M-1} X_i + \varepsilon_i)}{1 + exp(a_j + \beta_{M-1} X_i + \varepsilon_i)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

Where Y_i is the dependent variable used in this study which is the food security status of households i and M-1 is the cutoff to estimate the probability of Y which take a particular value. More specifically: -

$$Y_i = \begin{cases} 1 \ \ if \ exp(a_j + \beta_j X_i + \varepsilon_i) \leq cut1 \\ 2 \ \ if \ cut1 < exp(a_j + \beta_j X_i + \varepsilon_i) \leq cut2 \\ 3 \ \ if \ cut2 < exp(a_j + \beta_j X_i + \varepsilon_i) \leq cut3 \\ 4 \ \ if \ cut3 < exp(a_j + \beta_j X_i + \varepsilon_i) \end{cases}$$

i. X_i = a vector of explanatory variables representing the household.

ii. β's = a vector of regression coefficients to be estimated using Maximum Likelihood Estimation and

iii. ε_i = error term

From equation (2), the order logit model looks as per below hence the parallel regression line assumption is not violated (see brant test in chapter four).

$$P(Y_i > j) = \frac{exp(a_j + AGE_i + SEX_i + MRS_i + ES_i + EDU_i + FAMSZ_i + DR_i + HS_i + INC_i + ASSET_i + SF_i + FEX_i + NonFEX_i + INF_i + SPP_i + SAC_i + TS_i + \varepsilon_i)}{1 + \{exp(a_j + AGE_i + SEX_i + MRS_i + ES_i + EDU_i + FAMSZ_i + DR_i + HS_i + INC_i + ASSET_i + SF_i + FEX_i + NonFEX_i + INF_i + SPP_i + SAC_i + TS_i + \varepsilon_i)\}}, j = 1,2,3 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

3.7.2.2 Maximum likelihood estimation

To estimate the parameters of the ordinary logistic regression model, the maximum likelihood estimation method is appropriate for estimating the logistic model parameters due to this less restrictive nature of the underlying assumptions. Thus, in this study, the

parameters of this model were estimated by using the maximum likelihood estimation rather than the movement estimation on which the OLS regression technique relies. The likelihood function is a probability to get observed values of the dependent variable given the observed values of independent variables. The likelihood value varies from 0 to 1 like any other probabilities.

Consider the logistic regression model $p(y_i/X'_i) = \frac{e^{X'_i\beta}}{1+e^{X'_i\beta}}$ since the observed values of Y_i say, s (i=1, 2… n) are independently distributed as Bernoulli, the maximum likelihood function of Y is given by:

$$L(\beta/y) = \prod_{i=1}^{n} p(y_i/X'_i) = \prod_{i=1}^{n} \left[\frac{e^{X'_i\beta}}{1+e^{X'_i\beta}}\right]^{y_i} \left[\frac{1}{1+e^{X'_i\beta}}\right]^{1-y_i}$$

The objective of ML estimation is to get an estimator $\hat{\beta}$ of β which maximizes the likelihood function.

3.8 Description and Measurements of Study Variables

Review of literature, the idea of experts, and knowledge of the researcher were used to identify dependent and independent variables.

Dependent variable

The dependent variable used in this study is the status of household food security. The status of household food security was measured based on HFIA category (food secured, mildly food insecure, moderately food insecure and severely food insecure).

Table 3:2 HH food security status

Category	Food Security Status	Criteria based on appendix I (section 2)
1	Food Secure	If (Q2.1a=0 or Q2.1a=1) and Q2.1 – Q2.9 = 0
2	Mildly Food Insecure	If (Q2.1a=2 or 3 or Q2.2a=1 or 2 or 3 or Q2.3a=1 or Q2.4a=1) and Q2.5- Q2.9=0
3	Moderately Food Insecure	If (Q2.3a=2 or 3 or Q2.4a=2 or 3 or Q2.5a=1 or 2 or Q2.6a=1 or 2) and Q2.7- Q2.9=0
4	Severely Food Insecure	If (Q2.5a=3 or Q2.6a=3 or Q2.7a=1 or 2 or 3 or Q2.8a=1 or 2 or 3 or Q2.9a=1 or 2 or 3)

Independent Variables

The independent variables which are expected to affect these dependent variables include demographic characteristics, institutional factors and socio-economic factors. The description of each variable is presented below.

Age of the household head (AGE): it is a continuous variable measured in years. Age matters in any occupation. It is argued that as the age of the household head increases he /she has acquired more knowledge and experiences with a possible positive effect on household food security. In other ways, it is expected that young household heads are productive and accumulate more resources which intern more likely to be food secure, than the older household head. Institutively, age is expected to have either positive or negative relationship with HH food security status. Birhane (2012) conclude that age of HH head has no significant association with food security status.

Sex of household head (SEX): sex of the household head is an important variable that influences food security status of a household. It is a dummy variable (coded as a female took the value 1 and 0 for males). Birhane (2012) conclude that sex of HH head has no significant association with food security status.

Marital status of household Head (MRS): The marital status of the respondents and the head of the households also determine the food security status of the households. It is a categorical variable, single, married, divorced, and widowed. Derso et al., (2021) conclude that marital status of HH head has significant association with food security status.

Employment sector of household head (ES): the household head is employed or engaged in self-employment activities such as petty trade matters the food security status. It is a categorical variable; own business, the government employed, the private organization employed and NGO employed. According to Birhane (2012), employment status of HH head and housing ownership were closely linked with food security.

Education level of household head (EDU): It is the year of formal instruction received and successfully completed. This variable is expected to have positive relation with food security of a household According to Birhane (2012), Households headed by those uneducated, and with primary education were more food insecure than those headed with diploma and above respectively.

Family Size (FAMSZ): It is total number of persons lives a given household. This variable is expected to have positive relation with food security of a household. i.e more family size is likely be food secured than family having less number. According to Derso et al., (2021), Household food security is lower for households with more family size comparing to those with having less family. Birhane (2012) conclude that family size does not have significant effect on household food security.

Dependency Ratio (DR): this is the ratio of children under age 15 and old age above 64 to a working-age family size age between (15 – 64 years). These groups are economically inactive and a burden to the other members of the household. Thus, it is hypothesized that a family with a relatively large number of dependent family members (high dependency ratio) negatively affects household food security. According to Derso et al., (2021), those households having high number of dependent family members are more likely to be food insecure and vice versa.

Housing Situation (HS): This variable determines where a specific household living in. According to Derso et al., (2021), those households who live in Kebele rental house are more likely to be food insecure than those who have their own private house while those who live in government rental houses are less food insecure than those who live in their private house. The researcher's expectation is not different from what Derso et al., (2021) has concluded.

Household Income (INC): It is a continuous variable measured in birr which is the sum of all monthly monetary income regardless of the source (inclusive of all income from employment, businesses, remittance, rent, etc.). According to Derso et al. (2021), household with high income are food secure than those having low income. So, this variable expected to have positive relation with food security of household.

Asset formation of household (ASSET): The total fixed asset formation of a particular household is measured by summing up the monetary value of the fixed assets of the household such as, car, house, radio, tape recorder, television, mobile phone, bed, refrigerator, but not include house in which a specific HH living in. It is a continuous variable and expected that this variable has a positive effect on household food security. According to Birhane (2012), house hold food insecurity is higher among asset poor households compared to those asset rich households while those asset medium households were twice food insecure as compared to the asset rich households.

Food Source (SF): means any growing crop or live animal, bird or fish from which food is intended to be derived (whether by harvesting, slaughtering, milking, collecting eggs or otherwise). It is expected to have either positive or negative relationship with food security.

Expenditure on food (FEX): It is a continuous variable which is measured by adding up total monthly expenditure on food items in Ethiopia birrs. The food component of consumption excludes expenditure on items such as; clothing, footwear, energy etc. Consumption expense of households increase; it is expected to reduce the household's propensity to be food secured because of increase in expenditure. Therefore, it is expected to have a negative relationship with food security.

