Addis Ababa University

College of Development Studies

Center for Population Studies

Urban Household Food Insecurity and Demographic Outcomes: Implications for Fertility, Contraceptive Use and Under-Five Mortality in Lideta Sub-City, Addis Ababa, Ethiopia

By: Ephrem Tadesse

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By Ephrem Tadesse

Dissertation submitted to the Center for Population Studies, College of Development Studies, Addis Ababa University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy (PhD) in Population Studies

Main Advisor: Prof. Terefe Degefa

Co-Advisor: Prof. Mengistu Ketema

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Addis Ababa, Ethiopia

Statement of Declaration

I, Ephrem Tadessse, hereby declare that this dissertation consists of my original work and has not been submitted in whole or in part to any academic institution for the award of any other degree or professional qualification. I confirm that all contents of the dissertation are solely the result of my work carried out during my application for higher studies at Addis Ababa University. Furthermore, all concepts, arguments and explanations contained in this report have been duly acknowledged from sources (theoretical, empirical literature and secondary sources) of other authors and duly cited in the list of references.

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ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

This is to certify that the Dissertation prepared by Ephrem Tadesse entitled: Urban Household Food Insecurity and Demographic Outcomes: Implications for Fertility, Contraceptive Use and Under-Five Mortality in Lideta Sub-City, Addis Ababa, Ethiopia: submitted in fulfillment of the requirements for the degree of Doctoral Philosophy in Population Studies complies with the regulations of the university and meets the accepted standards concerning originality and quality.

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Name and Signature of the Chair of the Examining Committee

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Acronyms

AU	African Union
CSA	Central Statistical Agency
CPI	Consumer Price Index
DFID	Department for International Development United Kingdom
EDHS	Ethiopian Demographic and Health Survey
FAD	Food Availability Decline
FAO	Food and Agriculture Organization
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
HFAS	Household Food Insecurity Access Scale
IDA	International development Association
IFPRI	International Food Policy Research Institute
ILO	International Labor Organization
ICLC	International Conference of Labour Statisticians
IDMC	Internal Displacement Monitoring Center
MDG	Millennium Development Goal
MoFED	Ministry of Finance and Economic Development
MOWA	Ministry of Women Affairs
NBE	National Bank of Ethiopia
NGO	Non-Governmental Organization
PDC	Planning and Development Commission
UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
UNICEF	United Nations International Children's Emergency Fund
UPSNP	Urban Productive Safety Net Program
USAID	United States Agency for International development
USDA	United States Department of Agriculture
WDG	World Bank Group
WFP	World Food Program

Abstract

Food security and vulnerability assessments in Ethiopia have traditionally focused on rural regions. However, in contemporary policy discussions, the topic of urban food security has garnered significant attention. Household food insecurity increases the risk of morbidity and mortality in children. The current investigation endeavors to ascertain the covariates associated with household food insecurity and to analyze the interrelationship amongst demographic indicators, fertility, and childhood mortality in the Lideta sub-city, Addis Ababa, Ethiopia. A community-based cross-sectional study was conducted from February to March 2023 in the sub-city. A total of 692 households were selected using a multistage sampling technique. The Pearson chi-square test (χ^2) and regression models were used to assess the association between food insecurity and demographic outcomes. As the results show, the overall prevalence of household food insecurity in the study area was 66.5%. Regression results indicate that seven of the hypothesized nine demographic and socio-economic determinants of household food insecurity have a significant influence on the probability of being food-insecure ($P<0.05$). Household food expenditure, dependency ratio, age, sex, educational status of the household head, access to savings and credit, and the urban productive safety net program were significant determinants of urban household food insecurity. Food insecurity status was also a significant predictor of the number of children ever born. Holding the other variables constant, the number of children ever born into food-secure households is 0.655 times lower compared to households with food insecurity. Similarly, the age of the mother, contraceptive use, women's income, and childhood mortality were significant in predicting the effect of the mean number of children ever born at $P< 0.05$. The findings further reveal a prevailing usage percentage of modern contraception of 50.5%. The utilization of contemporary contraceptive modalities was found to be markedly lower among food-insecure households (32.0%) in comparison to those who were food-secure (68.0%). It was found that households that experience food insecurity had a significantly reduced likelihood, by 76.5%, of contraception. Similarly, a positive attitude towards contraceptive use, utilizing family planning information services, discussion on contraceptive techniques with partners, women's income, and childhood mortality have a significant association with contraceptive use at p 0.05. Likewise, food insecurity status was a significant predictor of under-five mortality. Food-insecure households were 3.89 times more likely to experience under-five mortality as compared to food-secure households. Similarly,

women's education, age at first birth, initiation of breast feeding, age and sex of the child, birth order, and children ever born were significant predictors of under-five mortality at $p < 0.05$. The reduction of household size, amelioration of the dependency ratio, and improvement of other socio-economic factors collectively serve the purpose of empowering households to enhance their resilience in the context of food insecurity, which in turn improves fertility and child survival. Accordingly, policymakers ought to adopt measures aimed at enhancing stability in the food market and generating prospects that can enhance the living standards and economic capabilities of urban households.

***Keywords**: Household food insecurity; Fertility; Children ever born; Modern contraceptive use; Under-five mortality; Lideta sub-city; Ethiopia*

CHAPTER ONE

INTRODUCTION

1.1 Background

Over 800 million people remain undernourished, mainly in developing nations. Global undernourishment affects 9.9% of the population and is increasing (FAO, 2021). The urban population has been growing rapidly from 751 million in 1950 to 4.46 billion in 2021, projected to reach 6.68 billion by 2050 with an addition of 2.22 billion to urban areas (United Nations, 2018). The urban population in developing countries is projected to double from 1.46 billion in 1990 to 4.2 billion by 2030. These countries are struggling to provide enough food for their expanding populations due to poverty and food insecurity. Healthy diets are unaffordable for about 3 billion people worldwide, particularly the poor, due to expensive prices and income inequality (FAO, 2021). Lower-income countries in Africa, Asia, and Latin America make up 85% of the world's population but experience 99% of global population growth (United Nations, 2022). The total fertility rate, under-five mortality, and contraceptive prevalence rate in the lower-income and food-insecure countries are estimated at 4.6 children per woman, 48 per 1,000 live births, and 35%, respectively (World Bank, 2021). This indicates the challenges faced by lower-income countries in terms of population growth and healthcare services. Addressing these factors is crucial for improving the overall well-being and development of these nations (Boliko, 2019; FAO, 2020).

Poverty and food insecurity in Africa are overwhelming; many households struggle to afford even the most basic necessities, leading to widespread malnutrition and health issues. Children are particularly vulnerable, with many not having access to proper education or healthcare. Over one-third of the African population (282 million) is undernourished, and nearly three-quarters cannot afford a healthy diet (World Bank, 2020). The total fertility rate and under-five mortality on the continent in 2023 are estimated at 4.13 children per woman and 40.63 per 1000 live births, respectively (MacroTrends, 2023). These figures underscore the urgent need for increased support and resources in African countries to address the ongoing issues of poverty and malnutrition.

Sub-Saharan Africa has the highest food insecurity rate globally. Undernourishment rose 3.5% in a year and is now at 24%, hindering progress toward zero hunger by 2030. The number of undernourished people in sub-Saharan Africa rose from 219.8 million in 2019 to 264.2 million in 2020, with an additional 44.4 million people affected. The region has by far the fastest-growing population of any major region in the world, with a population of 1.3 billion (17% of the world population). Reproductive health among women residing in this region remains insufficient, leading to persistently high birth rates. On average, women residing within the region have about 4.26 children (United Nations, 2022). In sub-Saharan Africa, the proportion of women who have their need for family planning satisfied with modern methods continues to be among the lowest in the world at 56 percent (United Nations, 2022). The world's highest mortality rate for children under five is still in this region, at 73 per 1,000 live births. In sub-Saharan Africa, 1 in 14 children died before the age of five in 2021. That is 20 years less than the global average, which was 1 in 14 in 2001 and 15 times higher than the risk for children born in high-income countries. According to the UNICEF sub-Saharan Africa report (2023), in 2020, the under-five mortality rate in the poorest households is estimated to be 151 per 1,000 live births, while the mortality rate in the richest households is approximately 96 per 1,000 live births (Sharrow et al., 2021). This stark disparity in under-five mortality rates between the poorest and richest households highlights the deep-rooted inequalities that exist within societies. It is clear that access to quality healthcare, nutrition, and other essential resources greatly impacts the survival rates of under-five children. Access to family planning methods not only helps in controlling population growth but also plays a crucial role in improving maternal and child health outcomes (Smith & Rhonda, 2015).

Ethiopia has also been facing challenging problems ranging from those induced by environmental crises to those caused by demographic and socio-economic constraints that adversely affect people's production systems (World Bank, 2020). As a result, Ethiopia remains one of the world's most impoverished and food-insecure nations, with 30.8% of its population living below the poverty line for sustenance (Odekon, 2022). Despite this high rate of food insecurity, the total fertility rate and under-five mortality rate are still high at the national level, i.e., 4.6 children per woman and 59 per 1000 live births, respectively. The contraceptive prevalence rate at the national level is also estimated to be 41% (CSA, 2016a, 2019). These highlight the complex challenges facing Ethiopia in terms of poverty, food security, and

reproductive health. The high rates of fertility and child mortality suggest a need for increased access to family planning services and healthcare. Addressing these issues will be crucial to improving the overall well-being and quality of life for the population in urban areas.

Urban households in Ethiopia exhibit food insufficiency and are contingent upon market mechanisms to procure their food requirements. According to the Interim Report on Poverty Analysis Study in Ethiopia 2017, there was an estimated 14.8% proportion of the population in urban areas categorized as being below the food poverty line. The corresponding total fertility rate, under-five mortality and contraceptive prevalence rate in urban areas are estimated at 2.3, 66/1000 live births, and 49.8%, respectively (CSA, 2016). These households usually rely on cheap, nutrient-deficient staples like rice and wheat instead of fruits, vegetables, and animal products. Poor households are vulnerable to food price changes. Over 80% of urban households in Ethiopia depend on food markets, making income crucial for meeting caloric needs (UNICEF & WFP, 2019). In cities like Addis Ababa, food insecurity is worsened by market-based supply, chronic poverty, and high prices. Poor households are most affected by food price increases due to economic and political factors (Black et al., 2008). The conflict impacted urban household food security and the country's development. Many households in urban areas struggled to afford enough food as prices escalated during the conflict in the food supply regions. Furthermore, the lack of access to affordable and nutritious food exacerbates health disparities within these communities, leading to higher rates of malnutrition and chronic diseases. In addition, the instability caused by conflict can disrupt food supply chains, further limiting the availability of food and driving up prices (IDMC, 2021). As a result, efforts to stabilize the situation and rebuild food supply chains are essential to addressing the root causes of food insecurity in these regions.

Food insecurity in Addis Ababa is a growing concern due to rapid urbanization, population growth, economic slowdowns, political, environmental and various socio-demographic factors, which challenge household health and well-being and increase vulnerability to sudden market shocks (Birhane et al., 2014; Tadesse et al., 2017; Yimer & Alemayehu, 2021; Zhang et al., 2022; Dinku et al., 2023; Syafiq et al., 2022; IDMC, 2021). This can perpetuate poverty and food insecurity, further exacerbating the situation in deprived areas like Lideta sub-city. In Addis Ababa, the estimated proportion of individuals experiencing food insecurity, defined as those unable to purchase consumption items that yield a minimum of 2,200 kilocalories, is 19.1%

(PDC, 2019). Similarly, the proportion of people suffering from food insecurity in the Lideta sub-city, which is considered to be one of the most deprived sub-cities in Addis Ababa, was estimated at around 29.3%. This means that about one-third of the population falls below the threshold of adequate food intake (MOFED, 2018). The total fertility rate, contraceptive prevalence rate, and childhood mortality rate in Addis Ababa are relatively better compared to other regions of Ethiopia and are estimated at 1.8, 50%, and 26 per 1000 live births, respectively (CSA, 2016a, 2019). These emphasize the disparities in access to food and healthcare within Addis Ababa. While the total fertility rate and childhood mortality rate are relatively low, indicating better reproductive health outcomes, the high prevalence of food insecurity in certain areas, like the Lideta sub-city, is a concerning issue and has a clear effect on fertility, contraceptive use, and under-five mortality. This highlights the complex interplay between socioeconomic factors and health outcomes in the city. The disparities in access to food and healthcare within Addis Ababa underscore the need for targeted interventions to address these issues and improve overall health outcomes for residents. Efforts to address food insecurity and improve access to healthcare services in underserved area like Lideta sub-city are crucial in reducing disparities and promoting better health outcomes for all residents of the city.

In general, as previously noted, household food insecurity is affected by various demographic, socio-economic, and other political and environmental factors and has a relationship with demographic and reproductive health outcomes. This is especially true in poor urban areas, where limited access to nutritious food and healthcare can have a significant impact on the well-being of residents. Households living in these areas may face higher rates of malnutrition, chronic illnesses, and maternal and under-five mortality due to a lack of resources and support. There is also empirical evidence that confirm the effect of food insecurity on demographic outcomes. Food-insecure households have a higher number of children for both economic and social reasons (Birhanu, 2013; World Vision, 2022). These households may struggle to provide adequate nutrition for their children, leading to stunted growth and developmental delays. In addition, the stressful life in a food-insecure environment can also negatively impact mental health, further exacerbating poverty and poor health outcomes. In addition, food-insecure households have a higher under-five mortality rate as they are exposed to a higher susceptibility to various types of illnesses due to weakened immune systems from inadequate nutrition (Fram et al., 2015). This can have long-lasting effects on children in food-insecure households,

impacting their overall well-being and future opportunities. The lack of access to nutritious food not only impacts physical health but also hinders cognitive development and academic achievement in children (Belachew et al., 2011; Berra, 2020; Kimbro & Denney, 2015). Moreover, food security improves contraceptive use, and effective utilization of contraception reduces fertility and under-five mortality through the spacing of births (UNFPA, 2022). As a result, efforts to address household food insecurity in urban settings must prioritize improving access to affordable and healthy food options as well as increasing access to quality healthcare services. Addressing the connection between food security and reproductive health is also critical to ensuring population growth that does not overwhelm the world's resources (Khatun & Mallick, 2020).

1.2 Statement of the Problem

Households experiencing poverty typically encounter a plethora of challenges, such as unfulfilled family planning demands, families with sizes that exceed their preferences, and inadequate financial resources to afford the necessary quantity and quality of nourishing sustenance to meet the needs of their families (Smith & Rhonda, 2015). The condition of poverty precipitates inadequate access to family planning and, in turn, serves as a consequence thereof. Households with lower economic status experience limited availability of family planning services. They allocate a greater portion of their budget towards sustenance while expending a lesser amount of money per individual on food as opposed to affluent households (Smith & Rhonda, 2015; USAID, 2014).

Food insecurity in urban areas like Addis Ababa is a growing challenge. Households depend on self-employment and have a very low capacity to save, which exacerbates food insecurity and forces people to seek immediate government intervention (Riley et al., 2019; Zezza & Tasciotti, 2010). Though the capital city is going through a change in infrastructure, many of its citizens are suffering from extreme poverty. According to the urban productive safety net program report released in 2020, there are about 4.7 million urban poor in around 972 cities and towns, and the majority (about 70%) of urban food insecure people are found in eleven different sub-cities in Addis Ababa city (UPSNP, 2021). These findings highlight the critical issue of food insecurity in Addis Ababa. The concentration of the urban poor in certain sub-cities, such as Lideta, Kolfe-Keranio, and Addis-Ketema, underscores the need for targeted interventions and support to

address the food insecurity crisis in these specific areas (MOFED, 2018). It is imperative that effective policies and programs be implemented to alleviate the suffering of the urban poor and ensure access to adequate food and nutrition for all residents of Addis Ababa.

Lideta sub-city is the poorest and most densely populated sub-city in Addis Ababa (MOFED, 2018). The nominal population density in the Lideta sub-city is estimated to be 79 inhabitants per hectare (UN-HABITAT, 2021). This high population density poses significant challenges for urban planning and resource allocation in the Lideta sub-city. The average household food consumption expenditure in this sub-city is also lower compared to other sub-cities in Addis Ababa, which is 42.19%. This reflects the fact that about 60% of household income is allocated for non-food expenditure, and even under such disproportional allocation of income to food, many households still suffer from food insecurity (CSA, 2016b). This high proportion of non-food expenditure suggests that households in the Lideta sub-city may struggle to meet their basic needs beyond food, such as healthcare, education, and housing. Additionally, the prevalence of food insecurity despite the allocation of a significant portion of income to food highlights the underlying economic challenges faced by households in this sub-city.

Although various studies have been conducted to show the effects of food insecurity on child health and development (Kimbro & Denney, 2015; Quyen et al., 2014), education performance, and intellectual development (Belachew et al., 2011), external and internal behaviors (Murphy et al., 1998), and stunting, wasting, and underweight (Abdu et al., 2018; Abdurahman et al., 2016; Berra, 2020; Betebo et al., 2017), extensive attention has not been given to the relationship between urban household insecurity and demographic outcomes. Indeed, there have been some attempts by Campbell et al. (2011), DiClemente et al. (2021), and Feyisso et al. (2015). However these studies focused on examining the relationship in national and regional contexts, often giving less attention to disparities within localities and sub-cities. The empirical data provided in these studies may not definitively authenticate circumstances that transpire at a fundamental level and may inadequately reveal their relationship within sub-regional domains. To gain a comprehensive understanding of the issue within sub-regional domains, it is necessary to conduct more localized studies that delve into specific communities and neighborhoods. However, empirical evidence is lacking to demonstrate the effects of food insecurity on fertility, contraceptive use, and under-five mortality in the Lideta sub-city, while observation indicates

that poorer households are seriously affected with heavy consequences for their health and wellbeing. Therefore, these studies can identify unique challenges and disparities that may exist within a locality, providing valuable insights for policymakers and development actors to make informed decisions and take action so that possible interventions can be made.

1.3 Objectives

The general objective of the study is to investigate the interrelationship between urban household food insecurity and demographic outcomes in Lideta sub-city. The specific objectives are the following:

- Examining the effect of demographic and socio-economic factors on household food insecurity in the sub-city;
- Investigating the influence of urban household food insecurity and socio-demographic factors on fertility in the sub-city;
- Examining the link between urban household food insecurity and contraceptive use among reproductive-age women in the sub-city; and
- Examining the relationship between urban household food insecurity and under-five mortality in the sub-city.

1.4 Significance of the Study

Given the extent of food insecurity in Ethiopia and the need to meet the SDGs, the government and concerned international agencies are working towards the implementation of the urban productive safety net program. The government is also carrying out national surveys to inform policies and strategies regarding food security and the reproductive health status of the population. Food insecurity indeed affects the nation, community, household, and individuals. However, the burden of hunger is disproportionately heavier on some social groups and communities, especially densely populated urban households living in slum areas. Therefore, achieving the objective of the study will enable us to provide baseline and relevant information to stakeholders and policymakers about food insecurity status and its impact on demographic outcomes, which facilitate undertaking possible actions. The findings of this study will also contribute to the body of knowledge of existing literature by adding empirical evidence regarding different aspects of urban household food insecurity status. Moreover, it provides information on current food insecurity situation, factors that influence fertility, contraceptive use,

and under-five mortality the most, where to focus on and budget more, and which public policy needs amendments. This study also enables the sub-city to set up different food security plans and programs that benefit the community and monitor and evaluate their urban food security strategies and programs. Additionally, this study can help identify potential barriers to food security and work towards finding solutions that address the specific needs of the community.

1.5 Scope of the Study

Examining factors contributing to urban household food insecurity is limited to socio-demographic determinants only; it cannot venture to investigate the wider social, political and environmental dimensions of food insecurity. Moreover, it is limited to the access and availability of food security pillars. It does not include other interrelated utilization and sustainability elements. Anthropometric measurements, which determine the nutritional status of children, will not be included. Since it is a household-based study, the sample will not include urban residents who are classified as street children or the homeless population.

1.6 Concepts, Empirical Evidences of Food Insecurity and Demographic Outcomes and Analytical Framework

1.6.1 Concepts of food security and sovereignty

Food security is the ability of individuals and households to obtain a safe and nutritious diet to meet their dietary needs and food preferences for an active and healthy life. Food security focuses on five distinct but interrelated elements that are essential to achieving food security. These are food availability, food access, food utilization, sustainability, and malnutrition (FAO, 1996).

Food availability refers to the physical presence of food in a given location due to all forms of domestic production, commercial imports, and food aid. Food availability can be aggregated at the regional, national, district, or neighborhood levels (FAO, 2012). Food availability is stated to be attained when sufficient quantities of food are consistently available to all individuals within a country (FAO, 2012; Schmidhuber & Tubiello, 2007).

Food access refers to a household's ability to obtain a sufficient amount of food through self-production, purchases, trade, gifts, borrowing, and food aid (FAO, 2012; Schmidhuber &

Tubiello, 2007). When households and individuals within them have adequate resources to get appropriate meals, food access is ensured.

Food utilization is the consumption of food through a sufficient diet, clean water, sanitation, and health care in order to achieve nutritional well-being in which all physiological needs are met. Food utilization, according to CSA & WFP (2019), is the ability of household members to absorb and metabolize nutrients. It covers how food is stored, processed, and prepared, as well as the water and cooking fuel used, as well as the hygienic conditions.

Malnutrition impairs a person's ability to live a healthy life and occurs when a person's diet fails to provide the correct variety of nutrients in the right proportions. Overnutrition (an excess of food energy), undernutrition (a shortage of food energy and macronutrients such as protein), and micronutrient deficiencies (insufficient micronutrients such as iron, vitamin A, or iodine) are all examples of malnutrition (Fraanje & Lee-Gammage, 2018).

Food sustainability is defined as a condition in which all components of food security are met at all times (Abegaz, 2017; FAO, 2012). To put it another way, to be food secure, a population, household, or individual must have access to adequate and healthy food always.

Food sovereignty

Food sovereignty is the right of communities, people, and states to independently determine their own food and agricultural policies, including access to land and resources (Beuchelt & Virchow, 2012). It includes the people’s right to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture system (Beuchelt & Virchow, 2012; Thiemann & Roman-Alcalá, 2019). Food security is a challenge due to global economic crises, climate change, and food production issues. In essence, food sovereignty is a precondition for genuine food security. It emphasizes ecologically appropriate production, distribution and consumption, social-economic justice and local food systems as ways to tackle hunger and poverty and guarantee sustainable food security for all peoples. Food sovereignty also advocates for the recognition and support of traditional farming practices and indigenous food systems. Additionally, it promotes transparency and accountability in the food system, ensuring that all people have access to safe, nutritious, and culturally appropriate food. Ultimately, food sovereignty is a holistic approach to addressing

global food insecurity and promoting sustainable development for future generations (Matavel et al., 2022).

1.6.2 Household food insecurity and demographic outcomes: conceptual review

Household food insecurity is a lack of financial resources needed to ensure reliable access to food to meet dietary, nutritional, and social needs. Food expenditure (income spent on food) can be used as a proxy measure of wellbeing and determines the food poverty line below which a person is deemed to be either food secure or food insecure. A core basic need is having an adequate diet, and this poverty line is often the minimum caloric requirement (MOFED, 2018). Therefore, people who could afford money to purchase bundles of food that generate 2,200 kilocalories are counted as food secure or else as food insecure (FDRE, 2017; MOFED, 2018).

Household income includes the gross cash income of everyone over the age of 15 who lives in the same house, regardless of whether they are related or not. Employee salaries, wages, and other associated receipts from employers, net income from self-employment, business profits, and income from personal investments (rent, interest, and dividends), royalties, and commissions are all sources of household income (ICLS, 1974).

Fertility refers to an individual's, a couple's, a group's, or a population's real reproductive performance, which can be assessed using the number of children born, the consecutive birth interval, or the total fertility rate. Total fertility rate refers to the average number of children a woman would have (average parity) in her life time, whereas children ever born refers to the number of children born alive to a woman in a particular age group (CSA, 2016a). The disparity in fertility between countries is mostly due to disparities in economic, cultural, and health issues that interfere with the process of human reproduction (Teklu et al., 2013). Fertility is measured in this context by using the number of children born as a discrete outcome variable.

Contraceptive use is defined as the deliberate prevention of conception through the use of various devices, sexual behaviors, chemicals, medications, or surgical procedures (Rakhi & Sumathi, 2011). Modern contraceptive technologies are technological breakthroughs that aim to transcend biology. In this regard, current approaches must allow couples to have sexual intercourse whenever they choose (Hubacher & Trussell, 2015). The contraceptive prevalence rate is defined as the percentage of all women or married women aged 15 to 49 who use any

form of contraception (Croft et al., 2018; CSA, 2016a). This can be used as an outcome variable, with the status being either user or non-user.

Under-five mortality is the mortality of children under the age of five. It refers to the rate of dying between birth and the 5th birthday expressed per 1,000 live births. It encompasses neonatal, infant, and child mortality (Waterston, 2011). This can be measured by taking a child's survival status or event as a dummy variable (dead or alive) or hazard of death at time *t* as a continuous variable. Under-five mortality in this context is measured by taking a child's survival status or event as a dummy outcome variable (dead or alive).

1.6.3 Factors affecting food availability in Ethiopia

The factors that affect Ethiopia's current food insecurity problem are varied and highly interrelated to the availability of food (ATA, 2020). These factors have a clear impact on urban household food insecurity since they are mostly contingent upon market mechanisms to procure their food requirements. Food prices in urban areas have been steadily increasing due to limited availability and access to nutritious food options. Additionally, the reliance on imported goods has made urban households vulnerable to fluctuations in global markets (Birhane et al., 2014). As a result, many families are struggling to afford basic necessities, leading to a rise in food insecurity levels across the country. According to the reviewed material, the following factors have an indirect effect on food insecurity in urban areas of Ethiopia:

1. **Backward agriculture**

Agricultural technology can help boost food production (food availability) and agricultural and rural earnings (better access to food), as well as have beneficial spillover effects in other sectors and contribute to overall economic growth. In Ethiopia, backward agriculture is one of the major causes of poor agricultural productivity and results in an increase in food prices due to the scarcity of food. By implementing modern agricultural technologies such as advanced irrigation systems, improved seeds, and mechanized farming techniques, Ethiopia can increase its food production and reduce dependency on imports. This will not only improve food security for the population but also create opportunities for economic growth through increased agricultural exports. Overall, embracing agricultural technology is crucial for Ethiopia to overcome its challenges of food scarcity and low productivity (Cheber Bezu, 2018; Moroda et al., 2018).

