

ANALYSING THE RELATIONSHIP BETWEEN FINANCIAL INCLUSION AND
FOOD SECURITY IN NAMIBIA

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ABSTRACT

This study focused on analysing the relationship between financial inclusion and food security in Namibia, with the specific aim of disaggregating the analysis into rural-urban as well as male and female headed households. The study is situated within the global context of Sustainable Development Goal 2 (SDG2), which aims to eradicate hunger and promote food security. The research employed a cross-sectional data which was sourced from the Namibia Financial Inclusion Survey (NFIS) 2017 to examine associations between financial inclusion and food security. The Ordered Probit model was used to empirically analyse the data. In terms of empirical findings, the study finds that access and usage of formal financial services such as bank accounts, formal savings, and access to insurance positively enhance the level of food security. Informal savings and access to credit are less effective in rural Namibia, pointing to structural limitations in rural financial systems. Furthermore, formal mechanisms such as bank accounts, formal savings, and insurance, significantly improves food security by female headed households as well as rural and urban households. However, the limited effects were observed for male-headed households and informal financial services highlighting structural barriers and gendered disparities in accessing and utilizing financial resources. By policy implication, the findings show the need to integrate financial inclusion as a core strategy to achieve SDG 2. Expanding access to formal financial services in Namibia, particularly in rural areas can significantly reduce food insecurity. Gender-specific initiatives targeting women should be prioritized to maximize the impact.

Keywords: Financial inclusion, food security, gender, location, ordered probit and Namibia.

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DEDICATIONS

I dedicate this dissertation to Jehovah my creator, my strong pillar, my source of inspiration, wisdom, knowledge and understanding. He had been the source of my strength throughout this program and on his wings only have I soared.

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DECLARATION

I, Selestine Bonifatius, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The global endeavour to attain Sustainable Development Goal 2 (SDG2), which seeks to eradicate hunger and guarantee food security, has faced enduring obstacles on a global scale, resulting in a significant number of individuals still experiencing prolonged periods of hunger and malnutrition (World Health Organization, 2021). Notwithstanding, the dedicated pursuit of this objective is hindered by circumstances such as the growth in population, changes in climate patterns, and rising levels of poverty. Thus, the attainment of zero hunger by the year 2030 continues to be elusive (Ogwu, 2019). The high levels of food insecurity have extensive implications, encompassing various domains such as health, education, labour productivity, and overall well-being (Johnson & Markowitz, 2018; Mishra & Rampal, 2020; Giller, 2020).

Food security, which refers to the consistent availability of an adequate amount of safe and nutritious food, continues to be a major worldwide issue, especially in Africa and other developing countries with limited resources (Giller, 2020). In 2020, the COVID-19 pandemic worsened this problem, leading to an estimated 768 million individuals experiencing hunger (Dasgupta & Robinson, 2021; FAO, 2021). The high incidence of food insecurity, especially in Africa, where an extra 46 million individuals faced hunger between 2019 and 2020, is worrisome (FAO, 2021). Women experienced higher levels of food insecurity in comparison to males (FAO, 2021). The presence of food insecurity has a detrimental effect on health, labour productivity, and general well-being (Giller, 2020). This highlights the necessity for specific governmental initiatives to tackle these problems. It is argued that such policies

should prioritise the promotion of peace, the improvement of climate resilience, the reduction of poverty, and the increased affordability of healthy food (FAO, 2021).

On the other hand, there is a consensus that financial inclusion offers diverse services that help reduce poverty and inequality and improve food security (reduce food insecurity), and ultimately increase economic growth (Omar, 2020). In addition, there is growing consensus that the expansion of financial infrastructure into rural communities is needed as they have practical and quantifiable gains to the livelihood and socioeconomic development of the rural poor and countries at large (Kennedy, 2015). Hence, financial inclusion plays a vital role in enabling individuals access to financial services, thereby empowering small-scale businesses and farmers to make investments into their agricultural activities (Koomson et al., 2022). According to Arshad (2022), investment in agriculture has the potential to improve crop yields and income, making a direct contribution to the overall goal of ensuring food security. This particularly matters for those living in poor households in rural areas as it helps reduce poverty and inequality. Similarly, the establishment of the Maya declaration in 2011 has been an important progress that made financial inclusion a policy priority in many emerging economies (Renata, 2018)¹.