Non-Food Expenditure (NonFEX): It is a continuous variable that measures by adding up total monthly expenditure on non-food items in Ethiopia birrs. This variable implicitly includes HH monthly saving per month. It is expected to reduce the household's propensity to be food secured because of increase in expenditure (non-food also). Therefore, it is expected to have a negative relationship with food security.

Awareness on Inflation (INF): refers to a general progressive increase in prices of goods and services in an economy. It is expected to have a positive relationship with food security.

Access from Social Protection Programm (SPP): access from all public and private initiatives that provide income or consumption transfers to the poor, protect the vulnerable against livelihood risks and enhance the social status and rights of the marginalized; with the overall objective of reducing the economic and social vulnerability of poor, vulnerable and marginalized groups (Devereux & Sabates, 2004). In our case, it includes any subsidy for food vulnerable society like school feeding; any subsidy through urban safety net program and health insurance. It is expected to have a positive relationship with food security.

Access from Savings and Credit (SAC): access from cooperative financial organization owned and operated by and for its members, according to democratic principles, for the purpose of encouraging savings, using pooled funds to extend loans to members at reasonable rates of interest and providing retailed financial services to enable members improve their economic and social well-being (Tumwine et al., 2015). It is expected to have a positive relationship with food security.

Access to Training and Supervision (TS): According to (Dessler, 2007), training is the process of teaching new person the basic skills he/she need to perform his/her own job. Supervision is a process which aims to support, assure and develop the knowledge, skills and values of the person being supervised (supervisee), team or project group (Kettle, 2 015). It is expected to have a positive relationship with food security.

Table 3:3 Overall descriptions and coding of variables

Variable Name	**Description of variables**	**Measurement of variables**	**Expected sign**
Food Security	Probability of food secured	[1]Secure, [2]Mildly secure ,[3] Moderately, [4] Severely	Dependent
Age	Age of i^{th} household head	A continuous variable measured in a number	-
Sex	Sex of i^{th} household head	Dummy (0= Male, 1 = Female)	+/-
Marital Status of	Marital status of household	[1]single, [2] married,[3] divorced, [4] widowed	+/-
Employment sector of HH head	Employment sector of the i^{th} household head	[1] Own business, [2] Government employee, [3] Private organization employee, [4] NGO employee	+/-
Education level Of Household	The education level of the i^{th} household head	[1] Illiterate, [2] Read and write, [3] primary,[4]Secondary,[5] Diploma, [6] First degree and above	+/-
Family size of household	Family size of the households	Number of persons living within a given house	-
Dependency Ratio	Number of a dependent with in the i^{th} household head	The ratio of age [≤ 15 and ≥ 65] by age b/n 15-64	-
Housing situation	The housing situation of i^{th} household Head	[1] Own house, [2] Gifted from government /relatives/, [3] Kebele rent, [4] Rent from private owner	+/-
HH Income	Monthly income of i^{th} Household	A continuous variable measured in birrs	+

Asset Formation of HH	Household asset value	Summing up the monetary value of the fixed assets owned by a household	+
Source of food	Household food source(From where household got their food)	[1] purchasing from market , [2] own farm, [3] subsidy	+/-
Food expenditure	Household consumption expenditure on food items	A continuous variable measured in birrs	-
Non-Food expenditure	Household consumption expenditure on non-food items	A continuous variable measured in birrs	-
Inflation rate	Awareness of inflation rate	[1] yes , [0] otherwise	-
Access from social protection program	Access to social protection program of i^{th} Household	[1] got Access,[0] otherwise	+
Access from credit and saving	Access to credit and saving of i^{th} Household	[1] got Access,[0] otherwise	+
Access to training and supervision	Access to training and supervision of i^{th} Household	[1] got Access,[0] otherwise	+

3.9 Evaluation of Ordered Logit Model

Firstly, the overall model should be evaluated. The goodness of fit or calibration of a model measures how well the model describes the response variable. Secondly, the significance of each explanatory variable needs to be assessed.

3.9.1 Likelihood-Ratio Test

The Likelihood-Ratio (chi-square (X^2)) test is the test statistic commonly used for called log-likelihood ratio test, it is based on (-2*times log-likelihood). Test of hypotheses the overall fit of the model.

H_0: The model is not a good fitting model (the predictors have not a significant effect on the outcome variables.).

H_1: The model is a good fitting model (the predictors have a significant effect on the outcome variables).

The likelihood ratio test is a chi-squared distribution with degrees of freedom equal to the number of predictors; this difference in the model chi-square. i.e.

$$X^2 = -2\log\left(\frac{l_0}{l_1}\right) = -2[\log(l_0 - \log(l_1)]$$

Where Log l_0 is the log-likelihood value of the model which has the intercept term only and Log l_1 is the log-likelihood value of a full model. If the p-value is less than a 5% level of significance it leads to the rejection of the null hypothesis that all the predictor effects are zero.

3.9.2 Hosmer–Lemeshow Test

The Hosmer–Lemeshow test is used to check the overall fit of the model and allows for any number of explanatory variables, which may be continuous or categorical (Bewick et al., 2005). The test divides subjects into decile groups g (usually 10) based on predicted probabilities, and then computes a chi-square from observed and expected frequencies. The hypothesis to be tested is:

H_0: The model fits the data

H_1: The model does not fit the data

The value of the test statistics is given by: $X^2 = \sum_{i=1}^{10} \frac{(O_g - E_g)^2}{E_g}$

Where O_g are the observed events and E_g are the expected events for the g[th] risk decline group. This test statistic has an approximate chi-square distribution with a (g-2) degree of freedom small value with a large p-value closer to 1 means a good fit to the data. Large values with p less than 5% mean that a poor fit to the data (Hosmer & Lemeshow, 2000).

3.9.3 Brant Test of parallel regression assumption

In ordinal logistics regression models, there is an important assumption which belongs to ordinal odds. According to this assumption, parameters should not change for different

categories. In other word, correlation between dependent and independent variable does not change for dependent variable's categories; also parameter estimations do not change for cut-off points (Kleinbaum & Klein, 2010). In a way, this assumption states that the dependent variable's categories are parallel to each other. I.e. coefficients of independent variables are equal across each category. Brant (1990) proposed a test of parallel regression assumption for ordinal logistic model by examining the separate fits to the underlying logistic model. A non- Significant Brant test indicates that parallel line regression assumption is not violated.

3.10 Diagnostic Checking

3.10.1 Pairwise Correlation

Before estimating the model, test the severity of correlation within explanatory variables is an important diagnostic test to check the appropriateness of the model. Because two or more variables giving rise to the same piece of information may be included, that may have redundant information or unnecessarily included related variables.

CHAPTER FOUR

4. RESULTS AND DISCISSIONS

4.1 Introduction

This chapter concentrates on the actual research findings and analysis of data from field surveys. The data analysis and presentation were organized into two main sections; descriptive statistics and econometrics model. The descriptive statistics of demographic, institutional and socio-economic characteristics of sample households are presented with appropriate statistical tools like mean, standard error, percentage, and frequency distribution. For econometrics model, the results of the ordered logit model is presented and discussed.

4.2 Features of Households

This study aimed to identify the determinants of household food security. So, conducting descriptive analysis before estimating the model is important to know the properties and behaviors of study variables. It is useful to take some correction measurements so that the variables are certainly applicable in the estimation process. Additionally, descriptive analysis was employed to obtain some information about the distribution of the variables and to obtain rough information about the characteristics of the households.

4.2.1 Characteristics of households

The demographic, institutional and socio-economic characteristics of the sample household include age of HH head, sex of HH head, education status of HH head, household size, dependency ratio, marital status of HH head, income, employment sectors of HH head, food and Nonfood expenditure (including saving), housing situation, asset value (current), access from social protection program, awareness about inflation and accessibility of credits and saving. Among these, age of HH head, household size, dependency ratio, food and Nonfood expenditure (including saving), asset value (current), and income of HH are measured as continuous variables while the rest sex of HH head, education status of HH head, marital status of HH head, employment sector of HH heads, housing situation, access from social protection program, awareness about inflation and accessibility of credits and saving are categorical variables.