2. Drought

Ethiopia, as part of the area, faced extended drought and famine, resulting in significant crop failure and livestock damage, culminating in an acute food shortage (Tadesse *et al.*, 2017). Furthermore, the country's food insecurity crisis has persisted, as many rural communities have already lost their means of subsistence due to frequent droughts and crop failures. Drought and starvation have become commonplace in Ethiopia. In the last three decades, the country has seen three major famines and other famine-like circumstances, all of which have had a considerable impact on the food supply (Tadesse *et al.*, 2017).

3. Population pressure

In Ethiopia, population pressure combined with droughts and other unfavorable meteorological circumstances poses a challenge to famine avoidance. Most of the countries with the greatest number of food-insecure people also have high fertility rates and rapid population expansion (United Nations, 2022). This makes meeting nutritional demands much more difficult. A large population reduces per capita income, expenditure, and food consumption. The most plausible explanation is that in areas where households rely on less productive agricultural land, an increasing population leads to greater food demand. This demand, however, cannot be met by the existing food supply from domestic production, resulting in the household becoming food insecure (Mensah et al., 2013).

4. Political instability

In countries experiencing political instability, the resulting economic collapse affects the value of the country's currency, resulting in higher food prices and less nutritious food available for purchase. Job losses in a failing economy influence people's ability to afford food as income falls. As a result, many individuals are forced to cut back on the quantity and quality of food they consume, leading to malnutrition and other health issues. The lack of access to proper nutrition also contributes to a vicious cycle of poverty and ill health, further exacerbating the economic and social challenges faced by these communities. Ultimately, addressing political instability and its economic consequences is crucial to ensuring food security and improving the overall well-being of a nation's population. Nations such as the Democratic Republic of the Congo, Yemen, and Venezuela, as well as Ethiopia, are examples of nations where political instability is now harming food security (FAO, 2021).

5. **Unstable markets**

Food prices have been quite volatile in recent years. Food prices make it impossible for the poorest people to obtain healthy food consistently, which is exactly what they require. Families require adequate food all year. Price increases, on the other hand, may momentarily put food out of reach, which can have long-term effects on small children. When food costs rise, customers often switch to cheaper, less nutritious meals, increasing the risk of micronutrient deficiencies and other kinds of malnutrition (*Global Food Crisis | Plan International*, 2021).

6. **War & conflict**

War and violence are also major threats to food security. Food shortages are caused by violent conflict, which limits food availability and alters food distribution patterns in affected countries. During times of conflict, food imports are frequently restricted by embargoes. During both national and international conflict, governments prioritize military provisioning, which tends to reduce civilian access to food. It is also difficult to grow production while economic and human resources are being diverted to the conflict. Households whose livelihoods rely on earnings from industries that specialize in export commodities may be more vulnerable to food insecurity if restrictions result in unemployment or underemployment for workers in those industries. Civil violence in South Sudan and Ethiopia has resulted in mass displacements and abandoned farmlands (Calicioglu et al., 2019; IDMC, 2021).

1.6.4 Interrelationship between food insecurity and demographic outcomes

Food insecurity has an association with household fertility, contraceptive use, and under-five mortality (Bickel et al., 2000; Campbell et al., 2011; DiClemente et al., 2021; Feyisso et al., 2015). Most studies in different regions of Ethiopia have also shown that food insecurity is positively related to the fertility experience of households. Food-insecure households often have 3–4 more children as compared to food-secured households, which in turn exacerbates household-level hunger (Aschalew & Ayalneh, 2009; Ejigayhu & Edriss, 2012; Gezimu, 2012). Despite massive spending and extensive family-planning promotion, many poor people in the developing world remain reluctant to use modern contraceptive methods. As the study conducted by Feyisso et al. (2015) in the Wolaita Zone of Ethiopia showed, the use of the modern contraceptive method was significantly low among food-insecure women (29.7%) compared to those who were food secure (52.0%). Mostly, when poor people use modern contraceptive

methods, their continuation rate is low. However, most studies have related under-five mortality to stunting, wasting, and being underweight, while more than 50% of under-five mortality was attributable to food insecurity and malnutrition (Caulfield et al., 2018). A higher household food insecurity score is associated with greater neonatal, infant, and under-five mortality (Campbell et al., 2009).

Dynamic economy and livelihood factors can influence dynamic fertility preferences (Bongaarts & Casterline, 2013). Scholars also believe that economic uncertainty and volatility have the potential to influence family size and fertility preferences. Fertility and food insecurity have a complicated link. However, evidence suggests that fertility does not change and may even increase when an individual or household experiences food insecurity due to the financial burden of contraception, the desire to meet one's partner's sexual needs, insurance in a time of uncertainty, or to strengthen social and economic ties (Grace et al., 2017). On the other hand, Abdu et al. (2018) and DiClemente et al. (2021) found that as a household becomes food insecure, its fertility experience increases. This may be due to the stress and uncertainty that come with not having enough food to eat, which can affect a person's overall well-being and reproductive health. Additionally, food insecurity may limit access to adequate nutrition, which can impact fertility and pregnancy outcomes. Food-insecure households have more kids to support their livelihood. Children are often tasked with chores and may enter the labor force illegally to earn more income, carry on their family's legacy, and take on the responsibility of providing for and protecting their parents and siblings (Birhanu, 2013; World Vision, 2022). These findings highlight the importance of addressing food insecurity as a key factor in promoting reproductive health and overall well-being in households.

1.6.5 Benefits of contraceptive use for fertility reduction and child survival

Expanding access to reproductive health services, especially voluntary family planning, provides tremendous health, economic, and social benefits for families and communities, including reducing the impact of population dynamics on natural resources. Unintended pregnancies account for about half of all pregnancies worldwide (UNFPA, 2022). Allowing people to choose the number and spacing of their children, as well as spacing pregnancies at healthier intervals, will assist in alleviating these issues. When women are empowered to choose when and how often they become pregnant, they are more likely to have fewer children and reach their desired

family size (Gribble & Bremner, 2012; Kavanaugh & Anderson, 2013; Megquier & Belohlav, 2014). Furthermore, contraception can assist in delaying unplanned pregnancies until women are physically, psychologically, and socially prepared for parenthood, and lowering induced abortions (Gribble & Bremner, 2012; Kavanaugh & Anderson, 2013). Contraception also reduces infant mortality, delivery difficulties, and medical challenges for the baby at birth and beyond. Children conceived less than two years after the previous delivery had a substantially higher chance of dying (1.5 to three times higher) than those conceived three or more years after the previous birth (Gribble & Bremner, 2012).

1.6.6 Analytical Framework

Theoretical and empirical evidences show that demographic and socio-economic determinants influence urban household food insecurity (Ejigayhu & Edriss, 2012; Gazuma, 2018; Gezimu, 2012; Habte et al., 2019; Opiyo et al., 2018; Otekunrin et al., 2021; Syafiq et al., 2022). Similarly, scholars have explained that urban household food insecurity has an association with fertility, contraceptive use, and under-five mortality (Abdu et al., 2018; Campbell et al., 2009; DiClemente et al., 2021; Feyisso et al., 2015).

Food insecurity, as noted in Food Availability Decline and Food Entitlement Decline (Sen, 1981) and Political Economy Approaches (Plümper & Neumayer, 2009), is a complex issue that encompasses multidimensional factors, including demographic, socioeconomic, environmental, political, entitlement failure (loss in production caused by drought or flood or exchange-related failure in trade due to a shift in the price of food), and institutional failure. Among the various theories of population, fertility and under-five mortality, Neo-classical Microeconomic Theory (Becker & Lewis, 1973), Davis and Blake's (1956), Schultz (1984) and Mosley & Chen (1984), and Demographic Transition Theory (Notestein, 1953) are considered the most useful in examining the interrelationship between food insecurity, fertility, contraceptive use, and under-five mortality. These theories center on the principal determinants that are responsible for the elevated fertility and under-five mortality observed in developing nations. According to demographic transition theory, high infant and child mortality, poor agricultural productivity, low contraceptive use, and the relatively low social, educational, and employment status of women contributed to the high fertility and under-five mortality norms.

Demographic and socio-economic variables are directly related to household income. The household income in turn determines the level of household food expenditure and urban

household food insecurity status (Ejigayhu & Edriss, 2012; French et al., 2019). When the households can afford the money to obtain consumption items for their daily calorie requirement (2200 Kcal), they become food secure; otherwise, they are food insecure (FDRE, 2017; UPSNP, 2021). Empirical findings confirmed that food-insecure households are often poorly educated; for this reason, they are either unemployed or working in the informal sector, where income is very low and insignificant compared to their food-secure counterparts (Ayele et al., 2020; Cordero-Ahiman et al., 2020; Ejigayhu & Edriss, 2012; Gazuma, 2018; Opiyo et al., 2018; Otekunrin et al., 2021; Syafiq et al., 2022). Moreover, these lower-income households, which are most often food insecure, want to have more children compared to those higher-income households, as some of them are exposed to the risk of death due to starvation and poor and inadequate health care service (Freedman, 1961; Notestein, 1953).

Food insecurity has a clear effect on the health and nutritional status of children. Children in food-insecure households are exposed to various illnesses that may lead to mortality (Asiseh et al., 2018; Campbell et al., 2009). Furthermore, contraceptive use is negatively related to fertility and under-five mortality (Feyisso et al., 2015; Oumer et al., 2020). It plays a vital role in decreasing fertility by promoting healthy timing and spacing of pregnancies and increasing the chance of child survival through the spacing of birth (Gribble & Bremner, 2012; Megquier & Belohlav, 2014). Both fertility and childhood mortality outcomes are related to each other through demographic transition theory (Birchenall, 2016; Lloyd & Ivanov, 1988). Higher birth rates have led to higher under-five mortality during the pre-transition stage, although lower mortality as a result of improved sanitation, health care services, and agricultural productivity did not bring any notable change to fertility as in the early stage of transition (Bacci, 2017; Birchenall, 2016). Strong economic activities, higher levels of education, better health care services, and a higher proportion of working women observed in the 3rd and 4th stages of the demographic transition are also associated with low birth rates, near replacement level fertility, and a reduced under-five mortality rate (Bacci, 2017; Haines, 1988; Minale, 2019). Furthermore, the under-five mortality rate had a curvilinear relationship to the mother's age, an opposite relationship to birth interval length, and a positive relationship to birth order (Bean et al., 1992). Finally, the following conceptual and analytical framework has been developed and illustrates the key concepts or variables and the associations between them that need to be studied.

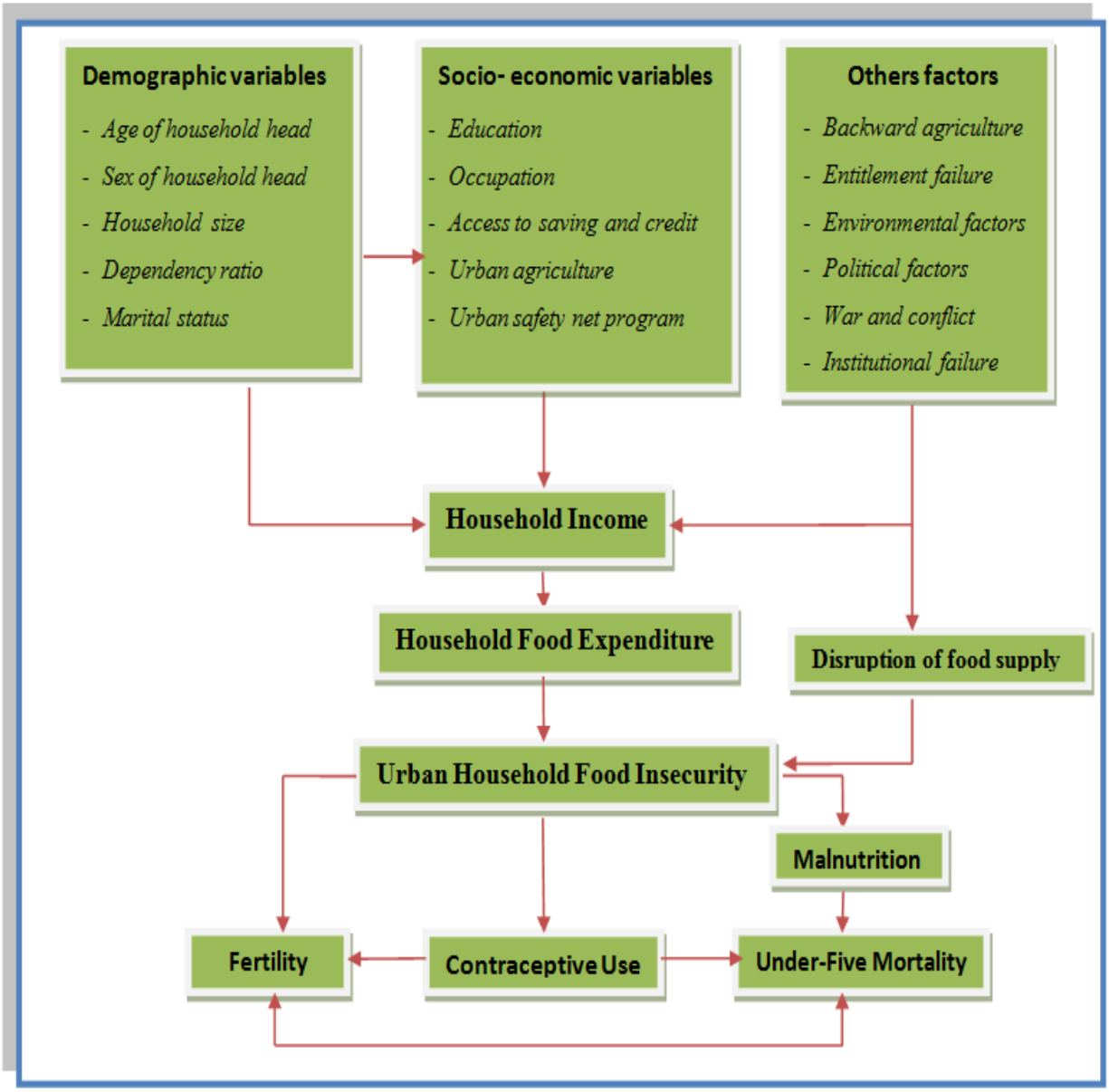

Figure 1.1: Analytical framework of urban household food insecurity developed by the researcher

1.7 Research methodology

1.7.1 Introduction

This section provides a framework for where and how the study was conducted, the data types, and the analytical methods employed. The major data collected includes socio-economic and demographic characteristics. The section begins with a description of the study areas. A description of the study setting was followed by the methodological philosophy, research

method, and source of data. The remaining sections describe the study design and procedure, inclusion and exclusion criteria, validity and reliability of data, and analysis of data, including ethical clearance issues.

1.7.2 Study setting

The study was conducted in the Lideta sub-city, located in the central-western area of Addis Ababa. Borders are shared with Addis Ketema, Arada, Kirkos, Nifas Silk-Lafto, and Kolfe Keranio. The sub-city is divided into ten Woredas. The study randomly selected three Woredas and collected data at respondents' residencies in the sub-city. Lideta sub-city covers 9.18 square kilometers with a population of 284,208, including 134,372 males and 149,836 females. The study focuses on a highly populated and poor district in Addis Ababa with a population density of 30,960 people per square kilometer. The aggregate population comprises 284,208 individuals (134,372 males and 149,836 females) (CSA, 2022b).

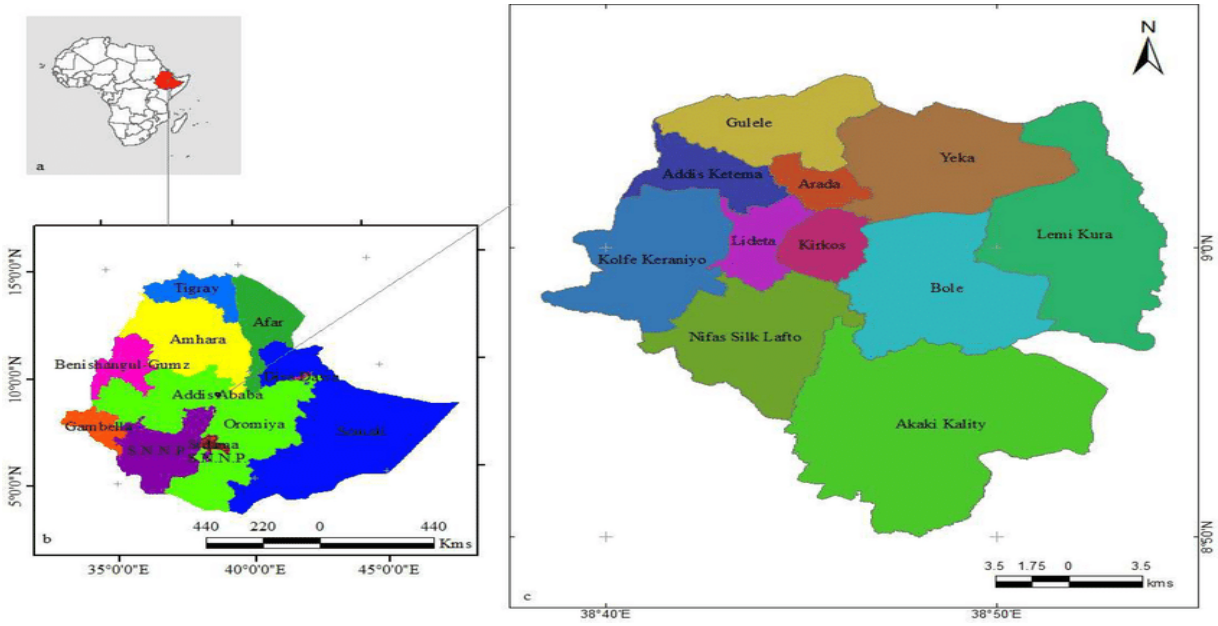

Figure 1.2 Map of Addis Ababa City Administration and Lideta sub-city

Source: Ethio GIS- Water and Land Information Resource Center (2022)

1.7.3 Demographic characteristics

The population of Ethiopia has grown fast in the last twenty years. The size has increased from 66.6 million in 2000 (at a 2.99% rate of growth), to around 115.9 million in 2020 at a growth

rate of 2.5 % (*Ethiopia Population 1950-2022 | MacroTrends*, 2021). The estimated population size of Addis Ababa is shown below.

Table 1.1: Estimated Population of Addis Ababa by Sub-city, Size, Area and Density

No	Sub-city	Area (km^2)	Population	Density (Km)
1	Akaki- Kaliti	118.08	255,348	2,162.5
2	Nefas Silk-Lafto	68.30	445,683	6,525.4
3	Kolfe –Keraniyo	61.25	604,226	9,864.9
4	Gulele	30.18	377,032	12,492.8
5	Lideta	9.18	284,208	30,959.5
6	Kirkos	14.62	311,765	21,324.6
7	Arada	9.91	298,044	30,075.1
8	AddisKetema	7.41	359,735	48,547.2
9	Yeka	85.98	488,537	5,682.0
10	Bole	122.08	435,421	3,566.7

(Source: CSA, 2022)

Note: The table indicates that the Bole and Yeka Sub-cities could be lesser as some parts of these sub-cities have been included in the newly established sub-city, Lemi Kura. The researcher could not find any tangible information about the population size, the size of the area, and the density of the population associated with the Lemi Kura sub-city.

1.7.4 Methodological philosophy

In this research, the pragmatic school of thought was employed. This school of thought argues that knowledge is both objectively (theory and hypothesis) and socially (the view of the participant) constructed, meaning researchers are free to draw from both quantitative and qualitative assumptions and the methods, techniques, and procedures of research that best meet their needs and purposes (Creswell, 2003). In this study, theory and hypothesis were tested, and the association between variables was examined. Since there is no absolute knowledge, unexpected and surprising quantitative results might be obtained. Therefore, the constructivist school of thought is essential for a deeper understanding of the view and experience of the participants as to how and why things are occurring the way they are.

1.7.5 Research method

However, the study used a mixed method; it was quantitatively dominant. This mixed method is more important for minimizing the weakness of relying on a single approach and is used for complex issues that would be difficult to quantify (Takona, 2024). Regarding strategies of mixing methods, however, the explanatory sequential design, a two-phase model was proposed to refine the quantitative results; unexpected or controversial results were not found since the explanatory design is a conditional qualitative method was not employed (Bezeau et al., 2023). To strengthen and refine ambiguous and unpredicted quantitative findings, existing empirical literature was used. The use of existing literature helped provide a deeper understanding of the quantitative results and allowed for a more comprehensive analysis of the complex issues at hand.

1.7.6 Data sources

The primary data were generated through a cross-sectional household survey. Structured interview questionnaires focused on the interrelationship between urban household food insecurity and demographic outcomes were prepared and pilot-tested after they were translated into the Amharic language for easy understanding by data collectors and respondents. The questionnaire was organized to gather data on the following key components:

1. Demographic characteristics and indicators of urban household food insecurity:

The section covers basic household information including household size, sex, age, and marital status.

2. Socio-economic characteristics and indicators of urban household food insecurity:

This section covers the income-earners of household members and their monthly income level by source in the Lideta sub-city. The household head's education and occupation status, as well as access to savings and credit issues, were also covered.

3. Questions related to the association of urban household food insecurity with fertility:

The section covers a set of household fertility, contraceptive use, and under-five mortality questionnaires related to food insecurity, adapted from the EDHS survey.

1.7.7 Sample determination and sample sizes

The determination of an appropriate sample size typically involves considerations of the necessary degree of precision, the level of variability associated with the traits under

investigation, and the available resources. Concerning sample size determination, the single population proportion formula proposed by Bartlett et al. (2001) was employed. When determining the appropriate sample size in the absence of prior information regarding the variability of the population concerning the intended outcome, the population proportion is often estimated by approximating it to 0.5. This approach is typically employed when the variance of the population proportion is unknown. Since cluster sampling techniques are used, a design effect of 1.5 was added to reduce variability in the study population.

$$n = \frac{Za^2 * Pq}{L^2} * \mathrm{D} = \frac{1.96^2 * 0.5 * 0.5}{0.05^2} * 1.5 = 576$$

Where

n= is the sample size

p- Variance of the population proportion is assumed to be 0.5 or 50%.

q= 1-p

L- is the error tolerance or limit of accuracy, which is assumed to be 0.05 or 5%.

Z - The number of standard error units that correspond to the 95% confidence level, which is given to be l. 96.

D- Design effect

Therefore, taking into consideration the non-response rate controlling outliers, incomplete data, and reducing level of uncertainty, a 15-20% allowance was added.

1.7.8 Sampling design and procedure

A cross-sectional study design was used to collect data from February to March 2023 in the Lideta sub-city. This design is mostly used to examine the relationship between variables and study specific characteristics of the population without excessive budget and resource use (Cvetković Vega et al., 2021). The sampling strategy of this study was operationally predicated on the pre-established enumeration areas of the sub-city, which had been delineated by the central statistical service of Ethiopia. Samples are drawn from a population using a multi-stage random sampling technique. This sampling technique is often used to collect data from a large, geographically spread group of people in national surveys (Brown, 2010). In multistage random sampling, three Woredas (districts) are randomly selected in the first stage. Secondly, each

Woreda comprises different Ketenas (villages), and from each of these three Woredas, two Ketenas are selected using the random sampling method. In the last step, a total of six Ketenas were there to select the total individual samples (692 respondents, which would be household heads and women) in each household. The total sample, which was selected using a multi-stage random sampling technique, was divided among all those Woredas and then among Ketenas proportionally to their population. The three Woredas have a total of 12,078 households, and selected Ketenas have a total of 3,930 households. The households from the respective Ketenas were selected by systematic random sampling based on a sampling frame of house numbers developed from Ketena records. If the selected household was found to be closed, the household with the next number on the list was selected, and this continued until the required number of sampled households was acquired. From each household, household heads were selected based on their income and ability to manage the household effectively (headship role). For selecting women, mothers were selected, as they play a crucial role in family dynamics and have a direct impact on fertility rates and child mortality (parental role). Respondents were selected proportional to size as follows:

$$n(multiplying\ factor) = \frac{\text{Sample Households (respondants)}}{Total\ household}$$

$$n(multiplying\ factor) = \frac{692}{3{,}930}$$

$$n = 0.176$$

Table 1.2: Sample selection procedure

Woredas	Total household head	Sample Ketena	Total household	Sample household
01	4654	03	670	118
		06	595	105
Total			1,265	223
03	4,562	01	714	126
		02	821	144
Total			1,535	270
10	2,862	Labora	760	134
		Wegagen	370	65
Total			1,130	199
Sub-total	12,078	6	3,930	692

1.7.9 Inclusion and exclusion criteria

Inclusion criteria

An inclusion criterion is a set of specified characteristics used to identify participants in a research study (Patino & Ferreira, 2018). As a result, the head of the household, women within the age range of 15 to 49 years, household heads and women who were willing to participate in the study and respondents within the Lideta sub-city were included in the study.

Exclusion criteria

An exclusion criterion refers to a set of pre-set parameters that identify people who will not participate in the study. Together, inclusion and exclusion criteria make up the eligibility criteria that determine whether or not a person is eligible to participate in a research study (Keung et al., 2020). Based on the exclusion criteria for household heads and women outside of the Lideta sub-city, respondents who were not willing to participate in the study and respondents who were seriously ill were excluded from the study.

1.7.10 Field staff and Pilot survey

Eight data collectors and Ketena coordinators (six females and two males) were chosen based on their educational background and data collection experience. In addition, two hours of training were provided to both the data collectors and the coordinators to ensure that the data-gathering procedures were administered effectively. The training content includes outlining the study's goal and objectives, the data collection technique, how to approach participants, and paying proper regard for the permission and ethical values of the researcher's activities. The questionnaire's pretest was conducted in a sub-city with similar socio-demographic parameters. The items that commonly prompt inquiries were modified and made apparent. The clarity, understandability, and completeness of the questions were evaluated by both interviewers and supervisors. A pre-test involving 40 households was conducted.

1.7.11 Data cleaning and preparation

Data cleaning improves the quality of data by checking that your dataset does not contain data entry errors and that it is set up appropriately for analysis (Pallant, 2013). Before data entry, every day, each of the completed questionnaires was reviewed and checked for completeness and relevance by the researcher and supervisors. The quality of the collected data had to be cleaned

up and verified before conducting data analysis. In this step, incomplete, incorrect, inaccurate, or irrelevant parts of the data were further identified and then replaced, modified, or deleted.

1.7.14 Data management

It is concerned with data creation, utilization, and organization, as well as data security and sharing with collaborators and publications (Steele, 2019). Data management was performed throughout the study cycle, from data collection planning to data processing, analysis, and archiving. As illustrated in Figure 1.3 below, it is a continuous process that occurs throughout the data lifespan.