¹ The Maya Declaration is a global commitment adopted by over 80 financial regulatory institutions from developing and emerging economies, representing more than 75% of the world's unbanked population (Alliance for Financial Inclusion, 2012). The declaration aims to advance financial inclusion by expanding access to financial services, strengthening consumer protection, promoting innovative financial technologies, and using data-driven policy-making to track progress. By endorsing the declaration, financial regulators commit to implementing national-level policies that facilitate financial inclusion as a tool for poverty reduction, economic development, and social empowerment. The Maya Declaration has played a pivotal role in accelerating financial inclusion

A number of studies have highlighted factors that contribute to the prevalence of food scarcity and vulnerability around the world (Baborska et al., 2018; Koomson and Danquah, 2021; Koomson et al., 2022). For example, Koomson & Danquah (2021) argued that climate change, conflict, and political instability are the primary causes of food insecurity in Africa. In recent years, there is growing evidence on the role of financial inclusion in tackling food security, through its beneficial impact on poverty alleviation, economic stability, and the promotion of entrepreneurial activities (Koomson & Danquah, 2021; Koomson et al., 2022).

Financial inclusion refers to the process of ensuring that individuals and businesses, regardless of their income levels or social status, have access to useful and affordable financial products and services which must meet users' needs and be delivered responsibly and sustainably (Ozili, 2021). However, despite efforts made by many nations and development partners to enrol everyone into the financial sector (ensure universal access to financial services), many barriers still serve as impediments to accessing financial services at the global, regional and country level – particularly in African countries. The World Bank report (2018) stated that a comprehensive financial inclusion agenda in countries that are grappling with poverty can function as an enabler for achieving many of the Sustainable Development Goals (SDGs) including SDG 2 - which aims to end hunger, achieve food security, improve nutrition and promote sustainable agriculture by 2030.

efforts globally, particularly in Africa, where many countries have used it as a framework to develop national financial inclusion strategies (Alliance for Financial Inclusion, 2012).

Although financial inclusion has received policy attention globally, in pursuit of the World Bank's goal of attaining Universal Access to Financial Services, around one out of three of the world's adult population is still unbanked, and over half of the unbanked are from poor and rural communities who derive their livelihoods in the informal sector (Datta & Sahu, 2023). Globally, the gender gap in accessing a formal bank account was about 6 percentage points (78% for men compared with 72% for women), which is quite alarming (Mbah, 2020). According to the Global Findex Database, the gender gap in the Sub-Saharan Africa region is twice compared to developing economy average and three times that of the world average. However, access to financial services in Sub-Saharan Africa has seen significant growth in the past decade, largely driven by the adoption of mobile money accounts. Yet, there is considerable variation across different countries. For instance, account ownership ranges from as low as 6% in South Sudan to as high as 91% in Mauritius (World Bank Group, 2024). Countries like Kenya and South Africa have particularly high rates of financial inclusion, with 79% and 85% of adults owning accounts, respectively (World Bank Group, 2024). Despite these advancements, many adults in the region still rely on cash transactions, and there are disparities in access based on gender, income, education, and age (Klapper et al., 2025). Thus, promoting more equal access and usage of financial services across all demographics remains a key challenge (Klapper et al., 2025).

In Africa, financial systems generally lag behind, even though there has been a significant improvement recorded within the past decades. The improvement is driven by some international bodies, such as the Alliance for Financial Inclusion (AFI) that emerged with the primary objective to advance financial inclusion for the world's poor and provide users with

an opportunity to withstand any financial shocks (Oya 2011). Furthermore, new technologies such as mobile money has helped broaden access to financial services, including savings and payment products in many Africa countries. However, the financial systems of many African countries still remain under-developed as compared to developed and other developing economies. As of 2021, about 55% of adults in Sub-Saharan Africa have an account with a formal financial institution or a mobile money provider (World Bank Group, 2024). However, many adults still rely on informal methods for saving and borrowing. For instance, around 30% of adults in Sub-Saharan Africa save using informal methods, such as saving at home or participating in savings groups (World Bank Group, 2024). Similarly, borrowing from family, friends, or informal lenders remains common and significantly high (World Bank Group, 2024).