Table 4:1 Summary statistics for continuous variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Age of HH head	256	42.484	12.36	22	76
Family Size	256	4.664	1.96	2	12
Dependency Ratio	256	1.176	1.219	0	6
HH income per month	256	9197.301	7838.448	0	60000
Asset value(current)	256	145675.78	200397.55	0	671000
HH food expenditure per month	256	4353.27	2700.743	0	20000
HH nonfood expenditure(including Saving)	256	4682.324	6083.641	0	50000

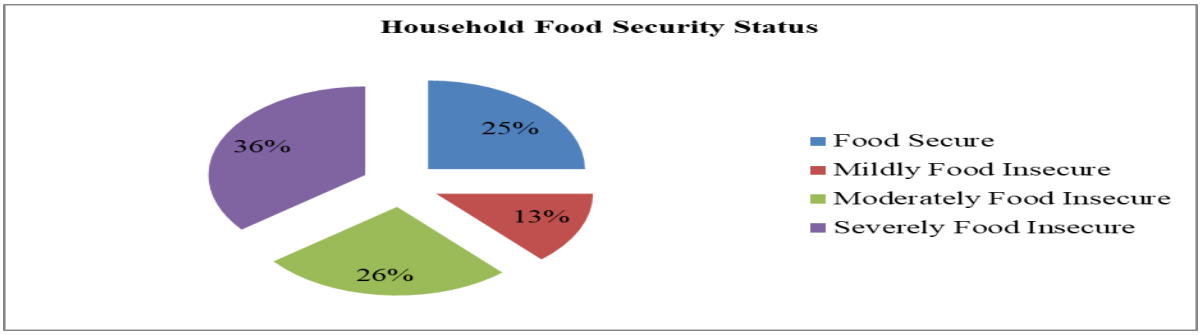
Source: Computed from own survey, 2022

From the table above, average age of household head was about 42 years old. Minimum age of household head in the sample was 22 years and maximum age was 76 years. Average family size in the sample was 2 and maximum was 12. On average, there exist one dependent in each sampled households and there exist a maximum of 6 dependents in sample household. Similarly, households had an average monthly income of 9,197 ETB. Out of this income, household spent 4.353 ETB for food and 4,683 ETB for non-food items.

4.2.2. Food Security Status of Household

When the data collection was undertaken, the household was specifically requested about their food security status earlier to the survey time. During the survey time, the maximum numbers of households were severely food insecure, which counts 36% out of 256 households. Of 256 households 25% were food secured, 13% were mildly food insecure and 26% were moderately food insecure as shown on the figure 4.1 below. From the result above, three out of each four households are food insecure in Addis Ababa city administration. This result is a blow as a country in general and for households in particular. And probably this is due to HH, which exist in urban areas are mostly depend on market based food consumption. Similarly, in Nairobi, only 29% of households in the sample were food secure on the HFIAP, all of the other households experienced some degree of food insecurity, including 36% who were mildly or moderately food insecure and 25% who were severely food insecure (Onyango & Crush, 2021).

Figure 4.1: Percentage distributions of HH food security status



Source: Survey data, Addis Ababa 2022

4.2.3 Demographic and Socio-economic characteristics of households by their Food Security Status

4.2.3.1 Sex of Household Head

Gender is an important variable which determine household food security status. The majority of the household heads in this study were males and accounts 64% while 36% of them were females. Out of 163 males HH heads, 25% of them were food secure, 15% were mildly food insecure, 26% were moderately food insecure households and 34% were severely food insecure household. On the other hand, out of 93 female household head respondents, 26% of them were food secure, 11% were mildly food insecure, 26% were moderately food insecure and 38% were severely food insecure household. From the result, female headed HH were relatively food secured than male headed HH. The chi-square p-value of the variable is 0.819, which is insignificant even at a 10% level of significance. Therefore, sex of the household head has no significant association with household food security status (Table 4.2).

4.2.3.2 Marital status of Household head

Marital status of the household head is variable which also determine food security status of specific household. From Table 4.2 below, 22% of household heads were single, 59% were married, 8% were divorced and 11% are windowed. Married household head respondents were the larger proportion in this study. From this, 25% of married household head respondents were food secure, 17% of married household head respondents were mildly food insecure household, 19% of married household head respondents were moderately food insecure household and 39% of married household head respondents were severely food insecure household. Moreover, the chi-square p-value of this variable is

0.023, which is significant at a 5% level of significance. Therefore, marital status of the household head has significant association with household food security status (Table 4.2).

4.2.3.3 Housing situation of the household

As shown in Table 4.2, out of total respondents, 46% of the households are living in privately rented house, 25% of the households are living in their own house and the rest 29% of them are living in houses gifted from government, in kebele house or live in somewhere else. This implies that in the study area rented households are higher than the households who are the owner. Out of the total households who live in private rented house (118), 19% of them were found to be food secure, 13% of them were mildly food insecure, 80 (68%) of them were either moderately or severely food insecure. Out of the total households who live in private rented house, 42% of households were food secure, 12% of households were mildly food insecure, 21% of households were moderately food insecure and 17% of households were severely food insecure. This shows that those who live in their own house are more likely to be food secured than others. As expected, out of the total households categorized under" other" (live somewhere), 100% them were severely food insecure. Here, the chi-square p-value of this variable is 0.000, which is significant at a 1% level of significance. Therefore, housing situation of household has significant association with household food security status (Table 4.2).

4.2.3.4 Education level of household head

As depicted on Table 4.2 below, 11% of household head were illiterate (at least they cannot read and write), 21% of the HH heads attended primary school, 17% of household head were attended secondary school education, 18% of household heads earned their diploma and 34% of household heads were graduate of their first degree and above. The comparison by food security status reveals that, 33% of households were food secured and 67% of households were food insecure (ether mildly, moderately or severely) categorized under illiterate education level. Surprisingly, 25% of households, which were food secured and 75% of households, which were food insecure (ether mildly or moderately or severely) are categorized under degree and above education level (Table 4.2). This shows that household head education level does not have any association with household food security status. This result contradicts with previous literatures. Right now, the issue of being food secure is beyond attaining high education level. For instance, the marginal increase in price of consumer good is incomparable with the return on higher education of a specific HH head. Additionally, the return on higher education of a specific HH head is almost fixed for long

period of time, while price of consumer good increases exponentially. The chi-square p-value of this variable is 0.216, which is insignificant at a 10% probability level.

4.2.3.5 Access to credit and saving

The result indicated that those household who did not have access to formal/informal credit and saving accounts 51% of the total sampled respondents. On the other hand, only 49% of the sampled respondents have access to credit and saving. Out of 129 households who do not have access to credit and saving, 24% households were food secure, 11% households were mildly food insecure, 17% households were moderately food in secure and 48% households were severely food insecure. Out of 129 households who had access to credit and saving, 26% households were food secure, 16% households were mildly food insecure, 35% households were moderately food in secure and 36% households were severely food insecure. This indicates that having and accessing to credit and saving (any credit and saving association) has significant association with household's food security status. The chi-square p-value (0.000) also confirms that access to credit and saving has insignificant association with household food security status (Table 4.2).

4.2.3.6 Employment sector of household heads

The selected sample represented the total population including different occupational groups including those who run own business, government employees, private organization employees, NGO employees and other (retired or else) as shown in Table 4.2. The study showed that the majority of households were engaged in government sector. It accounts around 41% of the sample, 25% of households did their own business, 14% of households were employed in private organization and 3% of households were working in NGO and 16% of households were retired household heads. Out of total household head who work at government sector, only 26% of households were food secure household. The remaining 74% household heads were food insecure household (10% of households were mildly food insecure, 23% of households were moderately food insecure and 41% of households were severely food insecure). Similarly, out of total household head that run their own business, only 26% of households were food secure household. The remaining 74% household heads were food insecure household (17% of households were mildly food insecure, 25% of households were moderately food insecure and 42% of households were severely food insecure). The chi-square p-value (0.267) show that employment sector of household head does not have significant association with household food security status (Table 4.2).