Figure 1.3 Data management cycle

1.7.15 Research hypothesis

Based on the theoretical and empirical review, the following hypothesis is formulated

- Household income, household size, and household heads' education level are strongly associated with urban household food insecurity ($H1_1$).
- Food- insecure households are more likely to have a higher number of children ever born than food-secure households ($H1_2$).
- Food-insecure households are less likely to use modern contraceptive methods than food-secure households ($H1_3$).

- The mean children ever born across the different age groups of reproductive-age women; with different household food insecurity statuses have significant differences in the Lideta sub-city ($H1_4$)
- Food-insecure households are more likely to experience under-five mortality than food-secure households ($H1_5$).

1.7.16 Method of data analysis

The data were collected through the utilization of the KoboCollect 3.5 version and subsequently entered into the SPSS 24 software with caution. Using the Statistical Package for Social Science (SPSS) version 24, the interrelationship between households' food insecurity status and demographic outcomes was analyzed by using Pearson chi-square tests, and regression models. The following data analysis techniques were utilized to identify food-secure and food- insecure households from the total sample:

Identifying food-secure and food–insecure households in the sub-city

The caloric value of foods that meet the threshold requirement of 2,200 kilocalories (kcal), as recommended by the Food and Agriculture Organization (FAO, 2004), for enabling healthy and moderately active adult living is determined by their corresponding national average prices to establish the food poverty line. Although the 2016 Interim Poverty Analysis Report estimated the cost at 3,772 birr per year per adult person in Ethiopia (FDRE, 2017; MOFED, 2018), this price is not feasible and has to be adjusted based on current food prices. However, the overall percentage of inflation has reached 122.2% from June 2016 to January 2023; computing the amount of food inflation year by year brings the estimated cost to Birr 11,524.52 per year per adult or Birr 960.33 per month per adult (CSA, 2023a; NBE, 2023). Accordingly, the cost of one kilocalorie is estimated to be Birr 0.0143 (Appendix 6).

In this article, the national food poverty line and household income and expenditure data were used to measure food insecurity status. The food poverty line determines whether a given household can have enough daily food expenditure (total household income spent on food) to meet its members' minimum daily calorie needs. Therefore, households that cannot afford the money or are unable to source consumer goods for these daily calorie needs are considered food insecure. However, individual access to food depends on household food distribution and gender parity, which in practice means that consumption patterns are not uniform (Battersby, 2011).

Often, children, women, and older household members consume less food compared to male adults (Claro et al., 2010). A per capita adult equivalent estimate is obtained by dividing the total monthly food expenditure by all household members, assuming a uniform food consumption pattern for families with different compositions. Therefore, if this adult person equivalent estimate were taken, Birr 960.33/month (the amount of food expenditure required for a daily caloric intake of 2200 kcal) would be used as a standard threshold to identify food-insecure households from those that are not. However, such an approach could make households food-insecure, which were almost certainly not insecure since they failed to consider the presence of household members with distinct energy needs. Thus, in this study, an adult-equivalent estimate of the calorie availability scale that has an adult-equivalent conversion factor was used (Appendix 3). The application of an adult-equivalent scale effectively narrows the variance between estimated and actual food intake, thereby enabling the discernment of the relative contributions of distinct household members towards the overall dietary pattern of the household, which is not feasible with the utilization of per capita metrics. The household income and expenditure survey is standard and widely applicable to measure household food insecurity and poverty at the household level (Bellú, L. G. & Liberati, 2005; Ruggeri Laderchi et al., 2003). The World Bank, USAID, the International Development Association (IDA), and the Ethiopian government have applied this monetary approach to measure household food insecurity or poverty related to the urban productive safety net program in urban Ethiopia (UPSNP, 2021). Moreover, the governments of Ethiopia and other developing countries have also applied this monetary approach to food poverty and insecurity analysis, identifying the prevalence, gap (shortfall), and severity of household food insecurity (FDRE, 2017; PDC, 2019).

Analytical methods applied for the different objectives are indicated below:

Objective 1*: Examining the effect of demographic and socio-economic factors on household food insecurity in the sub-city*

The effect of demographic and socio-economic factors on household food insecurity was analyzed using a logistic regression model taking, household food insecurity as the dependent variable (food secure or food-insecure) and other demographic and socio-economic factors as the main predictors, holding all the other variables constant.

Objective 2: ***Examining the influence of household food insecurity and socio-demographic factors on fertility in the sub-city***

The influence of food insecurity and socio-demographic factors on fertility was analyzed using the Poisson regression model, taking children ever born as a dependent variable and food insecurity as the main predictors, holding all the other variables constant.

Objective 3: ***Examining the link between urban household food insecurity and contraceptive use among reproductive-age women in the sub-city***

The relationship between urban household food insecurity and contraceptive use was analyzed using a logistic regression model, taking contraceptive use as the dependent variable (user or non-user) and food insecurity as the main predictors. Other control variables were included in the analytical model based on the results of the review of the literature.

Objective 4: ***Examining the relationship between urban household food insecurity and under-five mortality in the sub-city***

The relationship between urban food insecurity and under-five mortality was analyzed using a logistic regression model, taking under-five mortality as the dependent variable (alive or dead) and food insecurity as the main predictors. Other control variables were included in the analytical model based on the results of the review of the literature.

It's to be noted that this section gives a snapshot of the analysis method. The details of these statistical methods were explained in their respective chapters. Each method was chosen based on its appropriateness for the specific type of data being analyzed. The statistical analysis in each chapter provided a comprehensive overview of the tools and techniques used to interpret the results.

1.7.17 Ethical clearance and considerations

Ethical approval was obtained from Addis Ababa University's College of Development Studies, following the ethical guidelines for research involving human subjects. Before the study could begin, authorization was needed from sub-city offices and participating houses. Participants were given enough information about the research's objectives and benefits. They were guaranteed the confidentiality of the information they would supply, as well as their complete right to decline participation. Each participant was asked to offer oral consent, which was noted on the consent form that explained the goal of the study and the research protocol.

1.7.18 Ensuring the confidentiality and privacy of research data

Research ethics is a critical component of any research project, and the protection of the confidentiality and privacy of research data is a key part of this. Respect for the rights and preferences of research participants is paramount when it comes to collecting, storing, using, and sharing their personal information and data. To ensure the confidentiality and privacy of research data, researchers have taken the following steps: obtaining informed consent from participants, utilizing appropriate data collection methods, securely storing data, ethically using data, and disposing of data safely. Informed consent included an explanation of the purpose, methods, risks, and benefits of the research, as well as how the data were handled and protected. Data were also stored securely; using password-protected devices, cloud services, or databases, and access should be limited to authorized personnel only. Data were used ethically; it was not disclosed or shared without the consent or authorization of research participants or the relevant authorities. Finally, data could be disposed of safely, following the retention and deletion policies of the institution, funder, or publisher, and using secure methods of data destruction, such as shredding, wiping, or erasing.

1.7.19 Study variables

The following variables are used to investigate the interrelationship between urban household food insecurity and demographic outcomes.

Table 1.3: Outcome variables

Dependent Variables	**Code**	**Definition of variables**	**Variable type**
Objective1	HFISTAT	Food insecurity	Dummy, 1 (Food insecure), 0 (Food secure)
Objective 2	V015a	Children ever born	Discrete
Objective 3	V015i	Contraceptive use	Dummy, 1. User 2. Non-user
Objective 4	V015j	Under-five mortality	Dummy, 0. Alive 1. Dead

Table 1.4: Variables/indicators of urban household food insecurity, fertility, contraceptive use and under-five mortality

Variables	Code	Definition of variables	Variable type
Demographic and socio-economic variables (Objective 1)	V004	Household size	Discrete
	V002	Sex of household head	Dummy 0. Male 1. Female
	V003	Age of the household head	Discrete
	V012	Marital status of household head	Categorical 1. Married 2. Single, 3. Divorced 4. Widowed
	V007	Household income	Continuous
	V008	Working status	Categorical 0. Employed 1. Currently not working
	V005	Education level of household head	Categorical 1. No education 2. Primary educ. 3. Secondary education 4. degree and above
	V010	Access to savings and credit	Dummy 0. Yes, 1. No
	V011	Urban agriculture	Dummy 0. Yes, 1. No
	V015a	Children ever born	Discrete
Fertility, contractive use and under-five mortality variables (Objectives 2,3 and 4)	V015h1	Age of child	Discrete
	V015h1a	Preceding birth Interval	Continuous
	V015ia	Sex of child	Dummy 0. Male 1. Female
	V015n	The desired number of children	Discrete
	V015i	Contraceptive use	Dummy, 1. Yes, 2. No
	V016k	Contraceptive discontinuation	Dummy, 1. Yes, 2. No
	V016l	Discussion with a partner on FP	Dummy, 1. Yes, 2. No
	V015e	Age of mother	Discrete
	V015m	Women education	Categorical, 0. No education 1. Primary education. 2. Secondary education, 3. Degree and above
	V015n	Work status of women	Dummy, 0 employed 1. Currently not working

1.8 Organization of the Thesis

This dissertation is organized into six chapters. This introductory chapter gives the research context and research objectives, a general theoretical framework, and directions for research design. Chapter Two presents the demographic and socio-economic factors of household food insecurity. Chapter Three examines the influence of household food insecurity and socio-demographic factors on fertility. The relationship between household food insecurity and contraceptive use among women of reproductive age is presented in Chapter Four. The link between household food insecurity and under-five mortality is then explained in Chapter Five. Chapter Six provides a comprehensive synthesis of the principal findings outlined in the preceding chapters, followed by a thorough explanation of policy recommendations.

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CHAPTER TWO

EXAMINING THE EFFECT OF DEMOGRAPHIC AND SOCIO-ECONOMIC FACTORS ON HOUSEHOLD FOOD INSECURITY IN LIDETA SUB-CITY, ADDIS ABABA

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Abstract

Food security and vulnerability assessments in Ethiopia have traditionally focused on rural regions. In contemporary policy discussions, the topic of urban food security has garnered significant attention. Notably, there is a lack of empirical substantiation of urban food security and its impact on the livelihoods of city dwellers as they cope with the ongoing escalation in food prices. The present study attempts to determine the extent of household food insecurity and identify correlating factors among 692 households in three randomly selected Woredas (districts) from the Lideta sub-city, a sub-city of Addis Ababa, Ethiopia. Six Ketenas (villages) were selected using a probability proportional to size technique from three Woredas between February and March of 2023. Data were collected through a validated survey by trained individuals and household income and expenditure were used to measure food insecurity access. Chi-square (χ^2) and logistic regressions were used to find factors linked with food insecurity in the region. The overall prevalence of household food insecurity in the study area was 66.5%. Regression results indicate that seven of the hypothesized nine demographic and socio-economic determinants of household food insecurity have a significant influence on the probability of being food-insecure ($P<0.05$). Household food expenditure, household dependency ratio, age, sex, educational status of household head, access to savings credit, and urban productive safety net program were significant determinants of urban household food insecurity. Food insecurity in Ethiopia is not confined to rural areas but also affects urban regions. This is mainly due to high urban poverty rates. Reducing the household size, amelioration of the household dependency ratio and improving socio-economic factors empower households to enhance resilience against food insecurity. Policymakers should adopt measures to alleviate food insecurity and improve the living standards and economic capabilities of urban households.

Keywords: Factors; Food insecurity; Household; Lideta sub-city; Ethiopia

2.1. Introduction

The world's population has experienced a remarkable increase, growing from 1 billion in 1800 to a staggering 8 billion today. The less developed countries of Africa, Asia, and Latin America now account for 85 percent of the world's population but account for 99 percent of global population growth (United Nations, 2022). The highest fertility rates and higher childhood mortality rates are found in the poorest and food-insecure countries (Boliko, 2019; FAO, 2020). Surprisingly, the world is still home to over 800 million undernourished people over 97% of which live in developing countries, the rate of undernourishment worldwide is on the rise, affecting 9.9% of people globally (FAO, 2021). Sub-Saharan Africa has by far the fastest-growing population of any major region in the world, with a population of 1.3 billion (17% of the world population) (United Nations, 2022).

Ethiopia remains one of the world's most impoverished and food-insecure nations, with 30.8% of its population living below the poverty line for sustenance (Odekon, 2022). The majority of urban households in Ethiopia, comprising approximately 80%, exhibit food insufficiency and rely heavily on market mechanisms to procure their food requirements. Following the Interim Report on Poverty Analysis Study in Ethiopia (2017), there was an estimated 14.8% proportion of the population in urban areas categorized as being beneath the food poverty line. In Addis Ababa, the estimated proportion of individuals experiencing food insecurity, defined as those unable to purchase consumption items that yield a minimum of 2,200 kilocalories, is 19.1% (PDC, 2019). Similarly, the proportion of people suffering from food insecurity in the Lideta sub-city, which is considered to be one of the most deprived sub-cities in Addis Ababa, was estimated at around 29.3%. This means that about one- third of the population falls below the threshold of adequate food intake (MOFED, 2018).

Urban food security is mostly chronic, combined with higher urbanization rates, food price changes, and market instability (Boliko, 2019; Riley et al., 2019), and a long time in nature and persists for long periods if not lifetimes (FAO, 2020). It is closely associated with urban poverty. As the study conducted by Belachew et al. (2012) in Ethiopia showed, chronic food insecurity in households can result in persistent malnutrition as a consequence of the inability to secure adequate and sustained access to food. In situations where there is a surge in food prices, households that do not engage in food production, particularly those located in urban areas, are

compelled to procure food through alternative means, predominantly through purchase. The purchasing power of households is contingent upon their income, thus a rise in the prices of food can lead to adverse effects on their ability to access sufficient amounts of food (Boliko, 2019). Numerous investigations conducted within the domain have demonstrated an inclination towards examining the national and regional settings, being that disparity within localities and sub-cities has been given less representation. The empirical data provided may not definitively authenticate circumstances that transpire at a fundamental level and may inadequately expose the magnitude of food insecurity predicaments within regional domains. As of the latter, there has been mounting concern over food insecurity among households residing in urban settings in Ethiopia. This predicament has correspondingly transpired as a repercussion of soaring food prices as well as conflicts that have arisen in certain areas of the country (CSA, 2022a; IDMC, 2021). The occurrence of the aforementioned unfavorable situation distinctly affects the food security of households residing in urban areas, thereby necessitating interdisciplinary research endeavors to determine the precise nature and degree of food security statuses. Consequently, the primary objective of this study is to bridge the existing gap in the relevant scholarly literature by comprehensively investigating the phenomenon of household food insecurity, including the identification of pertinent causal factors underlying it.

2.1.1 Theoretical Framework

The phenomenon of food insecurity is intimately linked to the interrelated factors of food availability and access, as well as the attendant risks that may arise as a result of insufficient availability or restricted access to food. The capacity of a household to overcome food insecurity is contingent upon its human, material, and institutional resources, which are commonly referred to as "food security factors" in scholarly literature. These factors encompass educational attainments, employment opportunities, household demographics, urban agriculture practices, asset ownership, access to financial savings and credit facilities, the provision of clean water and sanitation, and the cost of living conditions. (Ayele et al., 2020; Dinku et al., 2023; Ejigayhu & Edriss, 2012; Gazuma, 2018; Gezimu, 2012; Habte et al., 2019; Opiyo et al., 2018; Otekunrin et al., 2021; Syafiq et al., 2022). Food Availability Decline, Food Entitlement Decline (FED), and the Political Economy Approach are considered the most useful approaches to examining factors of household food insecurity.

The phenomenon commonly referred to as the "Food Availability Decline" (FAD) has drawn the attention of scholars and policy-makers alike in recent years. This phenomenon manifests in two distinct iterations. The initial perspective considers environmental phenomena such as drought and flood as primary factors in the reduction of food production, whereas the subsequent viewpoint gives emphasis to the growth of the population (Taheri & Azadi, 2019). The concept of Food Entitlement Decline (FED) was introduced as a viable alternative to the notion of Food Availability Decline (FAD) (Burchi & Muro, 2012). As per the present approach, the occurrence of famine can be attributed to the inadequacy of entitlement, where disparate segments of the population are unable to attain control over sustenance. Sen's (1981) analysis suggests that the occurrence of entitlement failure could result from either a direct cause, such as a decrease in production brought about by drought or flood, or an indirect one, including exchange-related factors or a failure in a trade that may arise from a price shift in food.

The political economy framework, on the other hand, has identified various environmental and socio-economic factors that contribute to the predicament, namely accelerated population expansion, conflicts and civil wars (internal hostilities), drought, ecological deterioration, inadequate governance practices, asymmetric resource distribution, weak markets, institutional shortcomings, and political turmoil. According to Plümper & Neumayer (2009), the impact of the aforementioned phenomenon may be mitigated through the use of free or partially subsidized food allocation, the establishment of job and income-generating opportunities for the population impacted, the containment of epidemic outbreaks, and adequate access to health care services. Evidently, the effectiveness of such measures is heavily contingent upon the specific nature of both the governing political system and pertinent state institutions.

2.1.2 Empirical Literature

Various studies have been conducted to measure household food insecurity in different contexts. The majority of the extant literature, inclusive of the present investigation, has utilized the political economy framework, specifically focusing on demographics and socioeconomic factors, to explore the various determinants of household food insecurity. The study conducted in the South Wollo zone of Ethiopia has shown that the sex of household heads had a significant association with household food insecurity (Agidew & Singh, 2018). According to the study, male-headed households were more food secure than their female counterparts. The results of the study conducted in the Woliso district of Ethiopia demonstrate that there exists a statistically

significant relationship between household food insecurity and both the dependency ratio and the educational attainment level of the household head. The headcount ratio revealed that 25.2% of households were found to be food insecure (Dula, 2019). At the same time, the study conducted in Wolaita, Ethiopia found that household size and educational level of the household heads were significant in influencing food insecurity, whereby the headcount ratio indicated that 71.6% of the households were food insecure (Mota et al., 2019). In the same way, a study conducted in Maphumulo Local Municipality, South Africa, showed that education was significantly affecting food insecurity (Ngema et al., 2018). A study conducted in Khamuan, in the area of *Laos*, China, showed that household size, food price, household income per month, and sex of the household head were important factors in determining household food insecurity (Phouvong P, 2020).

The study conducted by Tadesse *et al.* (2017) in Sodo town of Ethiopia revealed that out of the ten explanatory variables, five variables, namely the status of being a single household head, family size, the number of daily laborers of household heads, monthly income, and food expenditure, exhibited significant influence on the food security status of households. The headcount ratio revealed that 37.6% of the sampled households were food insecure. Likewise, in Dessie and Combolcha cities, north-central Ethiopia (Dinku et al., 2023), analysis based on the binary logistic regression model demonstrated that three of the seven explanatory variables were statistically significant. These variables include sex, employment status, and house ownership. Here, as indicated by the headcount ratio, 33.1% of the sampled households were found to be food insecure. Furthermore, another study (Habte et al., 2019) that utilized the logistic regression model indicated that monthly food expenditure, age of household head, and level of education were significant factors determining urban food insecurity. As shown by the headcount index, 69.6% of the total households were below the food insecurity line.

Numerous investigations conducted within the domain have demonstrated an inclination towards examining the national and regional settings (Dinku et al., 2023; Donn et al., 2016; Dula, 2019; Gebre & Rahut, 2021; Habte et al., 2019; Phouvong P, 2020; Tariku & Ayana, 2022), given that disparity within localities and sub-cities has been given less representation. The empirical data provided may not definitively authenticate circumstances that transpire at a fundamental level and may inadequately expose the magnitude of food insecurity predicaments within regional

domains. Various studies have been carried out in rural environments, with a focus away from metropolitan regions. The present study aims to investigate the incidence of household food insecurity in the urban region of the Lideta sub-city, which is located in Addis Ababa, Ethiopia. The present study endeavors to identify and analyze the factors that exhibit a correlation with household food insecurity within the sub-city.

2.2 Data and methods

2.2.1. Sampling design and procedure

Samples are drawn from a population using a multi-stage random sampling technique. In multistage random sampling, three Woredas are randomly selected at the first stage. Secondly, each Woreda comprises different Ketenas and from each of these three Woredas, two Ketenas are selected using the random sampling method. In the last step, a total of six Ketenas were there to select the final 692 respondents (household heads). Systematic random samplings, proportional to their population, were used to select sample households from randomly selected Ketenas.

2.2.2. Study variables

The outcome variable of this study is household food insecurity. This is about having the required financial resources that are necessary to ensure consistent access to food to satisfy dietary, nutritional, and societal requirements. Therefore, households who could afford money to purchase consumption items that generate 2,200 kilo calories (daily caloric requirement) are counted as food secure or else counted as food insecure. Predictor variables and covariates include demographic and socio-economic variables such as the age and sex of household head, marital status, family size, household dependency ratio (The percentage ratio of household members aged under 15 and above 65 to the members aged 15–64), level of education, income and food expenditure, employment status, urban agriculture, access to saving and credit, and urban productive safety net program.

2.2.3. Statistical analysis

The dependent variable is binary, taking a value of zero for food-secure and one for food-insecure. The explanatory variables can either be continuous, categorical, or binary. The cumulative logistic probability function is specified as

$$Z_{\mathrm{i}} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_{\mathrm{n}} X_{\mathrm{n}} + u_{\mathrm{i}},$$

Where Z_i is a function vector of n explanatory variables, β_0 is an intercept, $\beta_1, \beta_2, \ldots \beta_n$ are slopes of the equation in the model, X is the vector of relevant household characteristics, and u_i is an error term.

The data were collected through the utilization of the KoboCollect 3.5 version and subsequently entered into the SPSS 24 software with caution. The method of data cleansing was employed to assess the correctness and inconsistencies to ascertain the completeness and errors of the data. The Chi-square test (χ^2) was employed to identify the variables that exhibited a statistically significant association with household food insecurity. In this study, the variables that exhibited a p-value of less than 0.25 were subjected to a thorough examination for multicollinearity issues utilizing the variance inflation factor (VIF). Following this preliminary assessment, the identified variables were included in the logistic regression model to determine their effect on the outcome variable (household food insecurity). The adjusted odds ratios, along with their respective 95% confidence intervals, were computed. A significance level of 0.05 was deemed statistically significant in the present study. To identify the best independent predictors of household food insecurity, logistic regression with a stepwise selection (LR) method was used.

2.3. Results

2.3.1. Demographic and Socio-economic characteristics of respondents

As shown in Table 2.1, a total of 692 respondents participated in the study. Of these, more than half about 64.3% of the heads of household were between 31 and 45 years old. Of all respondents, single, married, divorced, and widowed account for 119 (17.2%), 442 (63.9%), 96 (13.9%), and 35(5.2%), respectively. The majority of almost 80% of the respondents have a dependent population of 0-100%. More than 50% had a family size larger than 6, while the remaining 143 (20.7%) had 3 family members. The majority of respondents (38.7%) attended secondary school, followed by primary school (24.6%). In addition, 14.6% had a technical and diploma degree, and only 10.0% attended tertiary level of education. Regarding their professional status, 13.7% of heads of household were not participating in any income-generating activities, while a substantial proportion (86.3%) of the respondents were employed in any labor sector at the time of the survey. The majority of respondents, about 83.1% have access to savings and credit. Large proportions of respondents (i.e. 54.5%) use the urban productive safety net program and only 5.8% of respondents were involved in urban farming. Almost two-thirds of heads of household (about 81.8%) have food expenses of 1000-3000 Birr per month.

Moreover, measuring a household's food insecurity status also revealed that 66.5% of the sample households were food-insecure and the remaining 33.5% were food-secure.

Table 2.1: Demographic and socio-economic characteristics of the respondents

Demographic and socio-economic variables	Food insecure 460(66.5%)	Food secure 232(33.5%)	Total 692(100%)	Chi-square test		Demographic and socio-economic variables	Food insecure 460(66.5%)	Food secure 232(33.5%)	Total 692(100%)	Chi-square test	
	%	%	%	χ^2	Sig.		%	%	%	χ^2	Sig.
Sex of household head						Employment status					
Female	59.6	40.4	47.3	13.01	0.000	Employed	60.9	39.1	46.5	15.41	0.001
Male	72.6	27.4	52.7			Self-employed	67.3	32.7	39.7		
Marital status of household head						Pensioner	93.7	6.3	2.3		
Married	69.9	30.1	63.9	66.48	0.308	Unemployed	81.0	19.0	11.4		
Single	36.1	63.9	17.2			Access to savings & credit					
Divorced	82.3	17.7	13.9			No	87.2	12.8	16.9	27.07	0.000
Widowed	82.9	17.1	5.1			Yes	62.3	37.7	83.1		
Household size						Urban Agriculture					
1-3	38.5	61.5	20.7	78.00	0.000	No	67.2	32.8	94.2	0.041	0.859
4-6	69.8	30.2	62.7			Yes	70.0	30.0	5.8		
>7	88.7	11.3	16.6			Urban safety net program					
Age of household head						No	31.4	68.6	55.6	1.71	0.191
15-30	45.2	54.8	18.2	32.95	0.000	Yes	36.2	63.8	44.4		
31-45	72.6	27.4	64.3			Expenditure in Birr					
>45	66.1	33.9	17.5			0-1000	95.2	4.8	9.5	297.68	0.000
Household dependency ratio						1000.1- 2000	89.8	10.2	45.0		
0-50%	57.7	42.3	42.1	21.90	0.001	2000.1- 3000	64.6	35.4	27.3		
50%-100%	69.4	30.6	40.2			3000.1- 4000	22.7	77.3	13.5		
>100%	80.5	19.5	17.8			>4000	6.5	93.5	4.7		
Education of household head											
Uneducated	94.2	5.8	7.5	80.30	0.000						
Informal	65.6	34.4	4.6								
Primary	82.9	17.1	24.6								
Secondary	65.7	34.3	38.7								
Diploma &above	42.9	57.1	24.6								

2.3.2. Factors associated with food insecurity in Lideta sub-city, Addis Ababa

Pearson chi-square test (χ^2) was carried out to decide on candidate variables for logistic regression. Based on set criteria, the sex and age of household heads, educational status, household dependency ratio, employment status, urban safety net program and monthly food expenditure were selected as candidates for logistic regression. Though household size was found significant in the Pearson chi-square test (χ^2) at $p< 0.25$, it was excluded from the model due to the multicollinearity issue with the level of household dependency ratio. After controlling confounders, age and sex of household head, household dependency ratio, food expenditure, and level of education, access to savings and credit and urban productive safety net program had a statistically significant association with household food insecurity at 95% CI (Table 2.2). Efforts have been made to assess whether or not the necessary assumptions for applying logistic regression are met. In this context, the Hosmer and Lemeshows test of goodness of fit was performed to check the fitness of the model and was found to be 0.317. The Nagelkerke R-squared model explained 65.1% of the variation in observed data explaining factors of food insecurity in urban households.