The link between financial inclusion and food security illustrates the capacity of financial services to mitigate food insecurity by enhancing access to resources and promoting economic resilience (FAO., 2021). Financial inclusion may contribute to food security by promoting entrepreneurship and employment, boosting household incomes, and facilitating investments in education and health (Peprah et al., 2020). These factors are crucial for strengthening productivity and well-being (Koomson et al., 2022). Furthermore, access to financial services play a crucial role in enabling households to amass assets, mitigate risks, and ensure consistent consumption, all of which are vital for sustaining food security (Koomson et al., 2022). Currently, there is limited empirical evidence on the effect of financial inclusion on food security, especially in rural Namibia where numerous constraints often hinder access to financial services. This study addresses this gap by examining the

impact of financial inclusion on food security in Namibia. The analysis is further disaggregated into rural-urban households as well as female-male headed households.

1.1.1 Trends of food security in Africa

A significant share of the 815 million individuals experiencing food insecurity are concentrated in Africa. According to FAO (2017) Africa is home to 25 percent of the population suffering from malnutrition, and the number of individuals experiencing acute food insecurity is on the rise. The State of Food Insecurity (SOFI, 2008) study reveals that 150 million children suffer from undernourishment, according to these data. According to AfDB (2013), in the year 2013, the majority of nations in Southern Africa encountered a state of moderate food insecurity. However, several areas in the region, including central and southern Mozambique, Lesotho, southern portions of Zimbabwe, and southern Malawi among others, continued to experience severe food insecurity throughout the same time frame.

According to the Food Security Information Network (2019) and FAO (2017), Africa experienced three consecutive years of severe hunger, affecting over a hundred million people, with increase prevalence between 2015 and 2016. The food security situation has deteriorated in recent years but remain more severe in some regions of Sub-Saharan Africa and other conflict-affected areas that are also experiencing the impacts of climate change (FAO, 2017). In the year 2017, a total of 124 million individuals in 51 African nations experienced severe hunger. Notwithstanding the efforts made by heads of state, the situation

of food insecurity persists and continues to deteriorate without any reduction in intensity. In 2002, the heads of state convened and made a commitment to reduce undernourishment by 50% by the year 2015 (Crush & Frayne, 2010). The increase in undernourishment from 169 million in 1990 to over 278 million (a fifth of the African population) in 2023² raises concerns regarding the effectiveness of policies committed towards reducing undernourishment. In addition, 55 million children under five are stunted due to severe malnutrition. This suggests that the strategies implemented have been either insufficient, inadequately enforced, or impeded by structural challenges such as climate change, conflict, economic downturns, and inefficient agricultural policies. The failure to reverse the trend of increasing undernourishment highlights the need for a reassessment of the determinants of food security, particularly in ensuring that financial and infrastructural resources are effectively mobilized to achieve food security goals. Furthermore, this trend underscores the necessity for data-driven policy decisions and stronger governance frameworks to track and address the challenges hindering progress toward food security in Africa.

Additionally, the prevalence of undernourishment (PoU), a measure of global hunger, has been significantly declining, according to the SOFI (2018). However, there was a setback in 2015, and since then, the situation has stayed stable at a level below 11 percent. Internationally, more than 820 million individuals are grappling with food insecurity, underscoring the formidable task of eradicating hunger by 2030. According to SOFI (2018), hunger is mostly found in the majority of sub-regions in Africa, which has the greatest PoU

² <https://www.oxfam.org/en/press-releases/over-20-million-more-people-hungry-africas-year-nutrition>

in the world, estimated at around 20 percent. The decline in Africa's position may be ascribed to challenging global economic circumstances as well as violence and adverse meteorological conditions prevalent in most nations. The lack of progress in Africa's economic development may be linked to the low pricing of commodities, particularly in the oil and minerals sectors (Katoka & Dostal, 2022). The prevalence of food insecurity has increased in nations impacted by armed conflict, drought, and inundations (Balogun & Mudau, 2023). Significant portions of southern and eastern Africa have experienced severe drought conditions persistently (Ayugi et al., 2022).