4.2.3.7 Household awareness on inflation rate

Inflation rate is an important variable which determine household food security status. The majority of the household were aware of inflation rate and accounts 88% while 12% of them do not have awareness about inflation rate. Out of 224 households who had awareness about inflation rate, 22% households were food secured, 12% households were mildly food insecure, 28% households were moderately food insecure and 38% households were severely food insecure. On the other hand, out of 32 households who do not have awareness about inflation rate, 47% households were food secured, 19% households were mildly food insecure, 12% households were moderately food insecure and 22% households were severely food insecure. The chi-square p-value of the variable is 0.006, which is significant at a 5% level of significance. Therefore, household's awareness on inflation rate has significant association with household food security status (Table 4.2).

4.2.3.8 Household access to social protection program

Also, social protection program (like health insurance, school feeding, safety net program) is an important variable which determine household food security status. The majority of the household do not had access to social protection program and accounts 69% while 31% households had accesses to social protection program. Out of 176 households who do not have access to social protection, 22% households were food secure, 9% households were mildly food insecure, 27% households were moderately food insecure and 42% households were severely food insecure. On the other hand, out of 80 households who had access to social protection program, 31% households were food secured, 23% households were mildly food insecure, 24% households were moderately food insecure and 22% households were severely food insecure. The chi-square p-value of the variable is 0.002, which is significant at a 5% level of significance. Therefore, access from social protection program has significant association with household food security status (Table 4.2).

Table 4:2 Summary statistics on characteristics of household (categorical variables)

Variables	Category	Household Food Security status						P-Value
			Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure	Total	
Sex of HH head	Male	Freq.	40	24	43	56	163	0.8187
		%_age	25%	15%	26%	34%	100%	
	Female	Freq.	24	10	24	35	93	

		%_age	26%	11%	26%	38%	100%	
Marital Status of HH head	Single	Freq.	13	4	19	20	56	0.0231**
		%_age	23%	7%	34%	36%	100%	
	Married	Freq.	37	26	29	59	151	
		%_age	25%	17%	19%	39%	100%	
	Divorced	Freq.	4	0	9	8	21	
		%_age	19%	0%	43	38%	100%	
	Widowed	Freq.	10	4	10	4	28	
		%_age	36%	14%	36%	14%	100%	
Housing situation of Household	Own house	Freq.	27	12	14	11	64	0.0003***
		%_age	42%	19%	22%	17%	100%	
	Gifted from government/relatives	Freq.	3	2	3	6	14	
		%_age	22%	14%	21%	43%	100%	
	From kebele as a rent	Freq.	11	5	19	17	52	
		%_age	21%	10%	36%	33%	100%	
	Rent from private owner	Freq.	23	15	31	49	118	
		%_age	19%	13%	26%	42%	100%	
	Other	Freq.	0	0	0	8	8	
		%_age	0%	0%	0%	100%	100%	
Educational level of HH head	Illiterate	Freq.	10	2	6	9	27	0.2159
		%_age	37%	7%	22%	34%	100%	
	Primary school	Freq.	9	4	19	22	54	
		%_age	17%	8%	35%	41%	100%	
	Secondary school	Freq.	10	5	14	14	43	
		%_age	22%	12%	33%	33%	100%	
	Diploma	Freq.	14	11	7	14	46	
		%_age	30%	24%	15%	31%	100%	
	Degree and above	Freq.	21	12	21	32	86	
		%_age	24%	11%	17%	48%	100%	
Access to Credit and Saving of HH	No	Freq.	31	14	22	62	129	0.0000***
		%_age	28%	12%	20%	40%	100%	
	Yes	Freq.	33	20	45	29	127	
		%_age	25%	13%	26%	36%	100%	
Employment Sector of HH head	Own business	Freq.	17	11	16	21	65	
		%_age	26%	17%	25%	32%	100%	
	Government employee	Freq.	27	11	24	43	105	
		%_age	26%	10%	23%	41%	100%	
	Private organization	Freq.	7	9	8	12	36	
		%_age	19%	26%	22%	33%	100%	

	employee							0.2674
	NGO employee	Freq.	3	0	4	1	8	
		%_age	38%	0%	50%	12%	100%	
	Other(retired or any other)	Freq.	10	3	15	14	42	
		%_age	23.81	7.14	35.71	33.33	100%	
Awareness on inflation rate	No	Freq.	15	6	4	7	32	0.0063*
		%_age	47%	19%	12%	22%	100%	
	Yes	Freq.	49	28	63	84	224	
		%_age	22%	12%	28%	38%	100%	
Access from social protection program	No	Freq.	39	16	48	73	176	0. 0017**
		%_age	22%	9%	27%	42%	100%	
	Yes	Freq.	25	18	19	18	80	
		%_age	31%	22%	24%	22%	100%	

Note: ***, **, and * sign shows the rejection of the null hypothesis that there is no association between food security status with other variables listed above at 1%, 5%, and 10 % significant level respectively.

Source: Computed from own survey, 2022

4.2.3.9 Income level and HH food security status

The income of a household is all monetary income. Income is an important determinant of food security status for a specific household. It is calculated through an income approach that includes wages of the workers, rent from their house, remittance from relatives, and profit of a firm. Findings from Table 4.3 showed that 11% of total respondents were earning an average of less than 3000 Ethiopian birrs per month. From those respondents, 82% of households were severely food insecure, 7% households were food insecure, 4% households were mildly food insecure and 7% households were food secured. Out of 43% respondents who earn an income between 3,001 to 8,000 Ethiopian birr per month, 40% households were severely food insecure, 35% households were moderately food insecure, 12% households were mildly food insecure and 13% households were food secure. Out of 37% respondents who earn an income between 8,001 to 13,000 Ethiopian birr per month, 40% households were food secure, 13% households were mildly food insecure, 22% households were moderately food insecure and 25% households were severely food insecure. Moreover, this suggests that low-income earning households are relatively food insecure, which, coincides with our hypothetical assumption.

Table 4:3 Summary statistics of the HH monthly income

Variable	Category	Household Food Security status						P-value
			Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure	Total	
HH income level	<=3,000 birr	Freq.	2	1	2	22	27	0.0000***
		%_age	7%	4%	7%	82%	100%	
	3,001 - 8,000	Freq.	14	13	39	45	111	
		%_age	13%	12%	35%	40%	100%	
	8,001 - 13,000	Freq.	38	12	21	23	94	
		%_age	40%	12%	22%	24%	100%	
	13001 - 18,,000	Freq.	3	1	4	1	9	
		%_age	33%	11%	45%	11%	100%	
	>=18,001	Freq.	7	7	1	0	15	
		%_age	47%	47%	6%	0.00	100%	

Source: Computed from own survey, 2022

From the table above, there is evidence that income level has an association with food security status of a specific household at p value <0.01 (Table 4.3).

4.2.3.10 Food and non-food expenditure practices of Household

As indicated on the table 4.4, out of the total 256 households' respondents, 14% households had an expenditure of less than or equal to 3,000 ETB for food per month. Of these households, 65% households were severely food insecure, 16% households were food secured, 5% households were mildly food insecure and 14% households were moderately food insecure. Similarly, from a total of 256 households, 61% households had expenditure between 3,001-8,000 ETB for food per month. Of this households, 35% households were food severely insecure, 24% households were food secure, 13% households were mildly food insecure and 28% households were moderately food insecure.

On the other hand, out of the total 256 households' respondents, 43% households had an expenditure of less than or equal to 2,000 ETB for non-food per month. Of these households, 53% households were severely food insecure, 10% households were food secured, 8 (10%) households were mildly food insecure and 27% households were moderately food insecure. From the table below, there is evidence that both food and non-food expenditure has an association with food security status of a specific household at p value <0.01 (Table 4.4).