The results of the study indicate that households led by male individuals possessed a significantly higher likelihood of experiencing food insecurity, with an odds ratio of 2.72, in comparison to households headed by female individuals. The age of the household head exhibits a positive correlation with the probability of experiencing food insecurity, at a high level of statistical significance, denoted by $p<0.05$. The study revealed that households led by individuals within the age range of 31–45 years and those aged above 45 years had higher odds of food insecurity. The results of the study indicate that households headed by individuals within the age range of 31-45 were 3.69 times more likely to experience food insecurity. Additionally, those headed by persons aged above 45 years were 5.12 times more likely to experience food insecurity, with a corresponding 95% CI. The results of the study indicate that households exhibiting a higher degree of dependency ratio, specifically within the ranges of 50-100% and >100%, were significantly more likely to experience food insecurity when compared to households with a dependency ratio of 0-50%. The odds ratios for households with dependency ratios of 50-100% and >100% were found to be 2.06 and 6.68 respectively.

The result of logistic regression indicates variation in the probability of experiencing household food insecurity across diverse levels of education. A rise in educational attainment from no education to informal and primary education leads to a significant decrease of 89% and 75%, respectively, in the likelihood of experiencing food insecurity. Education attainment is strongly associated with a reduction in the risk of food insecurity. Moving from a lack of education to secondary education and obtaining a diploma and degree were found to reduce the risk of food insecurity by 84% and 89%, respectively. Household heads with access to savings and credit facilities experienced a significant reduction in the likelihood of food insecurity, estimated at 63% compared to those not having such access.

The results of this study reveal a statistically significant association between the urban productive safety net program and household food insecurity at a significance level of $P < 0.05$. The result of the study reveals that households that have access to urban safety net programs are significantly less likely to face issues of food insecurity. Specifically, the odds of experiencing food insecurity were found to be reduced by approximately 61% for households that utilized urban safety net programs compared to those that did not have access to such programs. The present study has identified an inverse correlation between the amount of food expenditure and the extent of household food insecurity. This relationship has been found to possess statistical significance across all groups, except for Birr 1000-2000 group. Elevating the level of food expenditure for sustenance from Birr 0-1000 to Birr 2000-3000 and to Birr 3000.01-4000 leads to a substantial decrease in the likelihood of encountering food insecurity by approximately 91.% and 99%, respectively.

Table 2.2: Coefficients and odds ratio of urban household food insecurity in Lideta sub-city (N=692)

Demographic and socio-economic variable	B	p	Exp(b)	95%CI of exp(b)	
Sex of household head					
Male (female)	1.00	.000	2.72	1.58	4.70
Age of household head					
31-45 years (15-30 years)	1.31	.000	3.69	1.99	6.85
46+ years (15-30 years)	1.63	.000	5.12	2.12	12.38
Household dependency ratio					
50%-100% (< 50%)	0.72	.008	2.06	1.21	3.52
>100% (< 50%)	1.89	.000	6.68	2.97	14.99
Educational attainment of household head					
Informal (uneducated)	-2.24	.011	0.11	0.02	0.59
Primary (uneducated)	-1.39	.050	0.25	0.06	1.00
Secondary (uneducated)	-1.84	.007	0.16	0.04	0.61
Diploma and above (uneducated)	-2.17	.002	0.11	0.03	0.45
Access to savings & credit					
Yes (no)	-1.00	.012	0.37	0.17	0.80
Urban safety net program					
Yes (no)	-0.95	.000	0.39	0.24	0.64
Expenditure in Birr					
1000.1- 2000 (<=1000)	-0.57	.390	0.56	0.15	2.08
2000.1- 3000 (<=1000)	-2.44	.000	0.09	0.02	0.32
3000.1- 4000 (<=1000)	-4.50	.000	0.01	0.00	0.05
>4000 (<=1000)	-6.85	.000	0.00	0.00	0.01

Note: The reference group is listed in the parentheses.

2.4. Discussion

The study reveals that 66.5% of the sample households were food-insecure. This finding was comparable with studies done at Addis Ababa City and Areka Town, Ethiopia reported as 71% and 69.6% respectively (Derso et al., 2021; Habte et al., 2019). However, it was higher than the previous findings related to Addis Ababa (75%) (Birhane et al., 2014). The observed discrepancy in the results could potentially be attributed to variances in study areas and data acquisition periods. This assertion may have potentially underestimated the scale and severity of

the issue at hand. The utilization of seasonal data with multiple surveys may provide enhanced evidential support (Shone et al., 2017; Tariku & Ayana, 2022). The political, economic, and social crises that occurred in recent years in Ethiopia could also be a potential factor in increasing the prevalence of household food insecurity. The lack of stability and resources in the country has led to a breakdown in the food supply chain, making it difficult for households to access affordable and nutritious food (Birhane et al., 2014; IDMC, 2021; Yimer & Alemayehu, 2021; Zhang et al., 2022).

2.4.1 Demographic characteristics and household food insecurity

The age of the household head was positively associated with household food insecurity and this finding corroborates some studies (Habte et al., 2019; Mekonen et al., 2023; Shone et al., 2017) but opposes others (Mota et al., 2019; Phouvong P, 2020). The observed disparity could potentially be attributed to the recent alterations in governmental policies and societal conditions, concerning the younger demographic concerning pertinent facets such as technical and vocational education. Elderly household heads usually exhibit a lower tendency to engage in diverse activities designed to generate household income relative to their peers. Such households may also lack productive household members and heavily rely on pensions as a primary source of sustenance (Habte et al., 2019).

The sex of household heads was also found to be significant in determining household food insecurity at $P < 0.05$. The study's results indicate that households headed by males exhibit greater levels of food insecurity in comparison to those led by females. This finding resonates with the previous study conducted in Dire Dawa City, Ethiopia and Kindo Didaye District of Southern Ethiopia (Aschalew & Ayalneh, 2009; Tabrizi et al., 2018) but against other evidence (Dinku et al., 2023; Mekonen et al., 2023; Negesse et al., 2020; Phouvong P, 2020). The observed difference can plausibly be attributed to variations in socio-economic factors across study areas, and the progression of female empowerment in the spheres of professional employment and strategic influence (Minale, 2019). It can be posited that female heads of households exhibit a heightened sense of responsibility, leading them to prioritize familial needs and allocate ample attention to their respective family members. The presence of a female as the head of the household exerts an influence on the augmented calorie supply, which may be attributed to the variations in expenditure preference observed between households that are headed by males versus their female counterparts (Aschalew & Ayalneh, 2009).

The present study has revealed that households with a comparatively reduced dependency ratio are more likely to achieve food security compared to those with a higher dependency ratio. Another thing being constant, household food insecurity increases almost 6.68-fold when the dependency ratio increases by more than 100% compared to households with dependency ratios of 0-50%. This finding was comparable to findings from Addis Ababa and Woliso districts of Ethiopia (Birhane et al., 2014; Dula, 2019; Tariku & Ayana, 2022). The rationale behind this observation can be attributed to the non-contributory role played by dependent members in generating income designated for purchasing food, coupled with their shared utilization of familial resources towards other necessities like children's education, clothing and nutrition as well as healthcare expenses for older family members who rely on others for support (Akukwe, 2020; Tariku & Ayana, 2022).

2.4.2 Socio-economic characteristics and household food insecurity

Level of education was also found significant in determining urban household food insecurity at $P < 0.05$. The result shows that households headed by individuals with a higher level of education are more prone to experiencing food security compared to those led by illiterate household heads. This finding coincides with studies conducted in different regions of Ethiopia (Dula, 2019; Mota et al., 2019; Ngema et al., 2018; Tadesse et al., 2017). The plausibility of this reason lies in the fact that education is believed to have a significant impact on various aspects of individual and societal progress, including but not limited to enhancing work proficiency, developing competencies, fostering income diversification, and stimulating vision in creating a conducive environment to educate dependents. This strategy can ultimately pave the way for better living conditions to be realized over the long term, which is in sharp contrast to the dire circumstances typically experienced by individuals lacking such education (Akukwe, 2020; Habte et al., 2019).

Household heads having any access to savings and credit were found food secure compared to those with no access to savings and credit at $P < 0.05$. This finding corroborates with some studies (Ejigayhu & Edriss, 2012; Mekonen et al., 2023) but opposes the findings of previous studies (Phouvong P, 2020; Tadesse et al., 2017). Membership in a savings association, accompanied by a sufficient account balance, implies the presence of surplus funds that can be allocated toward alleviating household food insecurity. Alternatively, the availability of credit

facilitates the household's participation in ventures aimed at generating income, which, in turn, enhances the financial resilience and buying ability of the household, thereby mitigating the hazards posed by food insecurity (Ejigayhu & Edriss, 2012; Sani & Kemaw, 2019).

Similarly, households using urban productive safety net programs were found food secure compared to those with no access to urban safety net programs ($P < 0.05$). This finding is consistent with some studies (Fan & Cho, 2021; Yibrah, 2014). The potential rationale for this phenomenon could be attributed to the fact that it facilitates the empowerment of urban communities that are confronted with enduring issues related to food insecurity. This program also enables the establishment of assets and the cultivation of resilience, ultimately contributing to the realization of food self-sufficiency objectives (Welteji et al., 2017; Wondim, 2018).

The level of household food expenditure was also found significant in determining household food insecurity at $P < 0.05$ and this finding corroborates some studies (Habte et al., 2019; Phouvong P, 2020; Tadesse et al., 2017). This might be ascribed to the diminished purchasing capacity of households belonging to the low-income bracket, which impedes their ability to procure food provisions on a consistent and timely basis to cater to their familial requirements. The occurrence of food insecurity and poverty within urban household settings in the sub-city can be attributed to the escalation of food inflation (Habte et al., 2019; Tariku & Ayana, 2022).

The study findings have been reinforced by the utilization of rigorous statistical analysis techniques and the attainment of high response rates in the data collection process. Moreover, utilizing a thoroughly validated structured questionnaire could have effectively mitigated the presence of instrumental and inter-rater biases. Despite the extensive exploration of determinants of urban household food insecurity, while adjusting for potential confounding variables, the cross-sectional design of the dataset restricts our ability to draw definitive cause-and-effect relationships between outcome and independent variables.

2.5. Conclusions

The present study delineates the demographic and socio-economic attributes of individuals experiencing food insecurity in the Lideta sub-city of Addis Ababa. It endeavors to discern the underlying factors that contribute to urban household food insecurity through the implementation of the logistic regression model. The regression model's findings reveal that seven out of the

eleven independent variables exhibit statistical significance. It is worth noting that the magnitudes and directionalities of the significant parameters varied, as predicted by common expectations. Upon controlling all other confounding variables, it was observed that the sex, age, household dependency ratio, education level, urban productive safety net program, and access to savings and credit had a significant impact on household food insecurity in the sub-city. Therefore, it is expected that city administration shall engage in collaboration and coordination across diverse sectors, expanding urban productive safety net initiatives, job creation efforts, food market stabilization strategies, and initiatives aimed at strengthening women's economic empowerment, to ensure households' access to food within the Lideta sub-city. Such concerted efforts are expected to achieve optimal outcomes by ensuring that the population has regular access to an adequate and diverse supply of food.

CHAPTER THREE

DO HOUSEHOLD FOOD INSECURITY AND SOCIO-DEMOGRAPHIC FACTORS INFLUENCE FERTILITY? A STUDY IN THE LIDETA SUB-CITY OF ADDIS ABABA, ETHIOPIA

Abstract

Despite financial investments, many individuals in poverty hesitate to use modern contraception, highlighting the need for improved reproductive health and nutrition. This study aims to examine the influence of household food insecurity and socio-demographic factors on fertility in the Lideta sub-city, Addis Ababa, Ethiopia. A study was conducted on 649 reproductive-age women in three randomly selected Woredas (districts) in the Lideta sub-city from February to March 2023. Poisson regressions were used to examine the influence of household food insecurity and socio-demographic factors on fertility, considering other covariates. The study shows that food insecurity status is a significant predictor of the number of children ever born. The number of children ever born within food-secure households is 0.655 times lower compared to households with food insecurity. Similarly, the age of the mother, marital status, contraceptive use, women's income, and childhood mortality were significant in predicting the number of children ever born at $P < 0.05$. Household food insecurity exhibits a positive correlation with the number of children ever born. Thus, it is imperative to recognize food insecurity as a barrier that must be addressed when developing family planning services.

Keywords*: Fertility, Children ever born, Food insecurity, Lideta sub-city, Addis Ababa, Ethiopia*.

3.1. Introduction

The world's population has grown significantly, with less developed countries accounting for 85% of the global population growth (United Nations, 2022). However, the poorest and most food-insecure countries still have the highest fertility rates and higher childhood mortality rates (Boliko, 2019; FAO, 2020). This is often attributed to a lack of access to education and healthcare, as well as cultural and societal factors that prioritize large families (FAO, 2021). To address these issues, international organizations and governments must invest in improving healthcare systems, promoting family planning, and providing access to education, particularly for women (Odekon, 2022). Sub-Saharan Africa has the fastest-growing population, but reproductive health remains insufficient, leading to high birth rates (United Nations, 2022). This population growth poses challenges for these countries, as they struggle to provide adequate healthcare, education, and resources for their growing populations. Additionally, the lack of access to family planning and reproductive health services exacerbates the issue, leading to a cycle of poverty and high fertility rates.

Ethiopia remains one of the world's most impoverished and food-insecure nations, with 30.8% of its population living below the poverty line (Odekon, 2022). The Interim Report on Poverty Analysis Study in Ethiopia (2017) shows 14.8% of the urban population below the food poverty line, with 19.1% experiencing food insecurity in Addis Ababa (FDRE, 2017). Despite this, the contraceptive prevalence rate in Addis Ababa is estimated to be 50% (CSA, 2016a). This indicates that a significant portion of the population in Ethiopia does not use any contraception methods. This lack of family planning options contributes to the high fertility rates in the country. The proportion of people experiencing food insecurity in the Lideta sub-city, one of the most deprived areas, is estimated at around 29.3% (FDRE, 2017). This data suggests that approximately one-third of the population falls below the threshold of adequate food intake (MOFED, 2018), which could influence fertility in the sub-city. Without proper education and access to reproductive health services, women and their families are unable to make informed decisions about their reproductive choices.

Households experiencing poverty often face challenges such as unfulfilled family planning demands, family sizes that exceed preferences, and inadequate financial resources to afford nourishing sustenance. These challenges further contribute to the cycle of poverty and food

insecurity in Ethiopia. Lack of access to family planning services can lead to unplanned pregnancies and larger family sizes, stretching already limited resources. Inadequate financial resources make it difficult for households to afford nutritious food, exacerbating malnutrition (Smith & Rhonda, 2015; USAID, 2014). Therefore, it is crucial to provide comprehensive services that address both family planning and economic empowerment to break the cycle of poverty and ensure food security. Although various studies have explored the effects of food insecurity on child health and development (Kimbro & Denney, 2015; Quyen et al., 2014), educational performance, and external and internal behaviors (Murphy et al., 1998), as well as stunting, wasting, and underweight (Abdu et al., 2018; Berra, 2020; Betebo et al., 2017; DiClemente et al., 2021), insufficient emphasis has been given on demographic outcomes within scholarly discourse. Therefore, this study aims to fill this gap by investigating the influence of household food insecurity and socio-demographic factors on fertility in the sub-city.

3.1.1. Theoretical Framework

Economic, social, and religious factors like income, education, religion, work status, age at first birth, age at first marriage, contraceptive use and childhood mortality affect fertility (Demeke et al., 2011; Dieu, 2016; Masoud, 2009; Mekonnen & Worku, 2011c; Ojakaa, 2008; Rabbi et al., 2013; Tomkinson, 2019). The economic theory of fertility, demographic transition theory and Malthusian theory of population elaborate on the interrelationship between income, food scarcity and fertility. The Malthusian theory of population declared an unequal link between the two by explaining exponential population expansion vs arithmetic agricultural productivity on finite arable land (Bremner, 2012). According to his theory, future famines and starvation will result from a scarcity of food per capita due to the rapid rise of the population (Burchi & Muro, 2012). According to this theory, the disparity between food supply and population will widen over time; even if food production increases, it will be insufficient to meet the needs of an increasing population.

According to Neo-classical Micro Economic Theory, higher-income families want high-quality children who are more expensive (Black et al., 2005; Doepke, 2015). The present theoretical framework not only takes into account household income and the expenses associated with raising children but also examine the potential influence of contraceptive knowledge on fertility. Specifically, the lack of knowledge regarding birth control methods in lower-income households is presumed, rather than being attributed to economic motivations to regulate fertility within the

household (Becker & Lewis, 1973; Black et al., 2005). The Demographic Transition Theory refers to a persistent progression in population metrics, where an initially stable population marked by elevated mortality and fertility rates undergoes a transition to reduced fertility and mortality rates (Bacci, 2017). According to demographic transition theory, high infant and child mortality, poor agricultural productivity, and the relatively low social, educational, and employment status of women contributed to the high fertility and low contraceptive use norms.

Davis and Blake (1956) proposed two types of factors that primarily influence fertility: direct or proximate determinants and indirect determinants or background factors. The proximate determinants of fertility include both biological and behavioral factors that have a direct impact on fertility levels. Socio-demographic and cultural factors have an indirect influence on fertility through these proximate determinants. Changes in an intermediate fertility variable, such as contraception prevalence, lead to changes in fertility (assuming other variables remain constant). However, indirect determinants like income or education may not always have the same impact (Davis & Blake, 1956). In the late 1970s, John Bongaarts created the modified set of proximate determinants of fertility, which comprises four components: marriage/cohabitation, induced abortion, contraception, and postpartum infecundity (Bongaarts, 2015).

3.1.2 Empirical Literature

There have been a few studies that look at the relationship between household food insecurity, socio-demographic factors, and fertility (Abdu et al., 2018; Feyisso et al., 2015; Mekonnen & Worku, 2011b). Mekonnen & Worku (2011b) employed Poisson regression in their study in Butajira District, South Central Ethiopia, and found that food insecurity is a significant predictor of children ever born at $P < 0.05$. Another study conducted in Tanzania by DiClemente et al. (2021) employed Multinomial logistic regression and found that food insecurity is positively related to household fertility experience at $p < 0.05$. Abdu et al. (2018), in Assayita District, Afar Regional State, Ethiopia, utilized logistic regression to show that household food insecurity is strongly related to household fertility. According to the study, households with at least five children (parity 5+) had a higher risk of food insecurity than those with no children (parity 0). Households with two or more children under the age of five had significantly greater risks of food insecurity than those with no children under the age of five. Scholars have also shown that

socio-demographic factors affect fertility. The study conducted by Aragaw et al. (2023) and Götmark & Andersson, (2020) showed that education, religion, and contraception affect fertility.

However, these findings showed that household food insecurity and socio-economic factors influence fertility. The empirical data provided in these studies may not authenticate the situation at a fundamental level and may inadequately reveal the influence within sub-regional domains. Therefore, these studies can identify the disparities that may exist within a sub-city, providing valuable insights for policymakers to make informed decisions and implement interventions.

3.2. Methodology

3.2.1 Study design and procedure

Samples are drawn from a population using a multi-stage random sampling technique. In multistage random sampling**,** three Woredas are randomly selected at the first stage. Secondly, each Woreda comprises different Ketenas (villages), and from each of these three Woredas, two Ketenas are selected using the random sampling method. In the last step, a total of six Ketenas were there to select the final 649 respondents. The total sample, which was selected using a multi-stage random sampling technique, was divided among all those Woredas and then among Ketenas proportionally to their population. The households from the respective Ketenas were selected by systematic random sampling based on a sampling frame of house numbers developed from Ketena records. Individual respondents (649 women within the age range of 15 to 49 years who would be either household heads or women and gave birth within the last 15 years preceding the survey) were sampled in each household based on their parental roles in the family.

3.2.2 Study variables

Children ever born (CEB) was the discrete outcome variable. Predictor variables included household food insecurity, mother's age, marital status, education, income, religion, and work status, age at first birth, contraceptive use, desired number of children, and childhood mortality.

3.2.3 Analytical Methods:

The data were analyzed using the Poisson regression model, taking children ever born as a dependent variable and household food insecurity status and socio-demographic factors as the predictors, considering other covariates. More formally, the Poisson regression model will be specified as:

$$\lambda_i = e^{\beta_0 + \beta_1 Xi_1 + \beta_2 Xi_2 + \ldots + \beta_n Xi_n + u_i}$$

λ_i is the number of children for women in the Lideta sub-city, xi is a vector of k characteristics, β_o is the intercept, β is the vector of covariate parameters, and u_i is the error term. The present study shows the outcomes of the model, which reveal the incidence rate ratio or EXP(ß), elucidating the relative change in the number of children given a unit change in the explanatory variable, while keeping all other variables constant. Descriptive statistics were used to provide bivariate analytical results for the study. The data were collected using KoboCollect 3.5 and entered into the SPSS 24 software with caution. The completeness and errors related to inconsistencies were verified using the data cleansing method. A bivariate analysis was employed to identify the variables that exhibited a statistically significant association with fertility. In this study, the variables that exhibited a p-value of less than 0.25 were subjected to a thorough examination for multicollinearity issues utilizing the variance inflation factor (VIF). Following this preliminary assessment, the identified variables were included in the Poisson regression model to determine their effect on the outcome variable (children ever born). Incidence rate ratios with their corresponding 95% confidence intervals were computed. A significance level of 0.05 was deemed statistically significant in the present study.

3.3. Results and discussion

3.3.1 Demographic and socio-economic characteristics of respondents

As shown in Table 1, a total of 649 respondents participated in the study. Of these, nearly half, or 48.7%, are between 25 and 34 years old. Of all respondents, single, married, divorced, and widowed account for 114 (17.5%), 432 (66.6%), 87 (13.4%), and 16 (2.5%), respectively. The majority of respondents (39.6%) attended secondary school, followed by primary school (33.7%). In addition, 8.0% had a diploma or higher and 11.9% had no educational qualifications. Regarding their employment status, the majority (62.7%) of respondents are engaged in any income-generating activities, while 37.3%) of the respondents were not employed in any labor sector at the time of the survey. Significant proportions of the survey participants (67.5%) were Orthodox Christians, 15.0% were Muslims, and Protestants accounted for 17.4%. The majority of respondents (50.4%) are not using any modern contraceptive method and 12.2% of respondents have at least a history of childhood mortality. The majority of respondents, around 72.5%, earn a monthly income of 0–3000 Birr. Regarding age at first birth, the majority of

respondents (39.6%) started childbearing at the age between 20 and 24. Moreover, measuring a household's food insecurity status also revealed that 68.3% of the sample households were food insecure and the remaining 32% were food secure.

Table 3.1: Demographic and socio-economic characteristics of respondents

Variables	Freq.	%	Mean	Sig.	Variables	Freq.	%	Mean	Sig.
Employment status					**Contraceptive use**				
Unemployed	242	37.3%	1.69		Yes	322	49.6%	1.31	
Employed	407	62.7%	1.52	0.081*	No	327	50.4%	1.85	0.000*
Women's income in Birr					**Marital status**				
0-1500	204	31.4%	2.18		Married	432	66.6%	1.87	
1500.01-3000	134	20.6%	1.54	0.000*	Single	114	17.6%	0.79	
3000.01-4500	133	20.5%	1.36		Divorced	87	13.4%	1.18	0.000*
>4500	178	27.4%	1.09		Widowed	16	2.5%	1.75	
Age at first birth					**Age of Mother**				
15-19	138	22.8%	1.88		20-24	33	5.1%	1.03	
20-24	240	39.6%	1.70	0.008*	25-29	159	24.5%	1.48	
25-29	137	22.6%	1.67		30-34	156	24.1%	1.96	0.152
30-34	66	10.9%	1.39		35-39	141	21.8%	2.00	
>35	25	4.1%	1.40		>40	159	24.5%	1.06	
History of Child mortality					**Household food security status**				
No	534	87.8%	1.63	0.000*	Food- secure	206	31.7%	1.14	
Yes	74	12.2%	2.11		Food-insecure	443	68.3%	1.79	0.000*
Desired number of children					**Religion**				
0-2	262	40.4%	1.50		Orthodox	418	67.5%	1.52	
3-4	251	38.7%	1.65	0.278	Protestant	108	17.4%	1.45	0.035*
>5	136	21.0%	1.62		Muslim	93	15.0%	1.89	
Women's level of education									
Uneducated	77	11.9%	1.48						
Informal	44	6.8%	1.50						
Primary	219	33.7%	1.76	0.649					
Secondary	257	39.6%	1.51						
Above Diploma	52	8.0%	1.42						

*P < 0.25 significant association

3.3.2 The relationship between food insecurity and fertility

Table 3.1 presents the mean values of children ever born among women, categorized based on food insecurity and socio-demographic characteristics. The findings of the survey indicate that households experiencing food insecurity exhibit a higher mean number of children ever born at 1.79 compared to those who are food-secure, with a mean number of children ever born of 1.14. The mean number of children ever born exhibits variance across various religious groups. According to the findings of the survey, Muslims exhibited the highest mean number of children ever born, with a value of 1.89, followed by Orthodox Christians with 1.52 and Protestants with 1.45. Based on the findings of the survey, it was determined that women with monthly earnings ranging from 1,500 to 3,000 Birr and 3,000 to 4,500 Birr had a mean number of children ever born of 1.54 and 1.36, respectively. This result falls below the replacement level as it signifies that these women are not producing enough children to replace themselves. Comparably, the number of children that have ever been born to individuals belonging to the high-income category (earning over 4500 Birr per month) and low-income category (earning between 0 and 1500 Birr per month) was determined to be 1.09 and 2.18, respectively. According to the findings, the mean number of children ever born to married women (1.87) was compared to those of unmarried, divorced, and widowed women, whose mean numbers of children ever born were 0.79, 1.18, and 1.75, respectively. These results suggest a significant association between marital status and the number of children ever born. In contrast, the findings indicate that females with no education and those holding degrees and above exhibit the greatest and least mean numbers of children ever born, standing at 1.48 and 1.42, respectively. There is a positive correlation between maternal age and the mean number of children ever born. The findings indicate that women in the age bracket of 35 to 39 exhibits a significantly greater mean number of children ever borne (2.00) in contrast to young women (1.03).