1.1.2 Financial inclusion and food security in Namibia

Namibia has the second largest financial system in Southern Africa (World Bank, 2018). The financial system is relatively well-developed compared to regional peers and is dominated by non-bank financial institutions which are pension fund and insurance companies. In the same vein, financial inclusion for individuals has increased remarkably in recent years and Namibia stands out for the high percentage of banked individuals emerging from low-income earners (World Bank, 2016). The Global Findex Database (2021) found that about 60 percent of Namibians had bank accounts, which was slightly higher than the level observed in South Africa and the East Asia Regions.

Notwithstanding, despite these improvements on financial inclusion at the household/individual level, some outstanding issues still remain. Given the large size of the country and the small population size (the low population density), there is low coverage of

bank branches/ATMs in many areas of the country particularly rural areas. Enhancing the use of more innovative delivery channels like mobile banking could enhance financial inclusion in rural Namibia. While bank branches have increased in the last couple of years, however, they are concentrated in urban areas (World Bank , 2021). Furthermore, physical access to banks is good in urban areas with 90 percent of adults needing an hour or less to get to a bank.

While financial inclusion has improved in Namibia, significant disparities remain between urban and rural populations. The proportion of financially included adults is higher in urban areas and is estimated at 82.5% of the eligible urban population compared to 72.9% of the eligible rural population (Namibia Statistics Agency, 2017; The Brief, 2024). This disparity indicates that a substantial proportion of rural inhabitants, 27.1%, remains financially excluded compared to 17.5% in urban areas (Namibia Statistics Agency, 2017).

The higher levels of financial inclusion in urban areas are primarily attributed to the widespread use of banking products and services, with 75.3% of urban residents having or using banking products (Namibia Statistics Agency, 2017). In contrast, while rural financial inclusion has shown significant growth since 2011, largely due to the increased accessibility of banking services and the introduction of relevant financial products, challenges persist. Rural banking accessibility reached 59.3%, yet remains lower than urban areas, highlighting structural barriers such as low population density, limited physical banking infrastructure, and logistical constraints (Namibia Statistics Agency, 2017). These disparities reinforce the

need for enhanced strategies to bridge the rural-urban financial inclusion gap. Expanding innovative delivery channels, such as mobile banking (the like of MTC Maris) and agent banking, is crucial in ensuring that financial services reach underserved rural communities (The Brief, 2024).

Eradicating hunger and guaranteeing food security remain a challenge for many countries around the globe, resulting in a significant number of individuals having prolonged periods of hunger and malnutrition (World Health Organization, 2021). Food security remains a pervasive issue that has garnered attention and efforts globally. Food security refers to the state of having reliable and uninterrupted access to food that is both safe and nutritious, in quantities that are adequate to meet the dietary requirements of individuals and communities (FAO, 2021). Food security can be classified into distinct tiers, namely, high, moderate and low. These tiers delineate the diverse levels of access to food. Food security is multifaceted and comprises four primary elements, namely, food availability, access, utilisation, and stability (FAO, 2021). The enhancement of food security is imperative due to its crucial significance in promoting health and productivity (Hartono, 2023).