Table 4:4 Food and non-food expenditure of Household

Variable	Category	Household Food Security status						P-value
			Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure	Total	
HH Food expenditure in ETB	<=3,000	Freq.	6	2	5	24	37	0.0000***
		%_age	16%	5%	14%	65%	100%	
	3,001 - 8,000	Freq.	37	20	44	54	155	
		%_age	24%	13%	28%	35%	100%	
	8,001 -13,000	Freq.	16	5	16	13	50	
		%_age	32%	10%	32%	26%	100%	
	13,001 -18,,000	Freq.	5	5	2	0	12	
		%_age	42%	42%	16%	0.00	100%	
	>=18,001	Freq.	0	2	0	0	2	
		%_age	0%	100%	0%	0%	100%	
HH non-food expenditure including saving in ETB	<=2,000	Freq.	8	8	21	42	79	0.0000***
		%_age	10%	10%	27%	53%	100%	
	2,001 - 5,000	Freq.	23	14	33	40	110	
		%_age	21%	13%	30%	36%	100%	
	5,001 -9,000	Freq.	26	5	11	7	49	
		%_age	53%	10%	23%	14%	100%	
	9,001 -13,000	Freq.	3	2	2	1	8	
		%_age	38%	25%	25%	12%	100%	
	>=13,001	Freq.	4	5	0	1	10	
		%_age	40%	50%	0%	10%	100%	

Source: Computed from own survey, 2022

4.2.3.11 Current asset value of Household

As indicated on the table 4.5 below, out of the total 256 respondents, 30% households had a current asset value of 50,000 ETB or less in their house. Of these households, 53% households were severely food insecure, 16% households were moderately food insecure, 12% households were mildly food insecure and only 10% households were food secure. Similarly, from a total of 256 respondents, 54% households had a current asset value of between 50,001-150,000 ETB in their house. Of these households, 34% households were severely food insecure, 27% households were food secure, 13% households were mildly food insecure and 26% households were moderately food insecure. From the table below, there is evidence that both food and non-food expenditure has an association with food security status of a specific household at p value <0.01 (Table 4.5).

Table 4:5 Asset value (current) of Households

Variable	Category	Household Food Security status						P-value
			Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure	Total	
HH asset value(current)	<=50,000	Freq.	8	9	19	40	76	0.0003***
		%_age	10%	12%	25%	53%	100	
	50,001 - 150,000	Freq.	37	18	36	47	138	
		%_age	27%	13%	26.09	34%	100	
	150,001 - 250,000	Freq.	3	0	1	0	4	
		%_age	75.00	0.00	25.00	0.00	100	
	250,001 - 350,000	Freq.	0	0	0	0	0	
		%_age	0%	0%	0%	0%	0%	
	>350,001	Freq.	16	7	11	4	38	
		%_age	42.11	18.42	28.95	10.53	100	

Source: Computed from own survey, 2022

4.3 Results of the Econometrics Model Analysis

4.3.1 Pairwise Correlation test

In this part, econometric method of data analysis is used to identify the determinant factors of household food security. Ordered logit regression model was employed to identify the determinant factors of household food security status by incorporating a set of the explanatory variable associated with the dependent variable. Before the estimation of the parameters of the model, the data have been tested for correlation problems. The reason for this is that correlation is a series problem in any econometric model. This problem arises when at least one of the independent variables is a linear combination of the others. If so, standard errors are inflated (creates very large standard errors), the sign of the estimated regression coefficients may be opposite of hypothesized direction, smaller test statistics that might lead to wrong conclusions (Wooldridge et al., 2016). Thus, correlation was examined and based on the test, the coefficient of correlation within explanatory variables is not more than 0.75 (see Appendix B, section B), which shows that the effect of correlation is fairly low. Hence, we can conclude that correlation is not a concern.

4.3.2 Model Goodness test

The dependent variable is a variable that takes a value of 1, 2, 3 or 4 depending on whether the respondent is a food secured, mildly food insecure, moderately food insecure or severely food insecure and regressed against all independent variables. Before interpreting the effect of independent variables on the dependent variable, it is important to see the fitness of the chosen model. Likelihood ratio test, and Hosmer and Lemeshow test shows the existence of a relationship between the dependent variable and the combination of the in dependent variables.

4.3.2.1 Likelihood ratio, and Hosmer and Lemeshow test

A likelihood ratio test is used by comparing the log-likelihood of the unrestricted model (full model) to that of the reduced model to test two hypotheses. The likelihood ratio test statistic has a chi-square distribution with degrees of freedom obtained by differencing the number of parameters included in both models. The null hypothesis for this test statistic is that all the coefficients in the logistic regression model except the constant are zero against the alternative hypothesis of the predictors have a significant effect on the outcome variables in the model. When the likelihood ratio test statistic is significant, at least one of the predictors is significantly related to the response variable (Hosmer & Lemeshow, 2000). In this study, the result of the full order logistic regression model was compared to the null model (only intercept model) using the likelihood ratio test (LRT) which tests whether the full model predicts better than the intercept-only model. The results of the likelihood ratio test confirm the full model predicts the data better than the null model since the value of the likelihood ratio chi-square statistic is LR (17) =146.02 with p- value equals 0.0000, implies that the null hypothesis is rejected and there is evidence that at least one of the explanatory variables contributes to the prediction of the outcome (See Appendix B, section A).

Hosmer-Lemeshow test is used to assess the overall goodness of the fitted model. Under this test, the study tests the null hypothesis of the model that fits the data against the alternative hypothesis of the model does not fit the data well. As shown from Figure 4.2, the ordinal Hosmer and Lemeshow test of the fitted model are insignificant (chi2 (26) =21.88 and p-value=0.6951). Since, the value of the ordinal Hosmer-Lemeshow goodness of fit test is greater than 0.05, implying fail to reject the null hypothesis and show that the model fits the data well (See Appendix B, section A). Therefore, we concluded that the

model fits the data very well. So, we can proceed to discussion and interpretation of the significant explanatory variables in the model.

4.3.2.2 Brant test of parallel regression assumption

The brant test of parallel regression assumption below yields p- value of 0.084, which is greater than the usual level of significance (5%). Thus, the parallel line regression assumption upheld. This suggests that the effect of the explanatory variables is constant across each category of the dependent variable.

4.3.3 Results of Order Logit Model

Table 4.7 shows the estimation results of order logit model for the determinants of household food security status. It reports the estimated coefficients, marginal effect and Pseudo R^2.

Table 4:6 Factors affecting HH food security status

Dependent Variable: HH Food Security Status						
Explanatory Variable	Category	Coefficient	Marginal effect(*dy/dx)*			
			Food Secured	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure
Marital status of HH head	Single (Ref.)					
	Married	-1.118	0.134***	0.040**	0.002	-0.176***
	Divorced	-.252	0.025	0.010	0.007	-0.042
	Widowed	-.54	0.058	0.022	0.010	-0.089
Employment sector of HH head	Own business (Ref.)					
	Gov't employee	-.024	0.003	0.001	- 0.000	- 0.004
	Private organization employee	-.212	0.027	0.006	-0.001	-0.032
	NGO employee	-1.265	0.184	0.021**	-0.039	-0.166*
	Other	-.346	0.045	0.010	-0.004	-0.051
Education level of HH head	Illiterate (Ref.)					
	Primary School	.421	-0.054	-0.013	0.004	0.063
	Secondary					

	School	.362	-0.047	-0.011	0.004	0.054
	Diploma	-.19	0.027	0.004	-0.005	-0.027
	1st degree and above	.324	-0.043	-0.009	0.004	0.048
Family size	<=4 (Ref.)					
	(4-8]	.537	-0.068*	-0.016	0.003	0.080*
	>=8	.493	-0.063	-0.014	0.004	0.073
Dependency ratio	<=33% (Ref.)					
	(33%-66%]	-.529	-0.066*	-0.017	0.001	0.082*
	>=67%	-.748	0.110	0.013	-0.025	-0.098
Housing Ownership of HH	Own house (Ref.)					
	Gov't house (gift)	.936	-0.131	-0.025	0.022	0.135
	Kebele (rent)	.236	-0.036	-0.004	0.010	0.030
	Private(rent)	1.271	-0.169***	-0.038***	0.017	0.190***
	Others	15.856	-0.342	-0.157	-0.255	0.754
HH Food source	Purchased from Market (Ref)					
	Own production	.255	0.033	0.007	-0.003	-0.038
	Remittance	15.829	-0.243	-0.135	-0.269	0.646
	Begging	12.554	-0.242	-0.135	0.269*	0.646***
	Any combination	1.336	-0.133	-0.049	-0.036	0.217
HH monthly Income Level (in ETB)	<=3,000 (Ref.)					
	(3,000-8,000]	1.263	0.107**	0.058*	0.060	-0.224*
	(8,000-13,000]	2.008	0.206***	0.086**	0.050	-0.342**
	(13,000-18,000]	1.996	0.204	0.085*	0.051	-0.340*
	>18,000	3.277	0.423	0.091**	-0.035	-0.479**
HH Asset(current value)	<=50,000 (Ref.)					
	(50,000-150,000]	.107	0.013	0.004	0.000	-0.017
	(150,000-250,000]	2.11	0.327	0.021	-0.099	-0.248**
	(250,000-350,000]	0	0	0	0	0
	>350,000	.901	0.125*	0.025	-0.018	-0.131*
HH monthly food expenditure (in	<=2,000 (Ref.)					
	(2,000-5,000]	.058	-0.008	-0.002	0.001	0.008