3.3.3 Factors of household fertility in Lideta sub-city, Addis Ababa, Ethiopia

A bivariate analysis was conducted to ascertain potential variables for inclusion in the Poisson regression model. Utilizing specific criteria, the variables of maternal age, marital status, women's income and work status, age at first birth, food insecurity, and childhood mortality were deemed suitable for inclusion in the Poisson regression analysis. After adjusting for confounding factors, including maternal age, marital status, contraceptive use, household food insecurity

status, and childhood mortality, significant statistical associations were observed with fertility at $p < 0.05$ (Table 3.2). Efforts have been made to assess whether or not the necessary assumptions for the application of Poisson regression are fulfilled. The present study compared the adequacy of two regression models, namely Poisson and negative binomial, in explaining a given set of data by utilizing two popular model selection criteria, namely Kaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC). The results revealed that both AIC and BIC were lower for the Poisson distribution than for the negative binomial distribution. This finding suggests that the Poisson regression model represents a better fit for the data compared to the negative binomial regression model. Conversely, the evaluation of model fit using the goodness of fit test reveals a deviance below 1, signifying that under dispersion is present and the value approaches zero. This result is indicative of zero inflation, thereby suggesting that the Poisson regression model is best fitted. The utilization of an omnibus test in the Poisson regression model has resulted in a significant p-value of 0.001, indicating that all predictor variables incorporated in the model are meaningful predictors of the number of children ever born.

The result of the study shows that food security status was a significant predictor of the number of children ever born at $p < 0.05$. Holding the other variables constant, the number of children ever born within food-secure households is 0.655 times lower compared to households with food insecurity. Women's monthly income was also a significant predictor of the number of children ever born. Holding the other variables constant, the number of children ever born for women with monthly incomes of 0–1500, 1500–3000, and 3000–4500 Birr is 1.495, 1.287, and 1.236 times greater, respectively, compared to those women having an income of Birr higher than 4500. This means that the reduction in income levels from Birr 4500 and above to Birr 3000–4500, Birr 1500–3000, and Birr 0–1500 is associated with increases in the number of children ever born by 23.6%, 28.7%, and 49.5%, respectively.

The results of the study show that marital status has a significant effect on the number of children ever born. The finding indicates that single women have 39.9% fewer children compared to their widowed counterparts. A woman's age is one of the most significant biological and demographic factors affecting fertility. The present investigation indicates that there is a significant disparity in the number of children born by older women as compared to their younger counterparts, meaning that a younger age at first birth is associated with a higher number of children ever born. When comparing the number of children ever born across

different age groups, it is evident that there is a decreasing trend as age decreases. Specifically, the age group of 20–24 displays a low number of children ever born, whereas the age group of 35–39 exhibits a high number of children ever born. Women belonging to the age groups of 20–24, 25–29, 30-34, and 35–39 have 1.359, 1.375, 1.682, and 1.646 times lower children, respectively, when compared with their counterparts in the 45–49 age brackets.

The difference in the number of children ever born between contraceptive users and non-users was also found to be significant at $P < 0.05$. Other factors being equal, the number of children ever born for contraceptive users is 0.833 times lower than for non-users. The history of child mortality and the need for children were also found to be significant predictors of the number of children ever born. Holding other factors constant, women with childhood mortality experiences have 0.721 more children than women without childhood mortality experiences.

Table 3.2: Coefficients and odds ratio of fertility in Lideta sub-city, Addis Ababa

Variables	B	Sig.	Exp(b)	95% CI for Exp(b)	
Marital status					
Married (Widowed)	-.139	.491	.870	.585	1.293
Single(Widowed)	-.509	.025	.601	.385	.938
Divorced (Widowed)	-.371	.089	.690	.450	1.058
Women's income in Birr					
0-1500 (>4500)	.402	.000	1.495	1.233	1.812
1500.01-3000 (>4500)	.252	.019	1.287	1.042	1.588
3000.01-4500 (>4500)	.212	.050	1.236	1.000	1.529
Contraceptive use					
Yes (No)	-.183	.015	.833	.719	.965
History of Child mortality					
Yes (No)	.327	.000	.721	.601	.865
Household food security status					
Food-secure (Food-insecure)	-.423	.000	.655	.544	.789
Age of Women					
20-24 (>40)	.306	.130	1.359	.914	2.020
25-29 (>40)	.318	.007	1.375	1.092	1.731
30-34 (>40)	.520	.000	1.682	1.359	2.084
35-39 (>40)	.498	.000	1.646	1.334	2.031

Note: The reference group is listed in the parentheses.

3.3.4. Discussion

The present study endeavors to evaluate the influence of household food insecurity and socio-demographic factors on fertility in the Lideta sub-city. According to the present investigation, the average number of children ever born to women of childbearing age in the study area is 1.58, which is below the replacement level. This finding was comparable with the study conducted in Addis Ababa, which was 1.9 births (Gurmu & Mace, 2008), but lower than what was reported in the Ethiopian DHS at the national level (2.84 births) (CSA, 2016). The observed variability could potentially arise from differences in the demographic, socioeconomic, or cultural status of women or from other factors pertaining to health, such as disparities in counseling proficiency (Shiferaw et al., 2019).

The findings of the study also show that the number of children ever born within food-insecure households was higher compared to children from food-secure households. This finding was consistent with some studies (DiClemente et al., 2021; Feyisso et al., 2015; Mekonnen & Worku, 2011b). The plausible explanation for this phenomenon is that children residing in households experiencing food insecurity are perceived as contributing meaningfully to enhancing the socio-economic status of their family (Birhanu, 2013; Leibenstein, 1975; World Vision, 2022). Moreover, women who belong to households experiencing food insecurity are at a high risk of experiencing negative sexual and reproductive health consequences, including ineffective utilization of contraception and unintended pregnancies. These outcomes are predominantly attributed to limited decision-making abilities and inadequate communication with their partners (Ahinkorah et al., 2021). The socio-economic status of women is also a significant factor in contributing to their participation in fundamental approaches to regulating fertility and promoting the effective utilization of progressive healthcare services (Dixit et al., 2021).

Considerable differences in the number of children ever born exist according to women's age, income, marital status, food security status, contraceptive use, and childhood mortality. The effect of marital status on the number of children ever born was found to be significant at $p < 0.05$. This finding was in line with the findings of previous studies and reports (CSA, 2016; Shiferaw et al., 2019), but opposed by a study conducted in the Tigray region of Ethiopia (Atsbaha et al., 2016). Single women are better in terms of making reproductive health decisions and utilizing contraception. In addition, single women may have more control over their reproductive choices and may prioritize their own well-being and career goals over having

children. This autonomy in making reproductive health decisions can lead to a lower number of children ever born compared to married women, who may face more societal expectations and pressures to have children (Dingeta et al., 2021).

The age of the mother was also found to have a significant relationship with the number of children ever born at $p < 0.05$. This finding was consistent with a study conducted in Ethiopia (Abdu et al., 2018; Adhikari, 2010; Aragaw et al., 2023) but opposed the finding of a prior study (Azmoude et al., 2017). The importance of these variables could be due to the fact that the likelihood of marrying and having more children increases as women get older, meaning that as women progress in age, there is a corresponding progression in their desire to achieve independence and establish an autonomous lifestyle. The cultural dimension also serves as a significant factor in the reinforcement of reproductive-age women to bear children before the cessation of their childbearing years (Atsbaha et al., 2016).

In the majority of instances, there is an inverse correlation between education level and fertility. The present study indicates that the absence of primary education among women is associated with increased fertility rates in comparison to those who have attained secondary and higher education (CSA, 2016a, 2019). However, in this study, the level of education was not found to be statistically significant in predicting the number of children ever born. This finding was in line with prior studies (Adhikari, 2010; Azmoude et al., 2017) but in contrast with studies (Aragaw et al., 2023; Atsbaha et al., 2016; Mekonnen & Worku, 2011a; Muche & Gebremichael, 2020; Rutaremwa et al., 2015). Although educated women are usually more aware of family planning methods and the advantages and disadvantages of having children, they should have more autonomy and power in making reproductive decisions, so that they experience a lower fertility rate. This study has further revealed that employment status was not found to be a significant predictor in determining the number of children ever born. This finding corroborates studies (Adhikari, 2010; Azmoude et al., 2017; Muche & Gebremichael, 2020) but contradicts the findings of previous studies (Andersen & Özcan, 2021; Muche & Gebremichael, 2020). This fact might be elucidated by the observation that a significant proportion of women are employed in the informal sector, which is characterized by relatively low impacts on fertility.

The finding of this study also confirms that there is a relationship between women's income and fertility, and this is in agreement with other studies (Götmark & Andersson, 2020; James et al., 2011; Shiferaw et al., 2019), but opposes a study conducted in the east of Iran (Azmoude et al.,

2017), which prioritizes the demand for children as the key predictor of the number of children ever born. The relationship between income and fertility rates was also reported to be direct by Kolk (2022). The observed inconsistency may be attributed to the selection of subjects/respondents exclusively from urban areas, where educational resources are plentifully available even to individuals with low socioeconomic status. Moreover, urbanization, commonly referred to as urbanism, is likely to be linked with a shift in ideas and attitudes concerning larger families. Moreover, it is plausible that individuals living in urban areas possess enhanced means to procure contemporary contraception methods, consequently empowering them to efficiently implement their intentions to limit fertility rates (White et al., 2018).

The difference in the number of children ever born between contraceptive users and non-users was also found to be significant at $P < 0.05$. Other factors being equal, the difference in the rate of children ever born for contraceptive users is 0.833 times lower than for non-users. This finding was consistent with some studies (Adhikari, 2010; Aragaw et al., 2023; Götmark & Andersson, 2020; Muche & Gebremichael, 2020; Shiferaw et al., 2019) but in contrast with (Atsbaha et al., 2016; Azmoude et al., 2017). The rationale behind the decline in fertility rates can be attributed to the crucial role played by contraception in promoting healthy timing and spacing of pregnancies. Further, contraception has been proven to increase the likelihood of child survival through the spacing of births (Megquier & Belohlav, 2014).

The findings of this study also reveal that the history of child mortality and the need for children were also found to be significant predictors of the number of children ever born. Holding other factors constant, the number of children ever born is higher when women have a history related to child mortality. This finding corroborates studies (Adhikari, 2010; Atsbaha et al., 2016; Jara et al., 2013; Mekonnen & Worku, 2011a; Muche & Gebremichael, 2020; Shiferaw et al., 2019) but opposes the findings of studies (Aragaw et al., 2023; Azmoude et al., 2017). The aforementioned phenomenon may be explicable by the fact that women who have experienced child mortality have the desire to replenish their children. Nonetheless, they are apprehensive of a recurrence of the adverse outcome (Atsbaha et al., 2016; Endriyas et al., 2017).

3.4 Conclusions

The current research demonstrates that the ability to access family planning services and effectively manage fertility is significantly hindered by food insecurity. Moreover, within

households experiencing food insecurity, women exhibited a decreased propensity towards utilizing contraceptive techniques in pursuit of attaining a suitable and satisfactory family size. The integration of suitable strategies aimed at enhancing the adoption of family planning services within food-insecure households is a crucial aspect of interventions geared toward regulating household fertility. Therefore, stakeholders are anticipated to engage in collaborative and coordinated efforts across various sectors to address the challenges of food insecurity and fertility issues. Such actions will prioritize expanding women's education, voluntary family planning initiatives, job creation programs, and initiatives to strengthen women's economic empowerment.

CHAPTER FOUR

EXAMINING THE LINK BETWEEN HOUSEHOLD FOOD INSECURITY AND CONTRACEPTIVE USE AMONG REPRODUCTIVE-AGE WOMEN IN LIDETA SUB-CITY, ADDIS ABABA

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Abstract

The enhancement of reproductive health in women can result in an improvement of children's nutritional status resulting in improvement of reproductive health. This association is important for sustainable population growth without overusing resources. This study aims to examine the relationship between household food insecurity and contraceptive use. A study was conducted on 651 reproductive-age women in three randomly selected Woredas (districts), Lideta Sub-city from February to March 2023. Six Ketenas (villages) were selected using a probability proportional to size technique from three Woredas. Data were collected through a validated survey by trained individuals, and household income and expenditure was used to measure food insecurity access. The Pearson chi-square test (χ^2) and logistic regression were used to examine the relationship between household food insecurity and contraceptive use, considering other covariates. Modern contraception usage was at 50.5% in the study area. Women with food insecurity had only a 32.0% usage rate, while those who were food secured had the higher rate of 68.0%. Food-insecure households had a 76% lower chance of using modern contraception compared to food secure households. Positive attitude, family planning information, partner discussion, income, and childhood mortality were associated with contraceptive use ($p < 0.05$). Use of modern methods of contraception showed a negative correlation with food insecurity. Therefore, addressing household food insecurity as a potential obstacle to the development of family planning services requires comprehensive stakeholder engagement and socio-economic policy intervention.

Keywords: Modern contraceptive use, Food insecurity, Lideta sub-city, Addis Ababa, Ethiopia.

4.1 Introduction

The world's population has experienced a remarkable increase, growing from 1 billion in 1800 to a staggering 8 billion today. The less developed countries of Africa, Asia, and Latin America now account for 85 percent of the world's population but account for 99 percent of global population growth (United Nations, 2022). The highest fertility rates and higher childhood mortality rates are found in the poorest and most food-insecure countries (Boliko, 2019; FAO, 2020). Surprisingly, the world is still home to over 800 million undernourished people, over 97% of whom live in developing countries. The rate of undernourishment worldwide is on the rise, affecting 9.9% of people globally (FAO, 2021).

Sub-Saharan Africa, with a population of 1.3 billion (17% of the world population), has by far the fastest-growing population of any major region in the world (United Nations, 2022). Despite significant advancements in reducing child mortality and enhancing life expectancy, reproductive health among women residing in developing nations, particularly in sub-Saharan Africa, remains insufficient, leading to persistently high birth rates. On average, women residing within the region have about 4.26 children (United Nations, 2022). The widespread adoption and utilization of family planning methods have become instrumental in mitigating the growth of the population as well as addressing the issues of hunger and malnutrition (Smith & Rhonda, 2015).

Ethiopia remains one of the world's most impoverished and food-insecure nations, with 30.8% of its population living below the poverty line for sustenance (Odekon, 2022). The majority of urban households in Ethiopia, comprising approximately 80%, exhibit food insufficiency and rely heavily on market mechanisms to procure their food requirements (WFP/UNICEF, 2019). Following the Interim Report on Poverty Analysis Study in Ethiopia (2017), there was an estimated 14.8% proportion of the population in urban areas categorized as being below the food poverty line. In Addis Ababa, the estimated proportion of individuals experiencing food insecurity, defined as those unable to purchase consumption items that yield a minimum of 2,200 kilocalories, is 19.1% (PDC, 2019). Similarly, the proportion of people suffering from food insecurity in the Lideta sub-city, which is considered to be one of the most deprived sub-cities in Addis Ababa, was estimated at around 29.3%. This means that about one-third of the population falls below the threshold of adequate food intake (MOFED, 2018). The share of total household income spent on food is around 42.2% (CSA, 2016b).

Indisputably, households experiencing poverty typically encounter a plethora of challenges, such as unfulfilled family planning demands, families with sizes that exceed their preferences, and inadequate financial resources to afford the necessary quantity and quality of nourishing sustenance to meet the needs of their families. The condition of poverty precipitates inadequate access to family planning and, in turn, serves as a consequence thereof. Families with lower economic status experience limited availability of family planning services. They allocate a greater portion of their budget towards sustenance while expending a lesser amount of money per individual on food as opposed to affluent households (Smith & Rhonda, 2015; USAID, 2014). Though the total fertility rate and contraceptive use in Addis Ababa are relatively better compared to other regions of Ethiopia and estimated at 1.8 and 47%, respectively, the fertility rate is still high at the national level, which is 4.6 children per woman. The contraceptive prevalence rate at the national level is also estimated to be 41% (CSA, 2016a, 2019). A crucial consideration towards maintaining sustainable population growth that does not burden the world's finite resources needs foremost attention to the interrelationship between food insecurity and reproductive health (Khatun & Mallick, 2020).

4.1.1 Theoretical Framework

Demographic and socio-economic factors like women's age, education, residency, occupation, marital age, wealth status, discussion of family planning with partner and health worker, food security status, number of surviving children, media exposure, men's employment status, fertility choice, among others, affect modern contraceptive use (Ahinkorah et al., 2021; Chauhan & Prasad, 2021; Feyisso et al., 2015; Ochako et al., 2017; Saheem et al., 2021).

In past and recent studies, the Health Belief Model (HBM), which is a psychological model, was used to predict health behaviors like contraceptive use, particularly concerning the uptake of health services. According to this theoretical framework, the knowledge, attitude, and beliefs of individuals are more important when deciding the use or non-use of contraceptives, meaning that individuals will likely take action when experiencing a personal threat or risk, but only if the benefit of taking action outweighs the barriers, whether real or perceived. This approach also emphasizes the importance of education, communication, and support in empowering individuals to make informed decisions about their reproductive health (Akonor et al., 2021; Hall, 2012; Herold, 1983). Demographic Transition Theory (Notestein, 1953), which is the outcome of

socioeconomic advancement in society, as clearly elucidated in the theories of development (Harriss, 2014), was also considered useful in examining the interrelationship between food insecurity and fertility and contraceptive use. This theory, especially in the late-transition period, explains how fertility rates observed in the world population have declined significantly with the help of contraception as socio-economic activities and agricultural productivity have advanced. As countries transition towards more developed economies, access to contraceptives and family planning services becomes more possible, leading to a decrease in fertility rates. This decline in fertility rates is crucial in addressing food insecurity as it allows families to better manage their resources and provide for their children. Therefore, both the Health Belief Model and Demographic Transition Theory frameworks underpin this study, which links household food scarcity and knowledge, attitude and beliefs to contraceptive utilization.

4.1.2 Empirical Literature

Studies conducted in Ethiopia and Ghana, based on the Health Belief Model, found that women who perceived a high risk of adolescent pregnancy complications were more likely to use contraceptives as compared to those who did not (Akonor et al., 2021; Kahsay et al., 2018). Another study conducted by Machira & Palamuleni (2017) in Malawi reported that adolescent mothers who were knowledgeable about adolescent pregnancy complications and susceptible to them were more likely to use contraceptives as compared to those who were not. On the other hand, prior research studies have indicated that poor economic status, household food insecurity, and demographic outcomes (fertility and contraceptive use) are very interrelated. The study conducted by Asresie et al. (2020) and Ibnouf et al. (2007) in East Africa showed that women from lower socio-economic backgrounds exhibit a lower tendency to utilize contemporary contraceptive methods.

The study conducted by Feyisso et al.(2015) in the Wolaita zone of Southern Ethiopia has shown that food insecurity had a significant association with modern contraceptive use. According to this finding, the use of the modern contraceptive method was significantly low among food-insecure women (29.7%) compared to those who were food-secure (52.0%). The finding of the study also showed that women residing in food-secure households demonstrated a greater likelihood (1.7 times) to utilize contemporary methods of contraception as compared to their counterparts from food-insecure households. There are also incompatible findings from some

studies. A study conducted by Mekonnen & Worku (2011b) in Butajira District, South Central Ethiopia found that food security and utilization of family planning services is inversely related. According to the study women who resided in households experiencing food insecurity were approximately 1.58 times more likely to adopt family planning methods relative to their counterparts residing in self-sufficient households.

Some previous studies have also shown that household fertility is higher in food-insufficient households compared to food-sufficient households due to low socio-economic status and poor contraceptive utilization. A study undertaken by Abdu et al. (2018) in the Assayita District of the Afar Regional State in Ethiopia found a significant correlation between household food insecurity and fertility, with households with five or more children having a higher likelihood of experiencing food insecurity. Another study conducted by DiClemente et al. (2021) in Tanzania also showed that food insecurity is positively related to the fertility experience of households. According to the findings, women experiencing hunger exhibit a higher likelihood of desiring additional children. These findings highlight the potential impact of food insecurity on fertility decision-making among reproductive-age women. Although various studies have been conducted to show the effects of food insecurity on child health and development (Kimbro & Denney, 2015; Quyen et al., 2014) and pregnancy complications (Bastian et al., 2022; Iqbal & Ali, 2021), insufficient emphasis has been placed on investigating the correlation between urban household food insecurity and reproductive outcomes within scholarly discourse. This study aims to investigate the effect of household food insecurity on contraceptive utilization in urban settings, providing policymakers and development stakeholders with valuable insights to guide well-informed decision-making and effective interventions.

4.2 Data and methods

4.2.1. Sampling design and procedure

Samples were drawn using a multi-stage random sampling technique. Initially, three Woredas (districts) were randomly selected in the first stage. Secondly, from each of these three Woredas (each Woreda comprises different Ketenas (villages), two Ketenas were selected using the random sampling method. In the last step, a final sample of 651 respondents was selected from the six Ketenas. The total sample was divided among all the Woredas and then among Ketenas proportionally to their population size. Households from the respective Ketenas were selected using a systematic random sampling method based on a sampling frame of house numbers

developed from Ketena records. Individual respondents (651 women within the age range of 15 to 49 years who would be either household heads or women) were sampled in each household based on their parental roles in the family.

4.2.2. Study variables

The outcome variable of this study is contraceptive use. Contraception refers to the deliberate act of preventing conception by employing a range of devices, sexual behaviors, chemical agents, pharmacological interventions, or surgical procedures. Therefore, women or couples who are using contraceptive methods to avoid unwanted pregnancy and have their desired children are classified as contraceptive users; otherwise, they are non-users. Predictor variables and covariates include household food insecurity status and other demographic and socioeconomic variables such as the age of the mother, marital status, women's education, women's income, religion, work status, age at first marriage, family planning information service, attitude towards contraceptive use, discussion with partner, and childhood mortality.

4.2.3. Statistical analysis

The dependent variable is binary, taking a value of zero for non-users of contraceptives and one for users. The explanatory variables can either be continuous, categorical, or binary.

The cumulative logistic probability function is specified as

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + u_i ,$$

Where Z_i is a function of explanatory variables, β_0 is an intercept and $\beta_1, \beta_2, \ldots \beta_n$ are slopes of the equation in the model, X is the vector of relevant women characteristics, and u_i is an error term. Hence, the above econometric model was used in this study and was treated against potential variables assumed to affect the use of contraceptives.

The data were collected through the utilization of KoboCollect 3.5 and subsequently entered into the SPSS 24 software with caution. The method of data cleansing was employed to assess the correctness and inconsistencies to ascertain the completeness and errors of the data. The data were categorized and sorted to facilitate their analysis. The Chi-square test (χ^2) was employed to identify the variables that exhibited a statistically significant association with contraceptive utilization. In this study, the variables that exhibited a p-value of less than 0.25 were subjected to a thorough examination for multicollinearity issues utilizing the variance inflation factor (VIF). Following this preliminary assessment, the identified variables were included in the logistic

regression model to determine their effect on the outcome variable (contraceptive use). The adjusted odds ratios, along with their respective 95% confidence intervals, were computed. A significance level of 0.05 was deemed statistically significant in the present study. To identify the best independent predictors of contraceptive use, logistic regression with a stepwise selection (LR) method was used.

4.3. Results

4.3.1 Demographic and socio-economic characteristics of respondents

As shown in Table 4.1, a total of 651 respondents participated in the study. Of these, nearly half, or 48.7%, were between 25 and 34 years old. Of all respondents, single, married, divorced, and widowed account for 114 (17.5%), 434 (66.7%), 87 (13.4%), and 16 (2.5%), respectively. The majority of respondents (39.2%) attended secondary school, followed by primary school (33.2%). In addition, 8.9% had a diploma or higher and 11.8% had no educational qualifications. Regarding their employment status, the majority (62.5%) of respondents were participating in any income-generating activities, while 37.5%) of the respondents were employed in any labor sector at the time of the survey. The majority of respondents (76.8%) have a favorable attitude toward the use of contraceptives. Only 12.1% of respondents have at least a history of childhood mortality. Around 62.4% of those surveyed had a free conversation with their partners about modern contraceptive methods, and about 329 (50.5%) were using contraceptives to control unintended pregnancy and attain the desired number of children. Large proportions of respondents (35.8%) were using condoms, followed by pills (31.3%), injectables (22.8%), and IUDs (9.8%). The majority of respondents, around 76.7%, earn a monthly income of 0–3000 Birr. The desired number of children for the majority of respondents, around 79.1%, was up to 4 children. Nearly more than half (61.8%) of the respondents had received family planning information in the past 3 to 4 months. Moreover, measuring a household's food insecurity status also revealed that 68% of the surveyed households were food insecure, and the remaining 32% were identified as food secure.

Table 4.1: Demographic and socio-economic characteristics of respondents

Variables	Contraceptive use			Chi-square test		Variables	Contraceptive use			Chi-square test	
	Non-user 322(49.5 %)	Use r 329(50. 5%)	Total 651 (100%)				Non-user 322(49.5 %)	User 329(50. 5%)	Total 651 (100%)		
	%	%	%	χ^2	Sig.		%	%	%	χ^2	Sig.
Employment status						Family planning information service					
Unemployed	54.9	45.1	37.5			No	73.1	26.3	38.2		
Employed	46.2	53.8	62.5	4.67	0.031	Yes	34.8	65.2	61.8	89.93	0.000
Women's income in Birr						Marital status					
0-1500	42.3	57.7	47.3			Married	39.4	60.6	66.7		
1500.01-3000	58.1	41.9	29.4			Single	57.9	42.1	17.5		
3000.01-4500	65.4	34.6	12.0			Divorced	81.6	18.4	13.4		
>4500	41.1	58.9	11.2	21.88	0.089	Widowed	87.5	12.5	2.5	66.07	0.000
Desired number of children						Children ever born					
0-2	43.7	56.3	40.4			1-4	47.9	52.1	87.0		
3-4	37.3	62.7	38.7			>4	49.4	50.6	13.0	0.58	0.810
>5	83.1	16.9	20.9	79.88	0.000	Attitude toward Contraceptive use					
Age of Mother						Favorable	39.2	60.8	76.8		
20-24	38.2	61.8	5.2			Unfavorable	83.4	16.6	23.2	90.82	0.000
25-29	34.6	65.4	24.5			Discussion with partner					
30-34	37.6	62.4	24.2	86.14	0.000	No	80.4	19.6	37.6		
35-39	47.5	52.5	21.7			Yes	30.8	69.2	62.4	150.5	0.000
>40	80.5	19.5	24.5			History of Child mortality					
Religion						No	46.4	53.6	87.9		
Orthodox	49.3	50.7	67.6			Yes	59.5	40.5	12.1	4.47	0.035
Protestant	49.1	50.9	17.4			Household food security status					
Muslim	49.5	50.5	15.0	0.144	0.989	Food-secure	38.5	61.5	32.0		
Women's level of education						Food-insecure	54.6	45.4	68.0	14.79	0.000
Uneducated	66.2	33.8	11.8								
Informal	60.5	39.5	6.6								
Primary	56.0	44.0	33.5								
Secondary	41.6	58.4	39.2	27.68	0.010						
Above Diploma	29.3	70.7	8.9								

4.3.2. Factors of contraceptive use in Lideta sub-city, Addis Ababa, Ethiopia

A Pearson chi-square test (χ^2) was conducted to ascertain potential variables for inclusion in the logistic regression. Utilizing specific criteria, the variables of maternal age, marital status, women's education, women's income, work status, family planning information, attitude regarding contraceptive use, discussion with a partner, household food insecurity status, desired number of children, and childhood mortality were deemed suitable for inclusion in the logistic regression analysis. After adjusting for confounding factors, including maternal age, women's education, women's income, employment status, attitude towards the use of contraceptives, family planning information service, communication with partners regarding modern contraceptive use, household food insecurity status, desired number of children, and childhood mortality, significant statistical associations were observed with contraceptive use at $p<0.05$ (Table 4.2). Efforts have been made to assess whether or not the necessary assumptions for applying logistic regression are met. In this context, the Hosmer and Lemeshows test of goodness of fit was performed to check the fitness of the model and was found to be 0.339. The Nagelkerke R-squared (R^2) model explained 63.7% of the variation in observed data predicting modern contraceptive use.