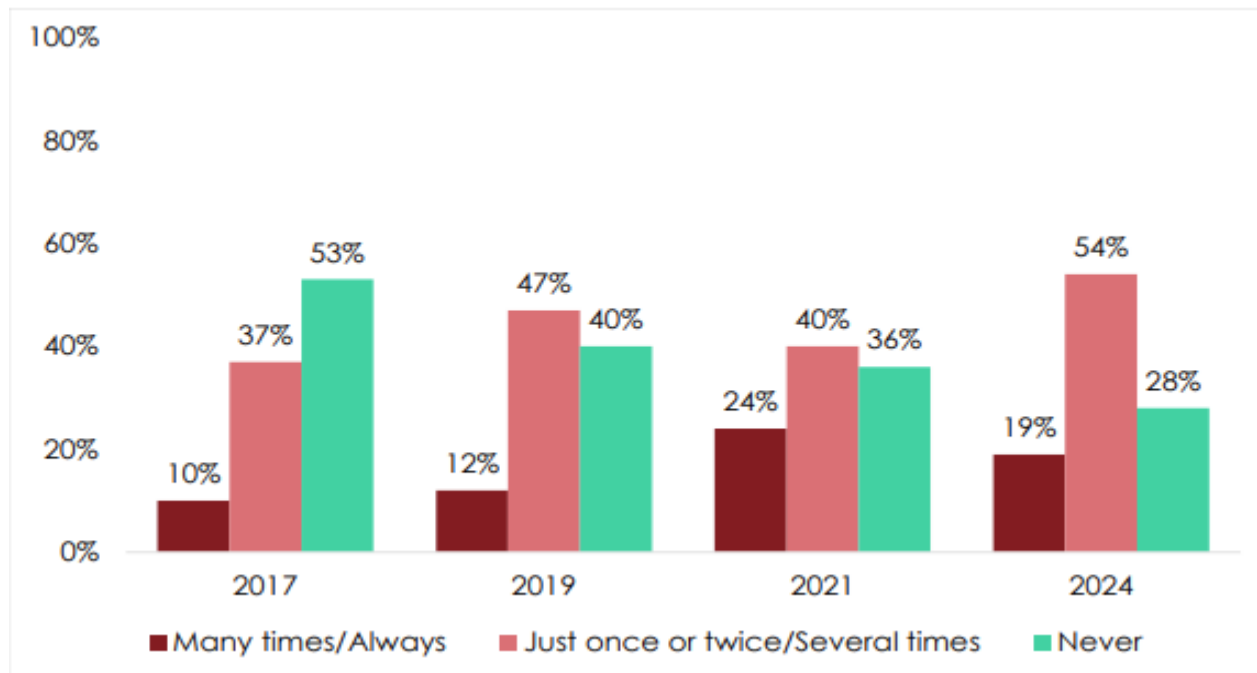
According to FAO (2021), approximately 690 million individuals (9% of the world population) experienced persistent food insecurity in 2019. Furthermore, in 2020, it was estimated that 811 million people faced hunger globally (Isaak, 2023). In Africa, 282 million people do not have access to sufficient food, as a result of food insecurity (FAO., 2021). Thus, investigating the connection between financial inclusion and food security is essential because financial services accessibility can enable people, particularly in rural areas, to invest

in agricultural production as needed, improve their standard of living, and ultimately increase their ability to secure sufficient food supplies. Despite the acknowledged potential impact of financial inclusion on all facets of development, the association with food security has received limited attention in scholarly research. Previous research has examined the impacts of various aspects of financial inclusion, including having an account, credit access, remittances, and agricultural insurance, on food security outcomes (Demirgüç-Kunt et al., 2018; Koomson et al., 2022; Arshad, 2022). However, there is still much to be learned, especially how the initiatives to advance financial inclusion will affect food security in rural regions.

Thus, the level of financial exclusion particularly in rural Namibia bears significant ramifications on poverty alleviation, economic stability, and food security. Namibia, like other African states, grapples with the issue of food security. The exacerbation of food insecurity, particularly in rural regions, has been attributed to prolonged droughts, unpredictable weather patterns, and disparities in food distribution (Young et al., 2021). Rural inhabitants frequently rely heavily on subsistence agriculture, rendering them vulnerable to instances of food scarcity and malnourishment (Integrated Food Security Phase Classification [IPC] Namibia Acute Food Insecurity Report, 2022). The link between food security and financial inclusion is apparent, as the restricted availability of financial resources might hinder the ability of rural communities to effectively respond to these concerns. An astonishing 59.3% of the rural population in Namibia experiences multidimensional poverty (World Bank, 2022). Furthermore, the issue of food security continues to be of significant concern, with over 14% of the population facing elevated levels of acute food insecurity

(IPC,2022). Food insecurity remains a pressing issue in Namibia, with recent statistics revealing a significant increase in food insecurity over the past five years. According to Afrobarometer (2024), 73% are without enough food at least once in the past year, an increase from 47% in 2017 (Figure 1). The proportion of those who always experienced food shortages increased from 10% in 2017 to 19% in 2024. Similarly, the percentage of individuals who went without food just once or several times increased from 37% in 2017 to 54% in 2024 while those who never experienced food insecurity has declined from 53% in 2017 to just 28% in 2024.