ETB)	(5,000-9,000]	.459	-0.056	-0.013	0.001	0.069
	(9,000-13,000]	.514	-0.063	-0.015	0.001	0.077
	>=13,000	1.344	-0.142	-0.045	-0.023	0.211
HH monthly non-food expenditure (in ETB)	<=2,000 (Ref.)					
	(2,000-5,000]	-.296	0.036	0.012	0.001	-0.049
	(5,000-9,000]	-1.387	0.200**	0.036**	-0.038	-0.198***
	(9,000-13,000]	-.434	0.054	0.017	-0.000	-0.070
	>=13,000	-.75	0.098	0.027	-0.008	-0.117
Inflation rate awareness	No (Ref.)					
	Yes	.715	-0.099	-0.018*	0.016	0.101*
Access from Social Protection Program	No					
	Yes	1.131	0.153***	0.030***	-0.020	-0.163***
Access from Credit and Saving Association	No (Ref.)					
	Yes	.535	0.069	-0.016	0.006	- 0.079*
Access to Training and Supervision (about FS)	No (Ref.)					
	Yes	.512	0.063*	-0.017	0.000	0.079
/cut1	-2.478432					
/cut2	-1.532416					
/cut3	.1234187					
Pseudo r-squared	0.214	Number of obs	256			
Chi-square	146.021	Prob > chi2	0.000			

Note: ***, **, and * sign shows the rejection of the null hypothesis that there is no association between food security status with other variables listed above at 1%, 5%, and 10 % significant level respectively.

4.3.3.1 Interpretation of Average Marginal effect

Based on the above ordinal logistic regression result, out of a total of seventeen independent variables, thirteen of them are statistically significant at 1%, 5% or 10% levels of significance. These are marital status of HH head, employment sector of HH head, family size, dependency ratio, housing situation of HH, source of food, HH income, HH

asset (current value), HH nonfood expenditure (including saving), HH awareness about inflation, HH access from social protection programs, HH access from credit and saving and HH access to training and supervision are significant at least at 10%, holding other variables constant. This means significant differences is observed between household food security status and the above mentioned significant explanatory variables. The Pseudo R2 indicates how well the covariates explain the probability of a household's food security status. The Pseudo R2 is found about 0.214. A negative sign coefficient of each explanatory variable indicates that the likelihood of HH being food in secure. In contrast, a positive sign coefficient of each explanatory variable indicates that the likelihood of HH being food secured.

Marital Status of HH head: It is a categorical variable, which takes a value of 1 if the HH head is single, 2 if HH head is married, 3 if HH head is divorced and 4 if HH head is widowed. This variable is significant at the 5% level of significance. Married HH head are 13.4% more likely to be food secured than single HH head, keeping all other covariates constant. Married HH head are 4% more likely to be mildly food insecure (somehow food secured) than single HH head, keeping all other covariates constant. Married HH head are 17.6% less likely to be severely food insecure than single HH head, keeping all other covariates constant. Intuitively, married HH head are more likely to share HH expenditure in the house, likely to generate more income than single HH head and results HH to be food secure. This result is consistent with Derso et al. (2021), conclude that marital status of HH head has significant association with food security status.

Family Size of HH: From the table above, HH having a family size of greater than 4 are 6.8% less likely to be food secured than HH having a family size of 4 or less, keeping all other covariates constant. Similarly, HH having a family size of greater than 4 are 8% more likely to be severely food insecure than HH having a family size of 4 or less, keeping all other covariates constant. When we see the sign of this variable coefficient, it shows that being food insecure increase when family size increases. This is due to that having more family size does not necessarily mean that all individual in a household are productive. May be, inactive labor is accumulated in a specific household which in turn affect household's food security status. This result contradict with Birhane (2012), who conclude that family size does not have significant effect on household food security. On the other hand it is in line with Derso et al. (2021), household food security is lower for households with more family size comparing to those with having less family size.

HH dependency Ratio: From the table above, HH having a dependency ratio of greater than 33% are 6.6% less likely to be food secured than HH having a dependency ratio of 33% or less, keeping all other covariates constant. Similarly, HH having a dependency ratio of greater than 33% are 8.2% more likely to be severely food insecure than HH having a family size of 33% or less, keeping all other covariates constant. When we see the sign of this variable coefficient, it shows that being food secured decrease when dependency ratio increases. Same, Derso et al. (2021) confirms that households having high number of dependent family members are more likely to be food insecure and vice versa.

Housing Situation of HH: From the table above, HH whom live in private rented house are 16.9% less likely to be food secured than HH whom live in their own house, keeping all other covariates constant. HH whom live in private rented house are 3.8% less likely to be mildly food insecure (somehow food secured) than HH whom live in their own house, keeping all other covariates constant. Similarly, HH whom live in private rented house are 19% more likely to be food insecure than HH whom live in their own house, keeping all other covariates constant. The result is not different from that of Derso et al. (2021) who reported that those households who live in private rental house are more likely to be food insecure than those who have their own private house.

HH food source: From the table above, HH whom got their food by begging are 26.9% more likely to be moderately food insecure (somehow food insecure) than HH whom got their food by purchasing from market, keeping all other covariates constant. Similarly, HH whom got their food by begging are 64.6% more likely to be severely food insecure than HH whom got their food by purchasing from market, keeping all other covariates constant. Intuitively, this result makes sense as those who got their food through begging suffered a lot than those who can afford and purchase their food item from market.

HH Monthly Income: From the table above, HH whom got a monthly income of greater than 3,000ETB but equal to 8000ETB or less are 10.7% more likely to be food secured than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant. Also, HH whom got a monthly income of greater than 3,000ETB but equal to 8000ETB or less are 5.8% more likely to be mildly food insecure(somehow food secured) than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant. On the other hand, HH whom got a monthly income of greater than 3,000ETB

but equal to 8000ETB or less are 22.4% less likely to be severely food insecure than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant.

HH whom got a monthly income of greater than 8,000ETB but equal to 13, 000ETB or less are 20.6% more likely to be food secured than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant. Also, HH whom got a monthly income of greater than 8,000ETB but equal to 13, 000ETB or less are 8.6% more likely to be food insecure (somehow food secured) than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant. On the other hand, HH whom got a monthly income of greater than 8,000ETB but equal to 13, 000ETB or less are 34.2% less likely to be severely food insecure than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant.

HH whom got a monthly income of greater than 13,000ETB but equal to 18, 000ETB or less are 8.5% more likely to be mildly food insecure (somehow food secured) than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant. On the other hand, HH whom got a monthly income of greater than 13,000ETB but equal to 18, 000ETB or less are 34% less likely to be severely food insecure than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant.

HH whom got a monthly income of greater than 18, 000ETB are 9.1% more likely to be mildly food insecure (somehow food secured) than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant. On the other hand, HH whom got a monthly income of greater than 18, 000ETB are 47.9% less likely to be severely food insecure than HH whom got a monthly income of 3,000ETB or less, keeping all other covariates constant. According to Derso et al. (2021), household with high income are food secure than those having low income. So, this result is in line with (Derso et al., 2021).