Based on the findings, food insecure households have a substantially reduced likelihood, by 76%, to use modern methods of contraception relative to their food-secure counterparts. The history of child mortality is negatively related to the initiative to use modern contraceptives at $P<0.05$. Women with any history of child mortality were 62% less likely to use modern contraceptive methods. Women who are engaged in any income-generating activities were 2 times more likely to use modern contraceptive methods compared to unemployed women. The initiative to use modern contraceptive methods decreases with increasing levels of income. The result of the logistic regression also shows differences in the probability of using contraceptives for different income levels of women. Increasing the level of women's income from Birr 0–1500 to Birr 1500.01–3000 and Birr 3000.01–4500 reduces the initiative to use contraceptive methods by 74% and 86%, respectively. Likewise, women earning more than Birr 4,500 a month were 89% less likely to use modern contraception than women earning less than Birr 1,000 a month. Women's level of education is positively related to contraceptive use at $p < 0.05$. Raising the level of women's educational achievement, specifically from a lack of education to the

attainment of diplomas and higher degrees, significantly increases the likelihood of adopting modern contraceptive methods by 3.75 times. The utilization of family planning information services also has a significant effect on the initiative to utilize modern contraceptive methods. Women using family planning information services were 4.43 times more likely to use modern contraceptive methods as compared to those who were not using any kind of family planning service. The discourse and communication exchanged between partners in an intimate relationship are positively correlated with the adoption and use of contemporary methods of contraception. Women having free discussions with their partners about modern contraceptive methods were 6.29 times more likely to use modern contraceptive services compared to those with no discussion.

The initiative to use modern contraceptives is inversely related to women's age. Taking women's age as a continuous independent variable shows that an increase in women's age is associated with an 8% decrease in modern contraceptive use. Women with favorable attitudes toward contraceptive use were 6.20 times more likely to use modern contraceptives as compared to those with unfavorable attitudes. The results of the study also showed that wanting to have more children was inversely related to contraceptive initiatives, and this relationship was significant at 95% CI. Women who want more children are less likely to use modern methods of conception. Women planning to have more than four children were 93% less likely to use modern contraceptives.

Table 4.2: Coefficients and odds ratio of modern contraceptive use in Lideta sub-city

Variables	B	Sig.	Exp(b)	95% CI for Exp(b)	
Employment status					
Employed (Unemployed)	0.69	.017	2.00	1.14	3.54
Women income in Birr					
1500.01-3000 (0-1500)	-1.34	.000	0.26	0.14	0.48
3000.01-4500 (0-1500)	-1.99	.000	0.14	0.06	0.31
>4500 (0-1500)	-2.21	.000	0.11	0.04	0.30
Women education					
Informal (Uneducated)	0.87	.147	2.39	0.74	7.79
Primary (Uneducated)	-0.43	.315	0.65	0.28	1.51
Secondary (Uneducated)	0.44	.309	1.55	0.67	3.60
Above Diploma(Uneducated)	1.32	.042	3.75	1.05	13.41
Family planning information service					
Yes (No)	1.49	.000	4.43	2.48	7.92
Attitude towards contraceptive use					
Favorable (unfavorable)	1.83	.000	6.20	3.17	12.13
Discussion with partner					
Yes (No)	1.84	.000	6.29	3.53	11.19
History of child mortality					
Yes (No)	-0.97	.006	0.38	0.19	0.76
Desired no of children					
3-4 (0-2)	-0.46	.098	0.63	0.37	1.09
>4 (0-2)	-2.72	.000	0.07	0.03	0.13
Household food security status					
Food- insecure (Food-secure)	-1.45	.000	0.24	0.12	0.46
Age of women	-0.09	.000	0.92	0.88	0.96

Note: The reference group is listed in the parentheses.

4.4. Discussion

In the present study, findings indicate that the prevalence of utilization of modern contraceptive methods (50.5%) shows a comparatively higher rate when compared to the national level (41%), and Addis Ababa (49%) (CSA, 2019). It is also relatively lower than the previous study conducted in the Wolaita zone of Ethiopia and Migori country of Kenya, which was 61.7% and 63%, respectively (Feyisso et al., 2015; Gokhale et al., 2017), and higher compared to the study

conducted in Debre Markos Town, Ethiopia, which was 41.3%. The observed variations in contemporary contraceptive utilization between the present study and previous research can potentially be ascribed to the distinct demographic characteristics of the respective populations and the variations in health interventions applied (Oumer et al., 2020). Notably, differing political frameworks, rules, regulations, and ideologies within distinct nations can significantly influence the utilization pattern of contraceptives (Afriyie & Tarkang, 2019; Alemayehu et al., 2018).

4.4.1 Household food insecurity and contraceptive use

The findings of the present study have revealed households facing food insecurity tended to exhibit a considerably lower probability, approximately 76% lesser, of utilizing contemporary contraceptive measures as compared to households with assured access to food resources. Prior research shows that women from lower socio-economic backgrounds are less likely to use modern contraceptive methods (Asresie et al., 2020; Ibnouf et al., 2007). A study conducted by Feyisso et al. (2015) in the Wolaita zone of southern Ethiopia has shown food security and contraceptive use are positively associated, with women in food-secure households using contraception more. However, a study conducted by Mekonnen & Worku (2011b) in Butajira District, South Central Ethiopia, found an inverse relationship, with women in food-insecure households being more likely to adopt family planning methods. The observed variability could potentially arise from differences in the demographic, socioeconomic, or cultural status of women, or from other factors pertaining to health, such as disparities in counseling proficiency (Shiferaw et al., 2019). The present finding is consistent with the findings of earlier investigations reported by Feyisso et al. (2015) but in contrast with the study by Mekonnen & Worku (2011b). The plausible explanation for this phenomenon is that children residing in households experiencing food insecurity are perceived as contributing meaningfully to enhance the socio-economic status of their family (Birhanu, 2013; Leibenstein, 1975; World Vision, 2022).

Moreover, women who belong to households experiencing food insecurity are at a high risk of experiencing negative sexual and reproductive health consequences, including ineffective utilization of contraception and unintended pregnancies. These outcomes are predominantly attributed to limited decision-making abilities and inadequate communication with their partners (Ahinkorah et al., 2021). The socio-economic status of women is also a significant factor in

contributing to their participation in fundamental approaches to regulating fertility and promoting the effective utilization of progressive healthcare services (Dixit et al., 2021).

4.4.2 Demographic and socio-economic characteristics and contraceptive use

The age of women and the need to use contraceptives are inversely related at P< 0.05. This finding was consistent with (Moon et al., 2021; Zegeye et al., 2021) but in contrast with the findings of previous studies (Afriyie & Tarkang, 2019; Alemu et al., 2020). The aforementioned phenomenon may be attributed to the positive correlation between the age of women and the probability of entering into marriage and bearing children. The increased level of receptiveness exhibited among younger women can be attributed to the successful communication they had with their spouses or partners on matters related to family planning. Another possible explanation for our results could be that older women approaching or experiencing menopause perceive themselves as having lower fertility and therefore less likely to perceive a need for contraceptive use (Moon et al., 2021). The result of the study also shows that the level of women's education was found significant in determining modern contraceptive use at P< 0.05. This finding was in line with some other studies (Dagnew et al., 2020; Moon et al., 2021; Oumer et al., 2020; Zegeye et al., 2021). This phenomenon may be elucidated by the conception that women who possess higher levels of education are endowed with improved opportunities to access pertinent health care information, attain a heightened level of decisional independence that is informed and tend to have a greater capacity to avail health care services (Dagnew et al., 2020; Zegeye et al., 2021). Besides increasing women's education, a gender-equitable environment is a crucial factor as it enables women to access and utilize family planning services without encountering the various obstacles that are prevalent in developing countries (Assefa, 2015; Minale, 2019).

Moreover, women who are engaged in any income-generating activities were 2 times more likely to use modern contraceptive methods compared to unemployed women. This finding was in line with the findings of a studies (Ahinkorah et al., 2020; McDougal et al., 2021). The observed phenomenon may be attributed to the notion that women who were employed had a greater chance of utilizing modern contraceptives, which aids them to delay childbirth (Daca et al., 2022). Our results are consistent with earlier studies which revealed that an improvement in women’s income and employment status correlates with an upsurge in the use of sexual and reproductive health services, such as the use of modern contraceptives. Medical costs,

particularly in food insecure areas, are a substantial barrier to the use of modern contraceptives by women from low-income households (Ahinkorah et al., 2020).

On the other hand, the desired number of children was also found significant in determining modern contraceptive use at 95% CI which is consistent with those studies (Asresie et al., 2020; Dagnew et al., 2020; Oumer et al., 2020; Zegeye et al., 2021) but oppose to a study conducted in Ho West District, Ghana (Afriyie & Tarkang, 2019). It could be deemed sensible to assume that once individuals have concluded regarding reducing the number of children they wish to bear, they would come up with the adoption of contraceptive measures to regulate their fertility (Oumer et al., 2020). Having any history of childhood is inversely related to the initiative to use modern contraceptives use. This relation was found to be significant at $p < 0.05$ and agreed with those studies (Feyisso et al., 2015; Oumer et al., 2020). This fact may be a result of a deliberate decision to replace offspring lost through natural causes or an intrinsic desire to bear additional children. From a sociological standpoint, communities with lower levels of education tend to rely on their children to offer support and care during their elderly years (Atsbaha et al., 2016; Endriyas et al., 2017).

Women's income was also found significant in determining the initiative to use contraceptive use at $p<0.05$. This finding was consistent with the studies conducted in different regions of Ethiopia (Asresie et al., 2020; CSA, 2016a) but opposes the finding of one study (Nethery et al., 2019). The observed disparities between these findings could potentially be attributed to a range of socio-economic and cultural factors. The possible explanation for the negative correlation between household incomes and usage of contraceptives lies in the notion that individuals with higher incomes may have a greater desire for a larger number of children, whereas those with lower incomes may not aspire to have more children than their financial means allow (Afriyie & Tarkang, 2019). Previous research has established that engaging in partner discussion regarding family planning and contraceptive practice is a crucial factor in promoting widespread acceptance of contraceptive practices, as well as reducing partners' fertility intentions in developing nations (Sears, 2011). The present investigation revealed that females who participate in discussions with their marital partners exhibit a significantly heightened propensity, estimated at approximately 6.29-fold greater likelihood, to utilize contemporary forms of contraception. This finding was consistent with a study conducted in the Wolaita zone and Debre Markos town

of Ethiopia (Alemu et al., 2020; Feyisso et al., 2015) but opposes other evidence (Afridi et al., 2014).

Family planning information service was positively related to the need to use contraceptives at P<0.05. This finding was consistent with the finding of previous studies (Feyisso et al., 2015; Zegeye et al., 2021) but opposed to Asresie et al. (2020). The rationale behind this phenomenon may be attributed to the provision of family planning information and services, or via media exposure, which can significantly contribute to the promotion of community health awareness and the resolution of socio-cultural issues. Furthermore, it enhances the requisition for healthcare amenities by affording a prospect for the members of a community to discern, acknowledge and react to their health necessities (Richard et al., 2017; Zegeye et al., 2021). Similarly, women having a favorable attitude towards contraceptive use were 6.20 times more likely to use modern contraceptives compared to those having an unfavorable attitude. This finding corroborates with those studies (Alemu et al., 2020; Feyisso et al., 2015; Oumer et al., 2020; Tilahun & Dinkinesh, 2021). The rationale for this fact lies in the critical role that attitudes towards specific activities play in initiating and sustaining behaviors, as well as in fostering a favorable atmosphere for the acceptance of informed consent by healthcare providers who offer contraceptive options (Tilahun & Dinkinesh, 2021).

4.5 Conclusion

The present study demonstrates that access to modern contraceptive methods is impeded by a major hurdle: food insecurity. The integration of suitable strategies aimed at promoting the use of modern contraceptive methods in areas fraught with food insecurity represents a crucial component of interventions geared toward achieving food security. Therefore, it is imperative for any program, governmental or non-governmental, seeking to enhance the utilization and sustainability of modern contraceptive methods to take into account the food security status of the target location in their family planning service design. The Woreda Health Office ought to prioritize the contemporary utilization of contraceptive practices regarding reproductive health services. The promotion of awareness regarding the significance of engaging in conversations on reproductive health matters by mothers and their partners, as well as the active encouragement of women to avail themselves of discussions concerning modern contraceptive methods with healthcare practitioners, should be prioritized.

CHAPTER FIVE

EXAMINING THE RELATIONSHIP BETWEEN URBAN HOUSEHOLD FOOD INSECURITY AND UNDER-FIVE MORTALITY IN LIDETA SUB-CITY, ADDIS ABABA

https://doi.org/10.36922/ghes.1682

Abstract

Household food insecurity increases the risk of morbidity and mortality in children. Improved reproductive health in women enhances the nutrition status of children, while better food security helps children survive. This study aims to examine the relationship between food insecurity and under-five mortality. A community-based cross-sectional study was conducted from February to March 2023 in Lideta sub-city, Addis Ababa, Ethiopia. A total of 605 women of reproductive age were selected using multistage sampling. A Pearson chi-square test (χ^2) and logistic regression were used to assess the association between food insecurity and under-five mortality after adjusting for other covariates. The result of the study shows that food security status was a significant predictor of under-five mortality at $p<0.05$. According to the findings, food-insecure households were 3.89 times more likely to experience under-five mortality compared to food-secure households. Similarly, women's education, age at first birth, initiation of breastfeeding, child's age and sex, birth order, and the number of children ever born were significant predictors of under-five mortality at $p<0.05$. These outcomes reinforce the notion that food insecurity is a significant public health concern. Consequently, national and regional considerations should prioritize addressing household food insecurity and cases of acute malnutrition to achieve sustainable development goals.

Keywords: *Under-five mortality; Food insecurity; Lideta sub-city; Addis Ababa; Ethiopia*

5.1. Introduction

The world's population has experienced a remarkable increase, growing from 1 billion in 1800 to a staggering 8 billion today. The less developed countries in Africa, Asia, and Latin America now account for 85% of the world's population but contribute to 99% of global population growth (United Nations, 2022). The highest fertility rates and under-five mortality rates are found in the poorest and most food-insecure countries (Boliko, 2019; FAO, 2020). Surprisingly, the world is still home to over 800 million undernourished people, with over 97% of them living in developing countries, and the rate of undernourishment worldwide is on the rise, affecting 9.9% of people globally (FAO, 2021).

Sub-Saharan Africa has by far the fastest growing population of any major region in the world, with a population of 1.3 billion (17% of the world population) (United Nations, 2022). Sub-Saharan Africa has the highest mortality rate for children under five, at 73 per 1,000 live births. In 2021, one in 14 children in sub-Saharan Africa died before reaching the age of five. This rate aligns closely with the global average from 20 years ago, when the under-five mortality rate was also one in 14 in 2001. However, it remains markedly higher than the risk for children born in high-income countries, surpassing it by 15 times. In 2020, the under-five mortality rate in the poorest households was estimated to be 151 per 1,000 live births, while in the richest households, it was approximately 96 per 1,000 live births (Sharrow et al., 2021).

Ethiopia remains one of the world's most impoverished and food-insecure nations, with 30.8% of its population living below the poverty line for sustenance (Odekon, 2022). The majority of urban households in Ethiopia, comprising approximately 80%, experience food insufficiency and heavily rely on market mechanisms to procure their food requirements (WFP/UNICEF, 2019). The under-five mortality rate in Ethiopia remains high, estimated at 59 per 1000 live births (CSA, 2016, 2019).

The relationship between food insecurity and under-five mortality is found not only at the national level but also at the regional level. According to the Interim Report on Poverty Analysis Study in Ethiopia (FDRE, 2017), an estimated 19.1% of individuals in Addis Ababa experience food insecurity (defined as being unable to purchase consumption items providing a minimum of 2,200 kcal) (PDC, 2019). Despite this, the under-five mortality rate in Addis Ababa is relatively lower, estimated at 26 per 1000 live births (CSA, 2016, 2019). However, in the Lideta sub-city,

considered one of the most deprived sub-cities in Addis Ababa, around 29.3% of the population suffers from food insecurity. This data suggests that approximately one-third of the population falls below the threshold of adequate food intake (MOFED, 2018), which could exacerbate under-five mortality in the sub-city.

Previous studies have focused on examining the relationship between food insecurity and under-five mortality at national and regional levels, often overlooking disparities within localities and sub-cities. The empirical data provided in these studies may not definitively authenticate circumstances that transpire at a fundamental level, potentially underestimating the magnitude of under-five mortality within sub-regional domains. Chronic food insecurity in households can result in persistent malnutrition as a consequence of the inability to secure adequate and sustained access to food. Conversely, the lack of access to safe and nutritious food increases the risk of under-five mortality, highlighting the necessity for stakeholder intervention (Belachew et al., 2012). As a result, the purpose of this study is to examine the prevalence and effect of household food insecurity on under-five mortality in the sub-city.

Theoretical Framework

This study is grounded in two theoretical frameworks: Schultz (1984) and Mosley & Chen (1984), which were developed to investigate the relationships between food insecurity and child survival, alongside other factors influencing under-five mortality. Schultz (1984) is recognized as one of the pioneering researchers in developing a theoretical framework for child survival. In addition to observed socioeconomic (social, economic, community, and religious) and biomedical (breastfeeding habits and hygiene) factors, Schultz's theoretical framework concentrated on the structural relationship between child survival and individual behavioral variables. According to Schultz's framework, socioeconomic factors have an indirect impact on child survival through their interaction with biomedical factors, which are modeled as having a direct effect on child mortality (Schultz, 1984). Similarly, Mosley & Chen (1984) divided child survival determinants into socioeconomic and biomedical (maternal, nutrition, environmental, injuries, and personal disease) factors. Proximate determinants were classified by Mosley and Chen as maternal factors (age, birth order, and birth intervals), nutrient deficiency (calories, protein, and micronutrient deficiency), environmental hygiene factors such as the source of water and type of sanitation, injury (related to physical, burn, and poisoning injuries), and personal

illness. The foundation for this research is the framework developed by Mosley & Chen (1984), which connects under-five mortality to nutrient deficiencies, as well as other maternal and environmental factors.

5.1.2 Empirical Literature

However, while many studies have focused on the association of food insecurity with stunting, wasting, and being underweight, it is worth noting that more than 50% of under-five mortality is attributable to food insecurity and malnutrition. Among the principal causes of death in young children, diarrhea, pneumonia, measles, and malaria are attributable to malnutrition (Caulfield et al., 2018). Both past and recent studies have consistently demonstrated that malnutrition significantly contributes to morbidity and under-five mortality (Girma et al., 2022; Pelletier et al., 1995; Puffer & Serrano, 1973). A study conducted across 53 developing countries revealed that malnutrition's potentiating effects account for 56% of child deaths, with 83% attributed to mild-to-moderate malnutrition. In individual countries, malnutrition's total potentiating effects on mortality ranged from 13% to 66%, with at least three-quarters of this arising from mild-to-moderate malnutrition in each case (Pelletier et al., 1995). Additionally, a study conducted by the Pan American Health Organization's Inter-American Investigation of Mortality in Childhood identified malnutrition as the primary cause of death in 15% of severe cases and an associated cause in 85% of less severe cases among children aged 1–4 years (Puffer & Serrano, 1973).

A study conducted by Campbell et al. (2009) in rural Indonesia has demonstrated that food insecurity is related to mortality among neonates and children under five after adjusting for potential confounders such as the age of the mother, maternal education, household kitchen sharing, maternal body mass index, and household food expenditure. Similarly, a study conducted by Cassidy et al. (2022) in North Carolina, America, has confirmed a positive correlation between household food insecurity and infant mortality after controlling for other variables such as diabetes. According to their findings, a 1% increase in country food insecurity results in 1.2 additional infant deaths per 1000 live births.

Inadequate access to food among young children significantly contributes to mortality rates, and increases in the average dietary energy supply for infants have notably reduced these mortality rates. A study conducted by Beyene (2023), based on evidence from sub-Saharan Africa, confirms that an increase in the prevalence of undernourishment has a significant positive effect

on infant mortality. The study findings revealed that a 1% increase in the prevalence of undernourishment leads to a reduction of 0.00348% in life expectancy while simultaneously causing infant mortality rates to increase by 0.0119%. Furthermore, a study by Walker et al. (2019) used a Cox regression model to demonstrate that food insecurity is linked not only to under-five mortality but also to adult mortality. According to the study, individuals reporting very low food security have twice the risk of mortality compared to those with full food security after adjustment for demographics.

Although various studies have explored the effects of food insecurity on child health and development (Kimbro & Denney, 2015; Quyen et al., 2014), educational performance, intellectual development (Belachew et al., 2011), and external and internal behaviors (Murphy et al., 1998), as well as stunting, wasting, and underweight (Abdu et al., 2018; Abdurahman et al., 2016; Berra, 2020; Betebo et al., 2017; DiClemente et al., 2021), insufficient emphasis has been placed on investigating the association between urban household food insecurity and demographic outcomes within scholarly discourse. This study aims to fill this gap by investigating the relationship between urban household food insecurity and under-five mortality in the sub-city. The findings are expected to provide policymakers and development stakeholders with valuable insights to guide well-informed decision-making and effective interventions.

5.2 Data and methods

5.2.1 Sampling design and procedure

Samples were drawn using a multi-stage random sampling technique. Initially, three Woredas (districts) were randomly selected in the first stage. Secondly, from each of these three Woredas (each Woreda comprises different Ketenas [villages]), two Ketenas were selected using the random sampling method. In the last step, a final sample of 605 respondents was selected from the six Ketenas. The total sample was divided among all the Woredas and then among Ketenas proportionally to their population size. Households from the respective Ketenas were selected using a systematic random sampling method based on a sampling frame of house numbers developed from Ketena records. Individual respondents (605 women within the age range of 15 to 49 years who would be either household heads or women, who had given birth within the last 10 years preceding the survey) were sampled in each household based on their parental role in the family.

5.2.2. Study variables

The outcome variable in this study is under-five mortality, which encompasses neonatal mortality, infant mortality, and child mortality. This variable can be measured by categorizing a child's survival status or event as a dummy outcome variable (dead or alive). Predictor variables and covariates include household food insecurity status, categorized as either food insecure or food secure, as well as demographic and socio-economic factors such as maternal education, age at first birth, availability of toilet facilities, antenatal care service, initiation of breastfeeding, age and sex of the child, type of birth, preceding birth interval, birth order, and the number of children ever born.

5.2.3 Statistical analysis

The dependent variable is binary, taking a value of zero for alive and one for dead. The explanatory variables can either be continuous, categorical, or binary. The cumulative logistic probability function is specified as

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + u_i ,$$

Where Z_i is a function of explanatory variables, β_0 is an intercept and $\beta_1, \beta_2, \ldots \beta_n$ are slopes of the equation in the model, X is vector of relevant characteristics, and u_i is error term .

Hence, the above econometric model was used in this study and was treated against potential variables assumed to affect under-five mortality.

The data were collected using KoboCollect 3.5 and subsequently entered into the SPSS 24 software with caution. The data cleansing method was employed to assess the correctness and inconsistencies, ensuring the completeness and accuracy of the dataset. The data were then categorized and sorted to facilitate their analysis. The chi-square test (χ^2) was employed to identify variables that exhibited a statistically significant association with under-five mortality. In this study, the variables that exhibited a *p*-value of less than 0.25 were subjected to a thorough examination for multicollinearity issues utilizing the variance inflation factor (VIF). Following this preliminary assessment, the identified variables were included in a logistic regression model to determine their effect on the outcome variable (under-five mortality). The adjusted odds ratios, along with their respective 95% CI, were computed. A significance level of 0.05 was deemed statistically significant in the present study. To identify the best independent predictors of under-five mortality, logistic regression with a stepwise selection (LR) method was used.

5.3 Results

5.3.1 Demographic and socio-economic characteristics of respondents

As shown in Table 5.1, a total of 605 respondents participated in the study. Nearly half of these households, constituting 48.7%, fell within the age range of 25–34 years old. The educational background of the respondents varied, with the majority (39.7%) having attended secondary school, followed by those who completed primary school (28.3%). In addition, 14.2% held a diploma or higher qualification, while 9.6% had no formal education. In terms of the number of children ever born, the majority of respondents (86.9%) reported having up to four children. A substantial portion of respondents used ante-natal care services (53.1%), and a vast majority (98.2%) had access to a common toilet facility. Approximately 70.2% of households surveyed were identified as food insecure. Regarding breastfeeding practices, the majority of respondents (74.7%) reported the initiation of breastfeeding within one day of childbirth. The age at which respondents had their first birth varied, with 39.3% starting between the ages of 20 and 24. Of the total under-five children, more than half (56.2%) were males, and only about 7.0% were multiple births. Out of 831 live births recorded, 60 (7.2%) under-five deaths were reported. Birth order analysis indicated that 773 (90.8%) children were born in first and second birth order, with approximately 41.0% born at a two-year interval. The majority of respondents (42.0%) experienced their first birth between the ages of 24 and 24. According to the current survey data, a notable proportion of 92.8% of under-five children were found to be alive out of the total of 831 live births (Table 5.2).