Figure 1: Namibian People who went without enough food to eat during 2017-2024



Source: Afrobarometer (2024)

This increasing trend in food insecurity shows the necessity of strengthening financial inclusion strategies, particularly in rural communities where economic vulnerabilities are

more pronounced. Expanding access to formal banking, credit facilities, and insurance mechanisms could play a pivotal role in enhancing food security by providing rural households with financial resilience against economic and environmental shocks. This study contributes to the growing literature by analysing the relationship between financial inclusion and food security in Namibia.

1.2 Statement of the Problem

A number of studies have highlighted factors that contribute to the prevalence of food scarcity and vulnerability around the world (Baborska et al., 2018; Koomson and Danquah, 2021; Koomson et al., 2022). For example, Koomson and Danquah (2021) argued that climate change, conflict, and political instability among others are the primary causes of food insecurity in Africa. In recent years, there is growing interest on the role of financial inclusion in tackling food security, through its beneficial impact on poverty alleviation, economic stability, and the promotion of entrepreneurial activities (Koomson & Danquah, 2021). However, the beneficial impact of financial inclusion on food security is not fully exploited since over 1.4 billion individuals around the globe still lack access to formal financial services (World Bank, 2024). This is particularly the case in many African countries and in rural communities where significant segments of the population are financially excluded (World Bank, 2019). For instance, only 40% of the rural population compared to 60% of the urban population in SSA have access to formal financial services (World Bank, 2023; World Bank, 2024). For better policy option, there is need to understand the relationship between financial inclusion and food security at country level.

Relative to many Sub-Saharan African countries, Namibia has made significant progress in the level of financial inclusion which is estimated at 78% (NFIS, 2017). According to the NFIS (2017) report suggests that financial inclusion is higher among eligible women (79.8%) compared to eligible men (76.1%). This is contrary to global evidence in which men have been viewed to be generally more financially included than women, suggesting that lessons can be learnt from the Namibian experience, if countries wish to address the persistent gender-based inequality in access and usage of formal financial products. The rural-urban disparity indicates that 82.5% of the urban population is financially included compared to 72.9% of the eligible rural population (NFIS, 2017).

According to the World Food Programme (WFP), COVID-19 increased the number of undernourished people worldwide from 83 million to 132 million in 2020 (WFP, 2020). In addition, Food and Agriculture Organization (2021), estimated that 47.6 million individuals within the SADC regions experienced food insecurity. In rural Namibia, a substantial proportion of the populace relies on agriculture as a source of livelihoods (FAO, 2021). Findings of the 2022 Global Hunger Index, suggest that Namibia exhibits a significant degree of hunger, occupying the 78th position among a total of 116 nations (WFP, 2022). According to the World Food Programme, (2022), 24% of children under the age of five suffer from stunting, 6% experience wasting, and 13% are underweight. The IPC Namibia Acute Food Insecurity (Integrated Food Security Phase Classification) Report (2022) found that during the last quarter of 2022, 14% of the population experienced more severe levels of food insecurity – with about 6,000 individuals classified as being in a state of emergency (IPC

Phase 4). Thus, the availability, access, utilisation, and stability of food resources in Namibia continues to be a significant concern.

Previous studies in Namibia looked at informal deserts and food insecurity (Crush et al., 2019), food insecurity and quality of life in informal settlements (Mbongo, 2017), financial inclusion and household wellbeing in Namibia (Mukong & Amadhila, 2021). However, there is not sufficient research on how financial inclusion directly affects food security in Namibia, particularly in rural Namibia where majority of the population is experiencing high levels of food insecurity. Around the globe, several studies have examined the relationship between financial inclusion and poverty reduction, unemployment, and economic growth (Ameena, 2022; Simatele & Maciko, 2022; Astuti & Hartono, 2023; Koomson et al., 2020). Some studies have investigated the relationship between financial inclusion and food security. For example, a study conducted by Baborska et al. (2018) examines the effects of access to financial services on food security across 88 low and middle incomes countries. Koomson et al. (2022), investigated the impact of financial inclusion on food insecurity in Ghana. While such evidence is growing but limited in many African countries, there is no evidence on the relationship between financial inclusion and food security in Namibia. This study contributes to the growing literature by investigating the relationship between financial inclusion and food security in Namibia. The analysis is further disaggregated into rural-urban households as well as female-male headed households.