HH Asset (current value in ETB): HH were asked about their asset which existed in there house. Those assets are converted to cash amount (in ETB) considering depreciation cost and current value of a specific asset. HH whose current asset value greater than 150,000ETB but equal to 250,000ETB or less are 24.8% less likely to be severely food insecure than HH whose current asset value is 50,000ETB or less, keeping all other covariates constant. Similarly, HH whose current asset value greater than 350,000ETB are 12.5% more likely to be food secured than HH whose current asset value is 50,000ETB or

less, keeping all other covariates constant. Also, HH whose current asset value greater than 350,000ETB are 13.1% less likely to be severely food insecure than HH whose current asset value is 50,000ETB or less, keeping all other covariates constant. Obviously, Increase in income leads household more food secured. According to Birhane (2012), household food insecurity is higher among asset poor households compared to those asset rich households. Similarly, above result confirms Birhane (2012) conclusion.

HH monthly non-food expenditure including saving (in ETB): From the table above, HH whose expense for non-food item and saving greater than 5,000ETB but less than 9,000ETB or less are 20% more likely to be food secured than HH whose expense for non-food item and saving less than 5,000ETB or equal, keeping all other covariates constant. Also, HH whose expense for non-food item and saving greater than 5,000ETB but less than 9,000ETB or less are 3.6% more likely to be mildly food insecure(somehow food secured) than HH whose expense for non-food item and saving less than 5,000ETB or equal, keeping all other covariates constant. On the other hand, HH whose expense for non-food item and saving greater than 5,000ETB but less than 9,000ETB or less are 19.8% less likely to be severely food insecure than HH whose expense for non-food item and saving less than 5,000ETB or equal, keeping all other covariates constant. When households expenditure is higher or non-food commodity, it indirectly limit their expenditure on food item which in turn affect their food security status.

HH awareness on inflation rate: From the table above, HH who had awareness on inflation rate are 1.8% less likely to be mildly food insecure (somehow food secured) than those who do not had awareness about inflation rate. Similarly, HH who had awareness on inflation rate are 10.1% more likely to be severely food insecure than those who do not had awareness about inflation rate. This happens may be; HH who do not have enough food in their house knows increment in price of consumer goods on coming months but not speculate neither their money nor food for next month consumption. Generally, those who are somehow food secured are not worried about increase in price of consumption goods as compared to food insecure household.

HH access to social protection program: From the table above, HH who got access to social protection programs are 15.3% more likely to be food secured than those who do not got access from social protection programs, keeping all other covariates constant. Also, HH who got access from credit and saving are 3% more likely to be mildly food insecure

(somehow food secured) than those who do not got access from social protection programs, keeping all other covariates constant. on the other hand, HH who got access to social protection program are 16.3% less likely to be severely food insecure than those who do not got access from social protection programs, keeping all other covariates constant.

HH access to Credit and Saving Association: From the table above, HH who got access to credit and saving association are 7.9% less likely to be severely food insecure than those who do not got access from credit and saving association, keeping all other covariates constant. This is due to credit access enhance households to be involved in income-generating activities and to earn derived benefits based on the amount and purpose of credit. Moreover, access to credit can increase an opportunity to invest and participate in a different income-generating activity which can in turn increase income and food security levels at the same time.

HH access to Training and Supervision: From the table above, HH who got trainings and supervisions about food security are 6.3% more likely to be food secured than those who do not have access to training and supervision, keeping all other covariates constant. From the result above, training and supervision regarding food security is more relevant for HH to be food secured than formal education.

This study found that approximately three out of forth of households in Addis Ababa are food insecure (mildly food insecure, moderately food insecure or severely food insecure) and only one in four households were food secure. Projection of this statistics means a lot, if we widen our study area as a country level. The findings also revealed that, household income, housing situation, food source, employment sector of HH head and non-food expenditure are main food insecurity. Living in rental house leads most household food insecure. This is because of expense on house rental indirectly affecting households not to purchase enough food items from the market. Obviously, urban food security is highly affected my income. This is due to that purchases of each and every consumable goods are highly dependent on households' monthly income. So, the more income households had, the more likely to be food secured and vice versa. Other factors that affect household food security status include family size, dependency ratio, access to social protection program and access to credit and saving. Here, family size with less productive labor or higher percentage of unproductive labor exposes household to be food insecure. Access like medical insurance, school feeding and other social protection program trigger households

more food secured. Similarly, getting credit access from bank and other financial institutions encourage households to run their own business, which in turn improve their monthly income and can make household food secured.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.2 Conclusion

This research was motivated to investigate the determinants of household food security in Addis Ababa administration city, Ethiopia. It is also intended to assess food security status of the households as well as to compare the socio-demographic, institutional and economic characteristics of households. For this purpose, cross-sectional primary data was collected from 256 sample households from the selected sub-cities namely Addis Ketema, Arada, and Kolfe Keranio using purposive and multistage cluster sampling technique followed by simple random sampling. All primary data were collected through structured questionnaires as the main data collection instrument. Based on the information collected data, the data analysis was done both the descriptive and econometrics model analysis.

Under the descriptive statistics food security status of the household was analyzed and compared the percentage of the household food security status with respect to important demographic, institutional and socioeconomic characteristics variables. In this regard, the descriptive analysis revealed that out of 256 households, about 25% were food secured, 13% were mildly food insecure and 26% were moderately food insecure and 36% were severely food insecure. The main determinants behind food secure HH and the barriers faced by non-food secured were also included in the analyses such as inflation, low income, housing situations, etc. Also, according to the chi-square result, there was a difference in food security status of households based on their income, marital status, Awareness on inflation, housing situation, HH asset, accessibility to social protection program and family size of HH.

The finding of this research results from the model analysis was recognized that household food security is determined by demographic, institutional and socio-economic factors. Based on this, Asset, income level of households positively and significantly affects household food security. Higher-income households were food secured than those of lower-income because the household's capacity to be food secured increases with household income. Family size of household is another important determinant of food security and it determines positively and significantly. This is due to that having more

family size can increase productivity by engaging in economic activity that generates revenue for households and in turn affect household's food security status. On the other hand, dependency ratio, non-food expenses and marital status determined HH food security negatively and significantly.

Access from social protection program, is another variable that determines the households' food security negatively and significantly. The result witnessed that the margin of households whom got access from social protection program are more likely to be food secured than those who did not got access from social protection program, ceteris paribus. On the other hand, the marital statuses of the household were negatively and statistically associated with the food security status of the households. This research concludes that marriage plays a positive role in household food security as compared to the unmarried household in the study area.

5.3 Recommendations

Based on the overall result and conclusion of the study, the following policy recommendations are forwarded.

- Income is the key determinant of food security then; due attention should be given to increase the income of households. Income could be increased through implementing policies which improve HH productivity, increase employment opportunities, improve the business environment and reduce underemployment. Focus on developing more credit supply policies for consumption goods, it is important to stimulate the income of households and ultimately improve HH food security status.

- Housing policies that support the improvement of rental housing are essential in the study area. Attention should be given on formulating policies such as increasing the availability of more houses through building, provision, and expansion of affordable rental housing, and this leads HH not to spend more money on house rent; rather HH will spent more on food, which in turn make them food secured.

- Almost all urban HH got their food consumption from market through purchasing, which affects their food security status. Facilities rural urban linkage in order to make households food secured. Stabilizing inflation of consumer goods is critical. Similarly, taking necessary action on greedy firms, which hide consumer goods and create shortage of supply.

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APPENDIX

ETHIOPIAN CIVIL SERVICE UNIVERSITY

College of Finance, Management, and Development

Department of Development Economics

Dear Respondent, this questionnaire is intended to collect data on "Determinants of household food security: a case of Addis Ababa, Ethiopia". The data is going to be used as an input for this research, and it will be submitted to Ethiopian Civil Service University for partial fulfillment of a Master of Science Degree in Developmental economics. The main objective of the study is to analyses the determinant of household food security in the above-selected study area. This questionnaire is prepared to supplement this research. Therefore, you are selected to be one of the participants in this study and I request you to give your genuine answer voluntarily. The study will use your responses for only educational purposes and have never any impact on any other entity. So your responses will be kept confidential and have a great deal of importance increasing the accuracy and reliability of the study to draw policy recommendations.