Table 5.1: Households and socio-demographic characteristics of women (N = 605)

Variables	Under-five mortality						Chi-square test	
	Alive		Dead		Total			
	Freq.	%	Freq.	%	Freq	%	χ^2	Sig.
Age at first birth								
15-19	82	89.1	10	10.9	92	15.2		
20-24	239	94.1	15	5.9	254	42.0		
25-29	138	85.7	23	14.3	161	26.6	26.65	0.000 [a]
>30	73	74.5	25	25.5	98	16.2		
Children ever born								
1-4	425	91.6	39	8.4	464	76.7	25.14	0.000 [a]
>4	107	75.9	34	24.1	141	23.3		
Toilet facility								
Private	9	81.8	2	18.2	11	1.8		
Common	521	88.0	71	12.0	592	98.2	0.664	0.434
Initiation of breast feeding								
Immediately	68	66.0	35	34.0	103	25.3		
Not-immediately	280	92.1	24	7.9	304	74.7	42.23	0.000 [a]
ANC service								
No	164	85.4	28	14.6	192	46.9		
Yes	186	85.7	31	14.3	217	53.1	0.007	0.932
Household food insecurity status								
Food- secure	174	96.7	6	3.3	180	29.8	18.41	0.000 [a]
Food-insecure	358	84.2	67	15.8	425	70.2		
Women's level of education								
Uneducated	48	82.8	10	17.2	58	9.6		
Informal	34	68.0	16	32.0	50	8.3		
Primary	146	85.4	25	14.6	171	28.3	32.08	0.000 [a]
Secondary	220	91.7	20	8.3	240	39.7		
Above Diploma	84	97.7	2	2.3	86	14.2		

[a]p< 0.25, Significant association

Source: Computed based on own primary data (2023)

Table 5.2: Bio-demographic characteristics of the under-five children (N = 831)

Variables	Under-five mortality						Chi-square test	
	Alive		Dead		Total			
	Freq.	%	Freq.	%	Freq	%	χ^2	Sig.
Birth type								
Twin	38	65.5	20	34.5	58	7.0		
Single	733	94.8	40	5.2	773	93.0	69.18	0.000 [a]
Birth interval								
<2years	113	91.9	10	8.1	123	41.0		
>2years	174	98.3	3	1.7	177	59.0	7.29	0.007[a]
Birth order								
<2	720	93.1	53	6.9	773	90.8		
>2	71	91.0	7	9.0	78	9.2	2.188	0.139 [a]
Sex of child								
Female	354	97.3	10	2.7	364	43.8		
Male	417	89.3	50	10.7	467	56.2	19.34	0.000 [a]

[a]p< 0.25, Significant association, Birth interval is calculated for non-first birth only.

Source: Computed based on own primary data (2023)

5.3.2 Factors contributing to under-five mortality in Lideta sub-city, Addis Ababa, Ethiopia

A Pearson chi-square test (χ^2) was conducted to ascertain potential variables for inclusion in the logistic regression. Based on predetermined criteria, variables such as maternal education, age at first birth, antenatal care service, initiation of breastfeeding, age and sex of the child, type of birth, preceding birth interval, birth order, household food insecurity status, and the number of children ever born were deemed suitable for inclusion. After adjusting for confounding factors, including maternal education, age at first birth, initiation of breastfeeding, age and sex of the child, birth order, the number of children ever born, and household food insecurity status, under-five mortality was significantly affected at $p<0.05$ (Table 5.3). Efforts were made to assess whether the necessary assumptions for applying logistic regression were met. In this context, the Hosmer and Lemeshow test of goodness of fit was performed to check the fitness of the model, yielding a result of 0.576. Nagelkerke R-squared model explained 73.2% of the variation in observed data, providing insight into factors contributing to under-five mortality.

The study's findings demonstrate a definitive correlation between breastfeeding and the survival status of children, with statistical significance observed at $p<0.05$. Children under five who received breastfeeding within an hour of birth were found to have a significantly lower risk of mortality by 85% compared to those who did not receive immediate breastfeeding. Furthermore, the age of the child was also found to significantly influence their survival status at $p<0.05$. Specifically, a one-unit increase in the age of the child was associated with a 2.29-time reduction in the risk of under-five mortality.

The study revealed that the male sex category was significantly associated with a decreased likelihood of under-five mortality, with odds 80% lower than those associated with the female sex category. Children born as first- and second-order births exhibited a 94% decrease in the likelihood of experiencing under-five mortality compared to those born as third-order or higher. Moreover, the odds of under-five mortality were 2.17 times higher when women had more than four children.

Furthermore, the study found that households with insufficient access to food were 3.89 times more likely to experience under-five mortality in comparison to those households with reliable access to adequate food. Logistic regression analysis also indicated a variation in the probability of childhood mortality in relation to different levels of educational attainment. Increasing educational attainment from no formal education to tertiary-level education was associated with a substantial reduction of 96% in the probability of under-five mortality. Additionally, the age at which a woman gives birth for the first time was found to have a statistically significant effect on childhood mortality, with a significance level of $p<0.05$. Elevating the age of first childbirth from the range of 15–19 years to 20–24 years resulted in a significant 78% reduction in the likelihood of childhood mortality.

Table 5.3: Coefficients and odds ratio of Under-five mortality in Lideta sub-city

Variables	B	Sig.	Exp(b)	95% CI for Exp(b)	
Birth order					
<2	-2.77	.000[b]	0.06	0.01	0.28
>2		1.00			
Sex of child					
Male	-1.60	.035[a]	0.20	0.05	0.89
Female		1.00			
Children ever born(Parity)					
>4	0.77	.035[a]	2.17	1.06	4.44
<4		1.00			
Initiation of breast feeding					
Immediately	-1.90	.000[b]	.15	0.08	0.28
Not-immediately			1.00		
Household food insecurity status					
Food-insecure	1.36	.012[a]	3.89	1.35	11.16
Food- secure		1.00			
Women education					
Informal	-0.57	.399	0.57	0.15	2.13
Primary	-1.04	.081	0.35	0.11	1.14
Secondary	-1.60	.011[a]	0.20	0.06	0.69
Above Diploma	-3.13	.007[b]	0.04	0.00	0.43
Uneducated		1.00			
Age at first birth					
20-24	-1.51	.010[a]	0.22	0.07	0.70
25-29	0.34	.504	1.41	0.51	3.88
>30	1.18	.051	3.27	1.12	9.58
15-19		1.00			
Age of child	-0.89	.000[b]	2.29	1.46	3.58

[a]P< 0.05 statistical significance, [b]P< 0.05 highly statistical significance, 1.00 = Reference

Source: Computed based on own primary data (2023)

5.4. Discussion

Under-five mortality is a crucial metric for assessing child survival rates and serves as a key indicator of the general health and overall prosperity of the broader population. In this study, the prevalence of under-five mortality was found to be 7.2%, which is higher than the rate reported by Ayele et al. (2022) in Ethiopia, which was 5.76%. The present study's results indicate a higher rate compared to the average world index, which stands at 3.4%, but is nearly comparable

to the figure reported in the previous 2016 Ethiopian Demographic and Health Survey Report (6.7%) and lower than the rate reported in a study conducted in Chad (13%) (Ahinkorah et al., 2020; CSA, 2016). Potential causes of this variance could arise from dissimilarities in socioeconomic status between countries, the presence of universal health coverage, disparities in the timing of the studies, and variations in study settings (Ayele et al., 2022).

5.4.1 Household food insecurity and under-five mortality

Based on the findings, food-insecure households were 3.89 times more likely to experience under-five mortality compared to food-secure households. This finding is consistent with similar findings from studies conducted by Beyene (2023) in sub-Saharan Africa and Campbell et al. (2009) in rural Indonesia. Additionally, Cassidy et al. (2022) confirmed in a study conducted in North Carolina, United States of America, that household food insecurity is positively correlated with infant mortality. Moreover, Walker et al. (2019) have demonstrated in their study that food insecurity is related to adult mortality. They found that individuals reporting severe food insecurity had twice the probability of mortality compared to those with adequate access to food, after controlling for demographic factors. The increased risk of mortality among children in food-insecure households can be attributed to higher susceptibility to illnesses and the consequent need for hospitalization. They may encounter impediments in their physical development, resulting in stunted growth, where they are unable to achieve their maximum potential physique. Furthermore, they may experience developmental disabilities that hinder their physical, cognitive, and emotional advancement (Fram et al., 2015).

5.4.2 Women's characteristics and under-five mortality

The study identified maternal education, age at first birth, and the number of children ever born as strong predictors of under-five mortality. Specifically, the odds of under-five mortality increased by 2.17 times when women had more than four children. This is attributed to the fact that children from smaller families tend to experience superior nourishment, improved health outcomes, and enhanced chances of survival compared to their peers from larger families.

Evidence suggests that advancing from no education to tertiary education reduces the risk of under-five mortality, consistent with the findings of Ahinkorah et al. (2022) yet contradicting the findings from a previous study (Zewudie et al., 2020). The rationale for this phenomenon lies in the correlation between maternal education and the adoption of health-promoting practices,

which encompass the cultivation of healthy dietary habits and the provision of optimal child care. Maternal education results in a modification of their familial role, permitting them to partake in essential measures that enhance the well-being of their children and facilitate the effective utilization of innovative healthcare services (Ahinkorah et al., 2022).

The age at first birth demonstrates a significant association with under-five mortality at $p<0.05$. This finding is consistent with several studies (Ahinkorah, 2021; Ayele et al., 2022; Zegeye et al., 2021) but contrasts with the findings of a previous study (Zewudie et al., 2020). This association can be explained by the prevailing circumstances where early births are often undesired and unsupported, thus giving rise to maternal emotional, psychological, and social predicaments. Consequently, these predicaments result in inadequate child care, support, and nutrition, ultimately increasing under-five mortality (Sakai et al., 2017).

5.4.3 Bio-demographic characteristics and under-five mortality

The study identified the initiation of breastfeeding, child sex, and birth order as strong predictors of under-five mortality. The results demonstrate a positive association between breastfeeding and the survival status of a child, which was significant at $p<0.05$. This finding is consistent with previous studies (Ayele et al., 2022; Zewudie et al., 2020). The phenomenon can be attributed to the timely initiation of breastfeeding, particularly within the first hour postpartum, which has the potential to prevent unfavorable health outcomes, such as under-five mortality associated with diverse infections and reduce morbidity. This observation underscores the significance of the early adoption of exclusive breastfeeding in promoting continuum care for the mother and the newborn. Such an intervention promotes bonding between mother and child and ensures that the infant receives colostrum, which is crucial for their first immunization. Additionally, there is potential for long-term impact on the health and neurological development of the child (CSA, 2016).

Under-five mortality among children was 80% higher among those born male compared to their female counterparts at birth. This finding concurs with Zewudie et al. (2020) but contradicts findings from other studies such as Ahinkorah et al. (2022) and Ayele et al. (2022). These phenomena can be attributed to variances in genetic and biological constitutions between genders, thus indicating that male children possess a relatively weaker biological construct and increased vulnerability to illnesses compared to their female counterparts (Pongou, 2013).

Furthermore, the risk of under-five mortality is significantly associated with birth order at $p<0.05$. This finding corroborates previous studies (Ahinkorah et al., 2022; Ayele et al., 2017; Zewudie et al., 2020) but contrasts with the findings of a previous study (Ayele et al., 2022). The association between under-five mortality and birth order can be elucidated by the observation that first births exhibit a greater predisposition to immunity against neonatal tetanus compared to sixth and higher-order births. Neonatal tetanus, a leading cause of infant mortality in numerous developing nations, is frequently attributable to inadequate adherence to hygienic protocols during the delivery process (CSA, 2016).

5.5 Conclusion

This study demonstrates that food insecurity is a significant public health problem and a potential predictor of under-five mortality, after adjusting for confounding factors such as maternal education, age at first birth, initiation of breastfeeding, age and sex of the child, birth order, and number of children ever born. It provides justification for examining under-five mortality at the sub-regional level, not only to validate these findings but also to explore the feasibility of implementing societal interventions aimed at reducing under-five mortality. Municipal authorities should prioritize formulating policies and programs to address household food insecurity as a key strategy for mitigating the potential risk of under-five mortality. Government initiatives such as the Urban Safety Net Program (2017) and the National Food and Nutrition Policy in 2019 are expected to significantly contribute to ensuring the sustainable provision, accessibility, and utilization of a diverse, secure, and wholesome food supply. Moreover, stakeholders should engage in collaborative and coordinated efforts across various sectors to address the challenges of food insecurity and under-five mortality issues. These efforts should prioritize expanding maternal education, promoting voluntary family planning initiatives, implementing job creation programs, and strengthening women's economic empowerment.

CHAPTER SIX

SYNTHESIS AND POLICY RECOMMENDATION

6.1. Introduction

The study was conducted to assess the factors contributing to household food insecurity and its relationship with demographic outcomes. According to the findings of the study, household food insecurity is affected by various demographic and socio-economic factors and shows a significant relationship with demographic indicators such as fertility, contraceptive use, and under-five mortality. This study is consistent with the findings of different studies (Abdu et al., 2018; Beyene, 2023; Cassidy et al., 2022; Caulfield et al., 2018; DiClemente et al., 2019; Dinku et al., 2023; Feyisso et al., 2015; Lamberte et al., 2000; Phouvong P, 2020). The phenomenon may be reasonably explained by positing that children residing in households that experience food insecurity are perceived as making a meaningful contribution towards improving the socio-economic standing of their family. Women who are affiliated with households encountering a state of food insecurity are exposed to a heightened likelihood of encountering negative sexual and reproductive health outcomes. These may encompass suboptimal adoption of contraception and unintentional pregnancies. Additionally, children who are afflicted by food insecurity are more susceptible to contracting morbidity and mortality. The following section will discuss their interrelationships in detail.

6.2 Interrelationship between food insecurity and fertility, contraceptive use and Under-five mortality

The age and sex of household head, dependency ratio, food expenditure and level of education, access to savings and credit and urban productive safety net program had a statistically significant association with household food insecurity. This finding is consistent with prior studies (Akukwe, 2020; Dinku et al., 2023; Habte et al., 2019; Phouvong P, 2020; Tadesse et al., 2017). Concerning theoretical argument, an attempt was also made to verify whether the results of the study are consistent with or deviate from these core theories commonly used in food security studies (FAD, FED, Political Economy). The general observation of the study can be placed within the explanation of political economy. Although farmland degradation and entitlement failure can be seen as the proximate cause of the household food security problem, the root cause of the problem was primarily due to the inappropriate and

inadequate implementation of policy measures and population, socio-economic factors, and how local institutions were effective in providing for households living in the sub-city.

The study found that household food insecurity and socio-demographic factors are associated with fertility. The number of children ever born within food-secure households is 0.655 times lower compared to households with food insecurity. This study is consistent with the findings of the studies (Abdu et al., 2018; DiClemente et al., 2021; Mekonnen & Worku, 2011b). Mekonnen & Worku, (2011b), in Butajira District, South Central Ethiopia, found that food security predicts the number of children born. Women in food-insecure households had 6% more children compared to those in food-secure households. A study in Tanzania by DiClemente et al., (2021) found that household fertility experience is positively correlated with food insecurity while controlling for education, residence, maternal age, and living children. Abdu et al., (2018) found in Assayita District, Ethiopia that household food insecurity is linked to household fertility. According to this finding, larger families were more likely to be food insecure than smaller families. The plausible explanation for this phenomenon is that children residing in households experiencing food insecurity are perceived as contributing meaningfully to enhancing the socio-economic status of their family (Birhanu, 2013; Leibenstein, 1975; World Vision, 2022). Moreover, women who belong to households experiencing food insecurity are at a high risk of experiencing negative sexual and reproductive health consequences, including ineffective utilization of contraception and unintended pregnancies. Concerning the theoretical argument, Davis and Blake's (1956) framework and the theory of demographic transition (Notestein, 1953) agreed with the results of the study, which showed a lack of economic progress, low agricultural productivity, inadequate use of contraceptives, and a lower socioeconomic and cultural situation are associated with the high fertility norm.

The findings of the present study have revealed that households facing food insecurity tended to exhibit a considerably lower probability, approximately 76% lesser, of utilizing modern contraceptive measures as compared to households with assured access to food resources. Previous studies show that lower-income women use fewer modern contraceptives (Asresie et al., 2020; Ibnouf et al., 2007). The study conducted by Feyisso et al.(2015) in southern Ethiopia found a connection between food security and contraception use. Women in food-secure households are 1.7 times more likely to use modern contraception methods compared to those in

food-insecure households. Conversely, the study conducted by Mekonnen & Worku (2011b) in Butajira District, Ethiopia showed that food insecurity and family planning usage are inversely related. Women in food-insecure households were 1.58 times more likely to use family planning. The observed variability could potentially arise from differences in the demographic, socioeconomic, or cultural status of women, or from other factors pertaining to health, such as disparities in counseling proficiency (Shiferaw et al., 2019). The plausible explanation for the positive relationship between food insecurity and contraceptive utilization is that children residing in households experiencing food insecurity are perceived as contributing meaningfully to enhancing the socio-economic status of their family (Birhanu, 2013; Leibenstein, 1975; World Vision, 2022). Moreover, women who belong to households experiencing food insecurity are at a high risk of experiencing negative sexual and reproductive health consequences, including ineffective utilization of contraception and unintended pregnancies. In terms of theoretical argument, the Health Belief Model (HBM), which is a psychological model, and Demographic Transition Theory (Notestein, 1953), the outcome of socioeconomic advancement in society were consistent with the findings of this study which link household food scarcity and knowledge, attitude and beliefs to contraceptive utilization.

The findings of the study showed that food-insecure households were 3.89 times more likely to experience under-five mortality compared to food-secure households. This is consistent with previous studies (Beyene, 2023; Campbell et al., 2011; Cassidy et al., 2022). The study by Campbell et al. (2009) in rural Indonesia found food insecurity linked to neonate and under-five mortality after adjusting for the mother's age, education, body mass index (BMI), and food expenditure. Cassidy et al., (2022) confirmed that household food insecurity is linked to infant mortality in North Carolina. A 1% increase in food insecurity increases 1.2 more infant deaths per 1000 live births. The study conducted by Beyene (2023) in sub-Saharan Africa shows that more undernourishment leads to higher infant mortality. A 1% increase in undernourishment leads to a 0.00348% decrease in life expectancy and a 0.0119% increase in infant mortality. Food insecurity impacts child and adult mortality. The study conducted by Walker et al. (2019) has shown that food insecurity and adult mortality are related. According to the study, those reporting very low food security had two times the risk of mortality as compared to those with food security. The reason for this is attributable to the fact that children who suffer from food insecurity are at a higher risk of experiencing illnesses and requiring hospitalization. They may

encounter an impediment in their physical development, resulting in an inability to achieve their maximum potential physique, commonly known as stunted growth. Concerning theoretical argument, however, Schultz (1984) also made a significant contribution to the theoretical framework regarding under-five mortality; the finding of this study was consistent with the framework established by Mosley and Chen (1984), which linked under-five mortality to a variety of maternal and environmental factors, including nutrient deficiencies.

6.3 Conclusion

In general, food security is closely tied to demographic outcomes because the size and composition of a population directly impact the availability of resources, including food. As populations grow, the demand for food increases, which can put strain on food systems and lead to food insecurity. Additionally, certain demographic factors, such as income level, education, and access to healthcare, can also influence food security within a population. Food insecurity has also influenced demographic outcomes. Food-insecure households have a higher number of children for both economic and social reasons. Food insecurity can lead to poor health outcomes for adults and children, further exacerbating poverty and food insecurity. In addition, food-insecure households may struggle to provide adequate nutrition for their children, leading to long-term health issues and developmental delays. In addition, food-insecure households have a higher mortality rate as they are exposed to illness and morbidity. Furthermore, children living in food-insecure households are more likely to experience stunted growth and cognitive impairments, affecting their long-term potential and future success. Food insecurity has a relationship with contraceptive use. Contraceptive use reduces fertility and under-five mortality through spacing of birth. Consequently, addressing food insecurity through effective contraceptive use can have a positive impact on child health and development outcomes.

Finally, food insecurity, which refers to the limited or uncertain availability of nutritious and safe food, has far-reaching consequences beyond hunger. It has been found to have a significant impact on various aspects of reproductive health and child mortality. Therefore, it is crucial to develop comprehensive strategies that not only focus on alleviating hunger but also address the underlying factors contributing to food insecurity, such as poverty, limited access to healthcare, and inadequate education. By providing households and communities with access to nutritious and safe food, it is possible to promote proper growth and development, reduce the risk of

maternal and under-five mortality, and enhance overall reproductive health. Additionally, addressing the underlying factors contributing to food insecurity, such as poverty, limited access to healthcare, and inadequate education, can help break the cycle of poverty and improve long-term health outcomes.

6.4 Strengths, Limitations and Future research

6.4.1 Strengths

The study findings have been validated through the application of meticulous statistical analyses and the attainment of an elevated percentage of responses during the data collection phase. Additionally, the implementation of a thoroughly validated, structured questionnaire may have successfully minimized the occurrence of instrumental and inter-rater biases. While accounting for potential confounding variables, the interdependence between household food insecurity and fertility, contraceptive use, and under-five mortality has been extensively investigated. This comprehensive approach has allowed for a more nuanced understanding of the complex relationship between household food insecurity and key demographic indicators. Overall, the rigorous methodology employed in this study has provided valuable insights into the interconnected nature of these important social and health issues.

6.4.2 Limitations

However, the utilization of a cross-sectional dataset design limits our capacity to establish definitive causal associations between the outcome and independent variables. It is imperative to utilize persistent, extended observational investigations and uniform measurement instruments, such as the Household Food Insecurity Access Scale and household dietary diversity score, in forthcoming research endeavors to establish causal connections among variables and determine the diverse levels and utilization aspects of food insecurity. Longitudinal studies can provide valuable insights into the long-term effects of food insecurity on fertility, contraceptive use, and under-five mortality. By tracking individuals or households over time, researchers can better understand how changes in food security status impact these outcomes. Additionally, using measurement tools like the Household Food Insecurity Access Scale can help ensure consistency and comparability across studies, ultimately strengthening the evidence base for policy and programmatic interventions aimed at addressing food insecurity. Finally, the general categorical classification of various levels of education has limited the analysis of the effect of food

insecurity on demographic outcomes at different grade levels of education. Rather than collecting data on access to savings and credit, the saving amount would have been better to examine factors of food insecurity in urban areas.

6.4.3 Future research

Limiting the scope of the study only to socio-demographic determinants may hinder a comprehensive understanding of the root causes of urban household food insecurity. In order to effectively address this issue, a future study that considers all dimensions of food insecurity is necessary. Additionally, excluding anthropometric measurements overlooks a crucial aspect of food insecurity, as malnutrition is a significant consequence of inadequate access to nutritious food. Therefore, it is imperative to consider all facets of food insecurity to effectively address this pressing issue in urban areas in future studies. While street children or the homeless populations are indeed vulnerable to food insecurity, their exclusion from the study may limit the overall understanding of the issue in urban areas. Future research should aim to incorporate these marginalized groups to create a more comprehensive picture of food insecurity and its various dimensions. By including a diverse range of participants, policymakers and organizations can develop more targeted and effective interventions to combat food insecurity and its associated challenges in urban environments. Employing the explanatory sequential design (ESD) method has substantially minimized the contribution of qualitative data and made research quantitatively dominant. By using an embedded or convergent design, researchers can effectively blend both types of data to provide a more comprehensive understanding of the topic being studied. This method allows for a richer interpretation of the results and can lead to more nuanced conclusions.

6.5 Policy recommendations

Addressing food security issues requires comprehensive interventions that not only improve access to affordable and nutritious food but also enhance overall household income and livelihood opportunities. These interventions could include implementing social protection programs that provide financial support to vulnerable households, promoting skill development and job creation initiatives, and improving access to quality healthcare and education services. By addressing the underlying economic challenges and improving overall household income, residents in the Lideta sub-city will have a better chance of meeting their basic needs and improving their quality of life. It is essential for policymakers and stakeholders to collaborate

and implement these comprehensive interventions to ensure sustainable development and poverty reduction in the sub-city. The study findings offer plausible policy recommendations, which are presented as follows:

1. The advocacy for action-centered awareness and the examination of the consequences of population growth at different sociological levels, namely within the family, community, and national levels, should be duly emphasized to potentially influence a decline in fertility rates and extend birth intervals, which, in turn, may lead to a decrease in the size of households and dependency ratios. Furthermore, development stakeholders engaged in population matters ought to stimulate households to maintain an appropriate level of fertility by providing targeted incentives, including subsidizing schooling expenses, offering educational training, and providing other associated benefits.
2. The findings of the study highlight a strong negative correlation between income and food insecurity. Accordingly, it is imperative to pursue and advocate for the acquisition and implementation of productive technical skills that enable trainees to navigate the current market and generate income.
3. The provision of credit has the potential to facilitate participation in economic endeavors that yield financial returns for households. The newly established banks and micro-business agencies in the city have embarked on the task of offering organizational and instructional services to interested members of the business community. Development partners in the study area ought to undertake the execution of extending credit to qualifying households based on a targeting criterion that accurately captures the characteristics of food-insecure households. Another critical concern pertaining to the lending of credit pertains to the requirements of collateral and the group lending scheme. These factors pose a significant impediment for numerous households. Furthermore, it is advisable to reconsider the current collateral requirement procedure as a means of alleviating food insecurity among households currently grappling with this dire issue. It is recommended that borrowers be encouraged to accumulate savings or contribute matching funds, which may help to extend the limited resources among a greater number of individuals who are in need.
4. The study's results point towards a policy implication concerning education's impact on promoting household food security. This finding reaffirms the substantial contribution of

the educational variable toward enhancing living standards. There exists a positive correlation between the level of education attained by the household head and the likelihood of family members obtaining education and gaining proficiency in modern technology, both of which are critical necessities in the current time. Therefore, it is imperative to promote the enhancement of both formal and informal education as well as vocational or skill training in order to mitigate the issue of food insecurity prevalent in Lideta sub-city of Addis Ababa.

5. The study's principal results reveal that the pursuit of urban agriculture in the sub-city has been undertaken to a negligible degree. Urban agriculture has the potential to aid in the generation of income for impoverished families living in urban areas, thus serving as an effective tool for mitigating the severity of poverty. Moreover, the aforementioned industry holds critical significance in furnishing these households with sustenance assurance and prospects for occupation. Nonetheless, the outcomes of the investigation suggest that the development of urban agriculture in the sub-city has been characterized by a sluggish pace. The potential reason for this phenomenon could potentially be attributed to a multitude of factors, including but not limited to the absence of official recognition by governmental entities and limitations on the procurement of land and financial resources. In light of the aforementioned findings, it is strongly advised that the government allocate ample resources to the agricultural industry, specifically in the domains of research and development, the provision of extension workers, inputs, and credit facilities, to enhance productivity and facilitate the prosperous advancement of urban agriculture.
6. Moreover, the present research indicates that food insecurity considerably impedes the capability to attain family planning services, proficiently regulate fertility, and minimize under-five mortality. Therefore, it is expected that stakeholders engage in collaboration and coordination across diverse sectors, expanding urban productive safety net initiatives, job creation efforts, food market stabilization strategies, the expansion of women's education, voluntary family planning initiatives, and initiatives aimed at strengthening women's economic empowerment, to promote the accessibility of household food within the Lideta sub-city. Such concerted efforts are expected to achieve optimal outcomes by ensuring that the population has regular access to an adequate and diverse supply of food.

7. Demography and human resource development should focus on implementing existing population policies, incorporating emerging issues and planning socio-economic development initiatives. Key areas of focus in this context include ensuring that activities related to human resource development contribute to overall economic performance, and carefully managing demographic transition to maximize the benefits from demographic dividends; In particular, it is necessary to ensure that the federal sector authorities responsible for implementing population policies and programs have included population-related aspects in their respective plans and are implementing them accordingly.

8. The building of an effective health system based on prevention and control methods; reducing maternal and child mortality; preventing communicable and non-communicable diseases that may cause death or illness; protecting citizens from deadly health incidents; goals providing equitable, quality and free education from pre-school to secondary school have been included in the Population and Human Resources Development Plan under Ethiopia's Ten-Year Development Plan (2020/21-2029/30). However, addressing the issue of food insecurity is not included. Since addressing the issue of food insecurity is essential to each person's health and wellness, it ought to be covered.

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Appendix 1: Survey/Questionnaire Consent Form

Dissertation title:

Urban Household Food Insecurity and Demographic Outcomes: Implications for Fertility, Contraceptive Use and Under-Five Mortality in Lideta Sub-City, Addis Ababa, Ethiopia:

I, _____(participant's name), understand that I am being asked to participate in a survey/questionnaire activity. I have been given some general information about this project and the types of questions I can expect to answer. I understand that the survey/questionnaire will be conducted in person/by phone/by email/on the internet and that it will take approximately _____ of my time to complete.

I understand that my participation in this project is completely voluntary and that I am free to decline to participate, without consequence, at any time prior to or at any point during the activity. I understand that any information I provide will be kept confidential, used only for the purposes of completing this assignment, and will not be used in any way that can identify me. All survey/questionnaire responses, notes, and records will be kept in a secured environment. The raw data will be offered to me within four months of the completion of the course assignment. If I decline it, it will be destroyed by the researcher. I will also be provided with a copy of the student assignment at my request.

I understand that the results of this activity will be used exclusively in the below-named student's Addis Ababa University research and none of the information I provide will be published, in any form, in any journals or conference proceedings.

I also understand that there are no risks involved in participating in this activity, beyond those risks experienced in everyday life.

I have read the information above. By signing below and returning this form, I am consenting to participate in this survey/questionnaire as designed by the below named Addis Ababa University student.

Participant name (please print): _____

Signature: _____

Date: _____

Addis Ababa University

College of Development Studies

Center for Population Studies

Dear respondent, the purpose of this survey is to gather data for a PhD dissertation entitled "Urban Household Food Insecurity and Demographic Outcomes: Implications for Fertility, Contraceptive Use and Under-Five Mortality in Lideta Sub-City, Addis Ababa, Ethiopia" for partial fulfillment of the Degree of Doctor of Philosophy in Population studies. The information you will give serve only the aforementioned academic purpose and thus your genuine response to questions is very important in achieving the goal of the study. Therefore, you are kindly requested to give your response freely and accurately. I would like to thank you in advance for your cooperation and time to give information on this survey.

General Instruction: Please give your response by using a tick mark "□"or writing the number of your choice from the different alternatives provided against each item for closed questions and by writing short notes on open-ended ones.

Appendix 2: Survey Questionnaire

PART 1. INTERVIEW BACKGROUND

1. Date of interview Day :_____ Month: _____Year:_____
2. Interviewed by _____
3. Date checked Day:_____ Month:_____Year:_____-
4. Checked by (supervisor's name):_____
5. Woreda : _____ Ketena: _____

A. Demographic characteristics of household

1. Age of household head _____
2. Sex of household head 1. Male 2. Female

3. Household Size: _____
4. Number of households members aged above 15 -64 _____
5. Number of household members aged above 65 _____
6. Number of household/s aged 0 to 14_____
7. Total number of dependent household/s _____
8. Marital status of household head 1. Married 2. Single 3. Divorced/separated 4. Widowed/widower
9. Are you an internal migrant ? 1)Yes 2) No

   If your answer to Q 9 is yes' from where to where :

   1) Rural to urban 2) Urban to urban 3) Both

   -If your answer to Q 9 is Yes' For how long have you been living in your current residence?

1) 0-5 Years 2) 6-10 years 3) 11-15years 4) 16-20 years 5) 21-26 years 6) More than 26

B. Socio-economic Characteristics of Participants

1. Educational level of the Household head_____

1. No education 2. Informal education 3. Primary education 4. Secondary education 5. Degree and above

2. Status of employment

1. Government/Private/NGO employee 2. Self-employed 3. Pensioner 4. Unemployed

3. Total household average income per month (in Birr) from different sources _____

4. Do you have access to savings and credit? 1. Yes 2. No

5. Are you engaged in urban agriculture 1. Yes 2. No

6. Do you use an urban productive safety net program 1. Yes 2. No

Part C: Background characteristics of women, fertility, contraceptive use and child survival

No	Question	Response
1	Age?	_____
2	What is your age at first marriage?	Age in completed years_____
3	Age at first birth?	Age in completed years_____
4	Level of education	0. No education 1. Informal education 2. Primary education 3.

5	Her (Q.4 above) husband's education level	0. No education 1. Informal education 2. Primary education
6	If you are married, how long have you been in marriage?	_____
7	Work status	1. Employed 2. Un employed
8	Income	_____
9	Religion	1. Orthodox 2. Protestant 3. Muslim 4.Others
10	Do you have children?	1. Yes 2. No
11	If yes, children ever born	M_____ F_____ total _____
12	How many of them are alive?	_____
13	Initiation of breast-feeding during your recent birth within two years	1. Immediately (within 1 hour) 2. Not immediately (within in day)
14	Toilet facility status	1. Private 2. Shared 3. Don't have
15	Do have any family planning information or media exposure in the past 3-4 month	1. Yes 2. No
16	Do you use Family planning services?	1. Yes 2. No
17	Do you use modern contraceptive methods?	1. Yes 2. No
18	What is your attitude towards contraceptive use?	1. Favorable 2. Unfavorable
19	If your answer to Q.18 above is 'yes' which one do you use?	1. Pills 2. IUD 3. Injectable 4. Condom 5. Implant 6. Others
20	Did you ever discontinue using modern contraceptive methods in the past five years?	1. Yes 2. No
21	If your answer to Q.18 above is 'yes' what was your reason?	1. Need to be pregnant 2. Health related issue 3. Seeking a better way 4. Specify 4. Other ___
22	Do you discuss with your husband about contraceptive?	1. Yes 2. No
23	How many children do/did you want to have?	_____
26	History of child death	1. Yes 2. No
25	Are you pregnant now?	1. Yes 2. No 3. Unsure
26	Did you have any ante-natal care (ANC) visits during last the five years?	1. Yes 2. No
27	Planning status of birth during last five years	0. Unwanted 1. Mistimed 3.

D. Birth History of Women

28	29	30	31	32	33	34
Full Name (Start from the child born recently)	Birth type? 1. Single 2. Twin	Sex 1. Male 2. Female	What is the DOB_ ?	What is the Age__ ?	Survival status of children 1. Deceased 2. Alive	If deceased, at what age?
35	36	37	38			
Other family members	Sex 1. Male 2. Female	Age	Responsibility			

Appendix 3: Demographic characteristics of respondents (marital status versus sex of household head)

Demographic characteristics	**Sex of household head**					
	Female 327(47.3%)		**Male 365(52.7%)**		**Total 692(100%)**	
	Freq.	**%**	**Freq.**	**%**	**Freq**	**%**
Marital status						
Married	101	22.9	341	77.1	442	63.9
Single	99	83.2	20	16.8	119	17.2
Divorced	93	96.3	3	3.1	96	13.9
Widowed	34	97.1	1	2.9	35	5.1

Source: Computed based on own primary data (2023)

Appendix 4: Conversion factor for estimation of adult-equivalent calorie requirements

Age (years)	Adult–equivalent conversion factors
Newborn	
0-1	0.29
Children	
1-3	0.51
4-6	0.71
7-10	0.78
Men	
11-14	0.98
15-18	1.18
19-24	1.14
25-50	1.14
51+	0.90
Women	
11-14	0.86
15-18	0.86
19-24	0.86
25-50	0.86
51+	0.75

Source: Claro et al. (2010). Per capita adult-equivalent estimates of calorie availability in household budget surveys. Cademos de Saúde Pública, 26 (11)

Appendix 5: The application of food poverty line and household income and expenditure survey for food insecurity analysis

Assume three households: a 40-year-old woman living with her 6-year-old child; a 30-year-old man living with his 13-year-old daughter; and a 55-year-old man living with his wife (42 years old) and his 12-year-old son. Although the first two households have the same household size, their food consumption patterns are different. The first household needs 1,508 Birr per adult equivalent, which is obtained by adding 960.33 (0.86) and 960.33 (0.71) together. Similarly, the second and third households consume 192 Birr and 3505 Birr, respectively. The following example shows how the author identifies food secure and food-insecure households.

Available data	1. Adult equivalent Conversion factor (Appendix 3)
	2. Standard threshold is Birr 960.33 /month per adult equivalent (CSA, 2023a; NBE, 2023)
	3. Household food consumption expenditure in Lideta sub-city is 42.2% (CSA, 2016b). Meaning, they spend 42.2% of their income on food.

Households	Household Members (2)	Age (3)	Sex (4)	Conversion factor (5)	Income/month (6)	Available food Expenditure Per month (6)*.422	Required food expenditure per month per adult equivalent Column (5)*960.33
Household 1	Mother	40	F	0.86	3850Birr	1625Birr	826Birr
	Son	6	F	0.71	-		682 Birr
	Total			1.57	3300Birr	1625Birr	**1508 Birr**
Household 2	Father	30	M	1.14	2516 Birr		1095 Birr
	Daughter	13	F	0.86	-	-	826 Birr
	Total			2.00	2516 Birr	1062Birr	**1921 Birr**
Household 3	Father	55	M	0.90	3000Birr	1266 Birr	864 Birr
	Mother	42	F	0.86	1800Birr	760Birr	826 Birr
	Son	18	M	1.18	-	-	1133 Birr
	Daughter	6	F	0.71			682Birr
	Total			2.47	4800birr	2026Birr	**3505 Birr**
Conclusion	If the actual available food expenditure per month is less than the actual required food expenditure per month, households would be food insecure. Therefore, households 2 and 3 are food insecure; while household 1 is food secure (1625Birr vs. 1508Birr). Note that: Birr 960.33/month is the amount of food expenditure required for a daily caloric intake of 2200 kcal.						

Appendix 6: Estimating the cost of consumption groups (basket of goods) to set the food poverty line (July 2016-January 2023)

Food poverty line = 3772 per year/adult person (FDRE, 2015/16)			
Year	Inflation rate (%)/year	Amount inflated/year in Birr	Total value/year in Birr
(July 2016-June 2017	7.2	271.56	4,043
(July 2017-June 2018)	13.4	541.8	4,584.8
(July 2018-June2019)	13.1	600.6	5,185.4
(July 2019-June2020)	23.3	1,208.2	6,393.6
(July 2020- June 2021)	23.1	1,477	7,870.52
(July 2021-June 2022)	32.4	2,550	10,420
(July 2022-January 2023)	10.6	1,104.52	11,524.52

Source (NBE. (2023). *Macroeconomic and Social Indicators: Quarterly Bulletin, National Bank of Ethiopia*. CSA. (2023a). *Country and Regional level consumer price indices (CPI): Federal Democratic Republic of Ethiopia Central Statistical Agency*, *Addis Ababa*. *43*(323), 46.)

Appendix 7: Publication Information

ACCSCIENCE PUBLISHING

International Journal of Population Studies

RESEARCH ARTICLE

Examining the effect of demographic and socioeconomic factors on household food insecurity in Lideta subcity, Addis Ababa, Ethiopia

Ephrem Tadesse Goda[1]*, Terefe Degefa Boshera[1], and Mengistu Ketema Aredo[2]

[1]Center for Population Studies, College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia

[2]Ethiopian Economic Policy Research Institute: Ethiopian Economic Association, Addis Ababa, Ethiopia

Abstract

Food security and vulnerability assessments in Ethiopia have traditionally focused on rural regions. In contemporary policy discussions, urban food security has garnered significant attention. Notably, there is a lack of empirical substantiation of urban food security and its impact on the livelihoods of city dwellers as they grapple with escalating food prices. The present study aims to determine the extent of household food insecurity and identify correlated factors among 692 households in three randomly selected Woredas (districts) within Lideta sub-city, Addis Ababa, Ethiopia. Six Ketenas (villages) were selected using a probability proportional-to-size technique from three Woredas between February and March of 2023. Data were collected through a validated survey administered by trained individuals, and household income and expenditure were used to

***Corresponding author:**
Ephrem Tadesse Goda
(ephr15@yahoo.com)

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Appendix 8: Publication Information (GHES)

ACCSCIENCE PUBLISHING

Global Health Econ Sustain

ORIGINAL RESEARCH ARTICLE

Examining the relationship between urban household food insecurity and under-five mortality in Lideta Sub-city, Addis Ababa, Ethiopia

Ephrem Tadesse Goda[1]*, Terefe Degefa Boshera[1], and Mengistu Ketema Aredo[2]

[1]Center for Population Studies, College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia

[2]Ethiopian Economic Policy Research Institute, Ethiopian Economic Association, Addis Ababa, Ethiopia

Abstract

Household food insecurity increases the risk of morbidity and mortality in children. Improved reproductive health in women enhances the nutrition status of children, while better food security helps children survive. This study aims to examine the relationship between food insecurity and under-five mortality. A community-based cross-sectional study was conducted from February to March 2023 in Lideta Sub-City, Addis Ababa, Ethiopia. A total of 605 women of reproductive age were selected using multistage sampling. A Pearson Chi-square test (χ^2) and logistic regression were used to assess the association between food insecurity and under-five mortality after adjusting for other covariates. The result of the study shows that food security status was a significant predictor of under-five mortality at $p < 0.05$. According to the findings, women from food-insecure households were 3.89 times more likely to experience under-five mortality compared to women from food-secure households. Similarly, women's education, age at first birth, initiation of breastfeeding, child's age and sex, birth order, and the number of children ever born were significant predictors of under-five mortality at $p < 0.05$. These outcomes reinforce the notion that food insecurity is a significant public health concern. Consequently, national and regional

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***Corresponding author:**
Ephrem Tadesse Goda
(ephr15@yahoo.com)

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Appendix 9: Publication Information (EMJ)

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Ethiopian Medical Journal 2024, 62(2) ISSN 0014-1755 eISSN 2415-2420 Goda et al.

Original Article

Understanding the Link between Urban Household Food Insecurity and Contraceptive Use among Reproductive-Age Women in Lideta Sub-City, Addis Ababa, Ethiopia

Ephrem Tadesse Goda[1]*, Terefe Degefa Boshera[1], Mengistu Ketema Aredo[2]

[1]Center for Population Studies, College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia,
[2]Ethiopian Economic Policy Research Institute: Ethiopian Economic Association, Addis Ababa, Ethiopia.

Corresponding authors*: ephr15@yahoo.com

Abstract

Introduction: *The enhancement of reproductive health in women can result in an improvement of children's nutritional status resulting in improvement of reproductive health. This association is important for sustainable population growth without overusing resources. This study aims to examine the relationship between household food insecurity and contraceptive use.*

Method: *A study was conducted on 651 reproductive-age women in three randomly selected Woredas (districts), Lideta Sub-city from February to March 2023. Six Ketenas (villages) were selected using a probability proportional to size technique from three Woredas. Data were collected through a validated survey by trained individuals, and household income and expenditure were used to measure food insecurity access. The Pearson chi-square test (χ^2) and logistic regression were used to examine the relationship between household food insecurity and contraceptive use, considering other covariates.*

Result: *Modern contraception usage was at 50.5% in the study area. Women with food insecurity had only a 32.0% usage rate, while those who were food secure had the higher rate of 68.7%. Women in food-insecure households had a 76.5% lower chance of using modern contraception. Positive attitude, family planning information, partner discussion, income, and childhood mortality were associated with contraceptive use ($p < 0.05$).*

Conclusion: *Use of modern methods of contraception showed a negative correlation with food insecurity. Therefore, addressing household food insecurity as a potential obstacle to the development of family planning services requires comprehensive stakeholder engagement and socio-economic policy intervention.*

Keywords: *Modern contraceptive use; Food insecurity; Lideta Sub-City; Addis Ababa; Ethiopia.*

Appendix10: Publication information (IJWHW)

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ORIGINAL ARTICLE

The Association between Fertility and Household Food Insecurity among Reproductive-Age Women in Lideta Sub-City, Addis Ababa, Ethiopia

Ephrem Tadesse Goda[1], Terefe Degefa Boshera[1] and Mengistu Ketema Aredo[2]*

[1]*Center for Population Studies, College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia*

[2]*Ethiopian Economic Policy Research Institute: Ethiopian Economic Association, Addis Ababa, Ethiopia*

***Corresponding author:** *Ephrem Tadesse Goda, Center for Population Studies, College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia*

Abstract

Introduction: Family planning and women's health are vital to food security and nutrition. Enhanced reproductive health fosters better nutrition and facilitates the attainment of a sustainable family size. This study aims to examine the association between household food insecurity and fertility in Lideta Sub-City, Addis Ababa, Ethiopia, and identify correlating factors.

Method: A community-based cross-sectional study was conducted on 651 reproductive-age women in three randomly selected Woredas (districts) from a sub-city from February to March 2023. Six Ketenas (villages) were selected using a probability proportional to size technique from three Woredas. Data were collected through a validated survey by trained individuals, and household income and expenditure were used to measure food insecurity access. The Pearson chi-square test (χ^2), independent t-test, and logistic regression were used to examine the association between household food insecurity and fertility, considering other covariates.

Result: The study area had a 68% prevalence rate of food insecurity. The study found that five factors affect the likelihood of food insecurity in households. Household size, the sex of the household head, women's education and

Keywords

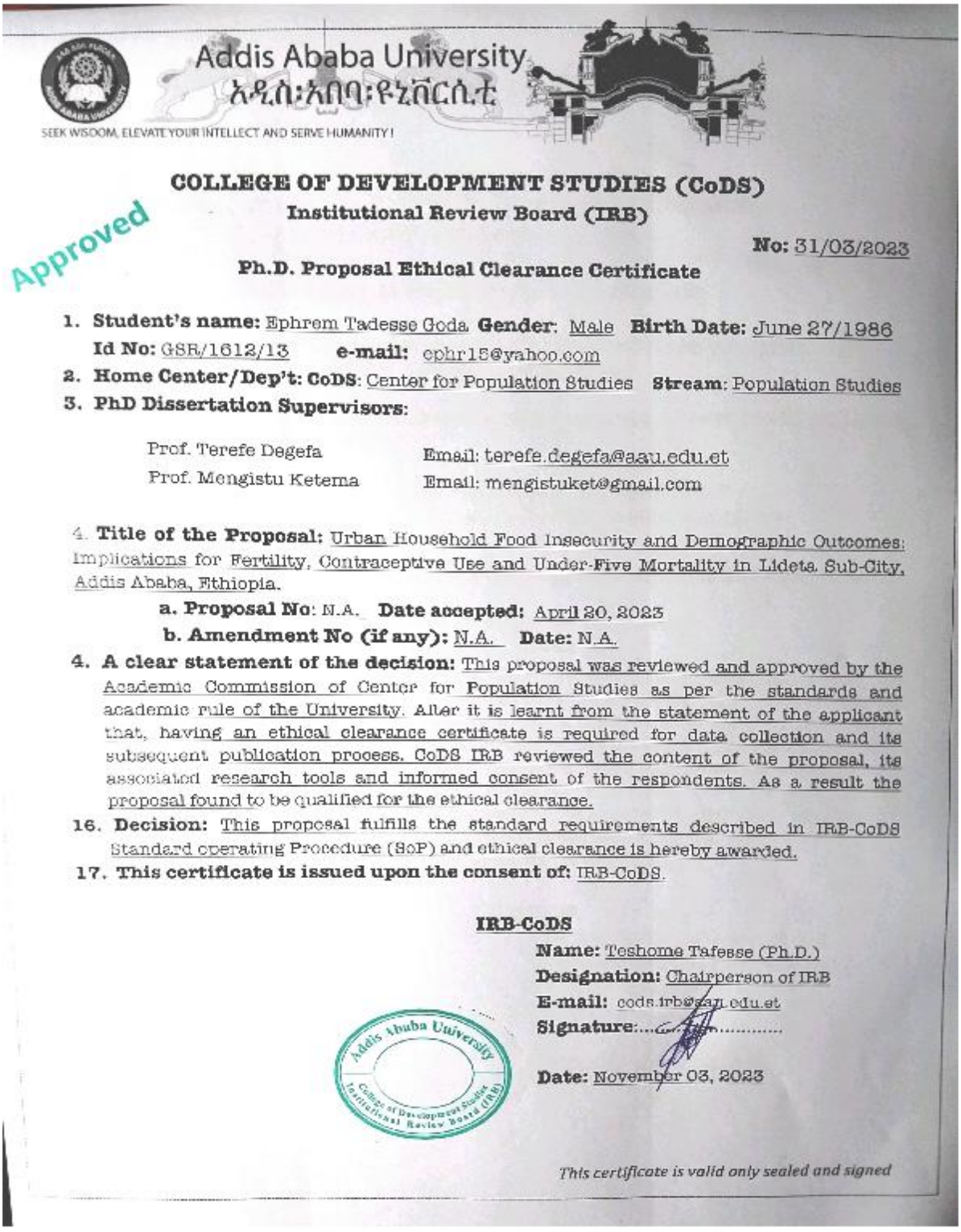
Fertility, Food insecurity, Lideta Sub-City, Addis Ababa, Ethiopia

Introduction

The world's population has experienced a remarkable increase, growing from 1 billion in 1800 to a staggering 8 billion today. The less developed countries of Africa, Asia, and Latin America now account for 85 percent of the world's population but account for 99 percent of global population growth [1]. The highest fertility rates and higher childhood mortality rates are found in the poorest and most food-insecure countries [2,3]. Surprisingly, the world is still home to over 800 million undernourished people, over 97% of whom live in developing countries. The rate of undernourishment worldwide is on the rise, affecting 9.9% of people globally [4].

Sub-Saharan Africa, with a population of 1.3 billion

Appendix 11: Ethical Clearance



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Ph.D. Proposal Ethical Clearance Certificate

1. **Student's name:** Ephrem Tadesse Goda **Gender:** Male **Birth Date:** June 27/1986
   Id No: GSR/1612/13 **e-mail:** ephr18@yahoo.com
2. **Home Center/Dep't: CoDS:** Center for Population Studies **Stream:** Population Studies
3. **PhD Dissertation Supervisors:**

   Prof. Terefe Degefa Email: terefe.degefa@aau.edu.et
   Prof. Mengistu Ketema Email: mengistuket@gmail.com

4. **Title of the Proposal:** Urban Household Food Insecurity and Demographic Outcomes: Implications for Fertility, Contraceptive Use and Under-Five Mortality in Lideta Sub-City, Addis Ababa, Ethiopia.
   a. **Proposal No:** N.A. **Date accepted:** April 20, 2023
   b. **Amendment No (if any):** N.A. **Date:** N.A.
4. **A clear statement of the decision:** This proposal was reviewed and approved by the Academic Commission of Center for Population Studies as per the standards and academic rule of the University. After it is learnt from the statement of the applicant that, having an ethical clearance certificate is required for data collection and its subsequent publication process. CoDS IRB reviewed the content of the proposal, its associated research tools and informed consent of the respondents. As a result the proposal found to be qualified for the ethical clearance.
16. **Decision:** This proposal fulfills the standard requirements described in IRB-CoDS Standard operating Procedure (SoP) and ethical clearance is hereby awarded.
17. **This certificate is issued upon the consent of:** IRB-CoDS.

IRB-CoDS
Name: Teshome Tafesse (Ph.D.)
Designation: Chairperson of IRB
E-mail: cods.irb@aau.edu.et
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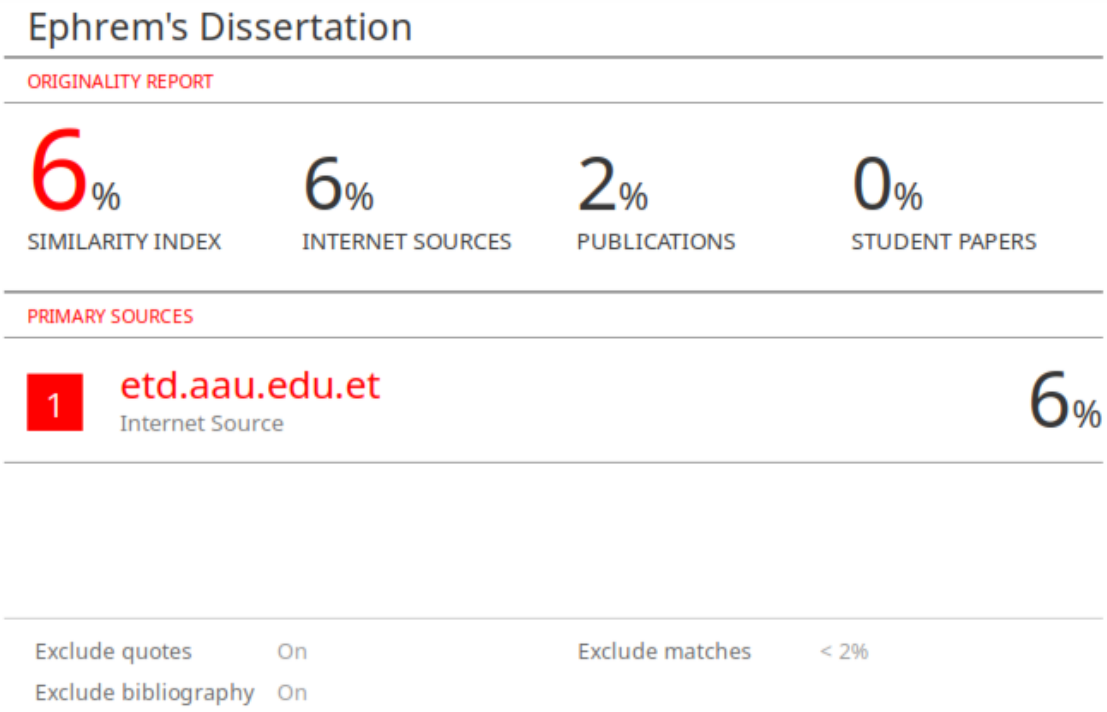

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