Thank you in advance for your cooperation!!

Estibel Dagne

Phone: +251920675953

Email:estibeldagne2008@gmail.com

Appendix A: English Version questionnaires

Section 1: Questions about general households' Economic, Institutional and demographic characteristics

Questionnaire serial number (code): _____ Date of data collection: _____
Sub-City_____ Wereda _____ House hold number: _____

Section 1: Questions about general households' Economic, institutional and demographic characteristics

No	Questions	Respond options	Code
1.1	Age of Household head	_____years	|___|
1.2	Sex of Household head	1. Male 2. Female	|___|
1.3	Marital status of HH head		|___|
1.4	What is employment sector of household head	[1] Own business, [2] Government employee, [3] Private organization employee, [4] NGO employee	
1.5	What is the educational status of household head	[1] Illiterate [2] primary,[3]Secondary,[4] Diploma, [5] First degree and above	|___|
1.6	What is the family size of your Household	1. Age men above 65 2. Age women above 65 3. Adult men (age 15-64) 4. Adult women (age 15-64) 5. Boy children (age 7-14) 6. Girl children (age 7-14) 7. Babies (boys) age under 7 8. Babies (girl) age under 7	|___|
1.7	How many dependents are there in the i^{th} household	_____	|___|
1.8	Who is the owner of the house you live in?	1.Own house 2. Gifted from government /relatives/ 3. Kebele rent 4. Rent from private owner	|___|
1.9	Average monthly household income (in Birr)	_____	|___|
1.10	Could you tell me if the type of Asset available at your house?	1. TV, DVD, Radio/Tape, Dish, 2. Refrigerators. 3. Modern Beds, tables and chair 4. Sofa set 5. Shelf 6. Jewelry (gold/silver): necklaces, ring, 7. Bicycle, motorcycle 8. Car 9.Washing machine	|___|
1.11	In the last six months what was the main source of your household food consumption	1. Purchased from market 2. From own production 3. Remittance from any agent 4. Begging 5. Others (specify)_____	|___|
1.12	What is the average monthly		|___|

	expenditure on food in your Household (in Birr)?		
1.13	Could you tell me the share of the following commodities(non-food items) in your household expenditure (in percentage or Birr)	1. Food items _____ 2. House rent _____ 3.Cookingfuel/charcoal/electricity_____ 4. Water and light 5. Education_____ 6. Transport _____ 7. Social _____ 8. Alcohol/other substances 9. Saving and others (specify)	|___|
1.14	Do you have awareness about inflation rate?	1. Yes 0. No	|___|
1.15	Did you have access from Social protection program?	1. Yes 0. No	|___|
1.16	Did you have access from any credit and saving association?	1. Yes 0. No	|___|
1.17	Did you have access to training and supervisions from any (woreda, sub city) officials about food security in the last 6 months?	1. Yes 0. No	|___|

Section 2: Occurrence and Frequency of Household Food Insecurity

No	Questions	Respond options	Code
2.1	In the past four weeks, did you worry that your HH would not have enough food?	0 = No (skip to Q2) 1=Yes	|___|
2.1a	How often did this happen?	1 = Rarely (once or twice in the last 4 weeks) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.2	In the past four weeks, were you or any HH member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	|___|
2.2a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.3	In the past four weeks, did you or any HH member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1=Yes	|___|
2.3a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.4	In the past four weeks, did you or any HH Member has to eat some foods that you	0 = No (skip to Q5) 1=Yes	|___|

	really did not want to eat because of a lack of resources to obtain other types of food?		
2.4a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.5	In the past four weeks, did you or any HH member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1 = Yes	|___|
2.5a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.6	In the past four weeks, did you or any other HH member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1 = Yes	|___|
2.6a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.7	In the past four weeks, was there ever no food to eat of any kind in your HH because of lack of resources to get food?	0 = No (skip to Q8) 1 = Yes	|___|
2.7a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.8	In the past four weeks, did you or any HH member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes	|___|
2.8a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|
2.9	In the past four weeks, did you or any Member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1 = Yes	|___|
2.9a	How often did this happen?	1 = Rarely (once or twice) 2 = Sometimes (3-10 times) 3 = Often (more than ten times)	|___|

Appendix B: Econometrics analysis

A) Measures of Fit for order logit

Likelihood ratio test

	ologit
Chi-square	
Deviance(df=236)	536.575
LR(df=17)	**146.021**
p-value	0.000
R2	
McFadden	0.214
McFadden(adjusted)	0.067
McKelvey & Zavoina	0.911
Cox-Snell/ML	0.435
Cragg-Uhler/Nagelkerke	0.467
Count	0.539
Count(adjusted)	0.285

Hosmer and Lemeshow test

Model: proportional odds (ologit)				
Dependent variable: fsstatus = [1, 2, 3, 4]				
Number of observations = 256				
Tests	Number of groups/patterns	Statistic	df	P-value
Ordinal HL	**10**	**21.882**	**26**	**0.6951**
PR(chi2)	4	504.568	19	0.0000
PR(deviance)	4	501.653	19	0.0000
Lipsitz	10	9.724	9	0.4182
(HL = Hosmer-Lemeshow; PR = Pulkstenis-Robinson)				

Brant test

Independent Variable	chi2	p>chi2	Df
All	**45.860**	**0.084**	**34**
Age of HH head	2.840	0.242	2
Sex of HH head	1.370	0.505	2
Marital status of HH head	1.620	0.446	2
Employment sector of HH head	2.100	0.349	2
Education level of HH head	2.870	0.238	2
Family size	1.370	0.505	2
Dependency ratio	0.750	0.688	2
Housing ownership	0.000	0.999	2
Income Level	0.240	0.888	2
Asset(current value)	1.200	0.549	2
Food expenditure	7.290	0.026	2

Nonfood expenditure	0.580	0.747	2
Inflation rate awareness	2.330	0.311	2
Access from social protection program	5.760	0.056	2
Access from Credit and Saving	0.960	0.620	2
Access to Training and Supervision	2.400	0.301	2

B) Multicollinearity result

Pairwise correlations

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
(1) HH head age	1																
(2) HH head sex	0.116	1															
(3) HH head marital st.	0.269	0.23	1														
(4) HH head employment sector	0.173	0.163	0.004	1													
(5) HH head educ.level	-0.224	-0.11	-0.11	-0.256	1												
(6) HH family size	0.287	-0.028	0.03	0.021	-0.161	1											
(7) Dependency ratio	0.068	0.011	0.021	-0.031	-0.133	0.57	1										
(8) Housing ownership	-0.272	-0.051	-0.018	-0.012	0.066	-0.251	-0.119	1									
(9) HH Income	0.099	0.007	0.056	-0.045	0.14	0.186	0.038	-0.221	1								
(10) HH Asset	0.118	0.081	-0.024	0.077	0.002	0.178	0.076	-0.194	0.369	1							
(11) Source of food	0.024	0.065	0.043	0.068	-0.16	0.2	0.132	0.145	-0.145	-0.091	1						
(12) HH Food expenditure	0.06	0.045	0.032	0.007	0.161	0.171	0.086	-0.163	0.713	0.399	-0.208	1					
(13) HH Nonfood expenditure	0.164	-0.014	0.105	0.033	0.05	0.147	-0.032	-0.207	0.691	0.281	-0.084	0.525	1				
(14) Awareness on infl	0.006	-0.034	0.082	0.054	0.057	-0.029	0.045	0.028	-0.072	0.09	0.002	0.031	-0.019	1			
(15) Access to social protection program	0.043	-0.001	-0.016	0.011	-0.062	0.064	0.027	-0.174	0.03	-0.009	-0.029	0.076	0.056	0.051	1		
(16) Access to credit& saving	0.18	0.059	0.119	0.042	-0.085	0.151	0.008	-0.225	0.07	0.143	-0.029	0.025	0.113	0.272	0.12	1	
(17) Access to training &supervision	0.066	-0.014	0.089	-0.028	-0.022	-0.01	0.011	0.001	-0.028	-0.062	-0.057	-0.009	0.022	0.155	0.072	0.075	1