1.3 The Objectives of the Study

The main objective of this research is to examine the relationship between financial inclusion and food security in rural Namibia. Specifically, the study aims to:

- Investigate the effect of access to financial services on food security in Namibia.
- Examine the effect of access to financial services on food security among rural-urban and male-female headed households in Namibia.

1.4 Hypothesis of the Study

H_{0a}: Access to financial services has no significant effect on food security in Namibia.

H_{1a}: Access to financial services has a significant positive effect on food security in Namibia.

H_{0b}: The effect of financial inclusion on food security does not differ significantly across rural-urban households as well as between male and female headed households Namibia.

H_{1b}: Financial inclusion has a stronger positive on food security on urban and male headed households than in rural and female headed households in Namibia.

1.5 Significance of the Study

There is growing interest on the role of financial inclusion in tackling food security, through its beneficial impact on poverty alleviation, economic stability, and the promotion of entrepreneurial activities (Koomson & Danquah, 2021). However, empirical evidence on the impact of financial inclusion and food security in the African continent is growing but limited. Thus, for better policy option to circumvent the growing levels of food insecurity in the continent, there need for an in-depth understanding into the determinants of food security.

The current study contributes to this literature by investigating the role of financial inclusion on food security in Namibia with particular focus on rural-urban households as well as male and female headed households. This study possesses considerable significance in contributing to both scholarly comprehension and pragmatic ramifications. This study is important because it guides specific policy strategies that could help rural communities move out of food insecurity and poverty through removing barriers to accessing financial services. It also assists to inform and guide public policy decisions towards achieving the Sustainable Development Goal on hunger and food security. Furthermore, the findings of the study contribute to the development of initiatives specifically tailored to enhance economic resilience, foster entrepreneurial activities, and promote income generation.

1.6 Limitations of the Study

This study could not consider all aspects of financial inclusion and food security due to limited or unavailability of information and data. For example, the study could not measure access to certain financial products such as bonds/securities, stock markets, commodities, and derivatives as they were not included in the Namibia financial Inclusion Survey used in the study. In addition, while food security is multifaceted and comprises of food availability, access, utilisation, and stability (FAO, 2021), the data only provided information on access. However, it is important to note that such limitations do not undermine the contribution of this study and it is recommended that future surveys should include such variables.

1.7 Delimitations of the Study

The study focused on households from rural areas of Namibia. Information regarding urban households are excluded from the study. The study's scope focused on how access to banking services, credit, savings, and digital financial services affects the level of food security.

1.8 Organisation of the Thesis

The thesis is structured into five chapters. Chapter 1 provides an introduction to the research issue, presenting the problem statement, objectives, importance, and scope of the study. Chapter 2 provides an extensive literature review that analyses previous studies on financial inclusion and food security. Chapter 3 provides a comprehensive explanation of the study methodology employed to examine the link between financial inclusion and food security in rural Namibia. This includes a description of the research design, data collection methods, sample procedures, and analytical tools utilised. Chapter 4 provides a comprehensive examination and discussion of the research findings, delving into a thorough analysis of the data. The primary emphasis is placed on the consequences for homes led by males and females. Chapter 5 serves as the final section of the thesis, where it provides a concise overview of the main discoveries, examines their significance for policy and practice, and offers suggestions for future research and interventions that aim to enhance financial inclusion and food security in rural Namibia.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of relevant and related literature on the relationship between financial inclusion and food security. The chapter reviewed the related literature to guide the study in line with the problem and purpose of the study - analysing the relationship between financial inclusion and food security. The theoretical and empirical evidence on the determinants of food security is reviewed in this chapter.

2.2 Theoretical Framework

2.2.1. Theory of Financial Development

The Theory of Financial Development, proposed by King and Levine (2017) posits that financial systems play a crucial role in economic development by mobilizing savings, allocating capital efficiently, facilitating risk management, and promoting economic stability. According to this theory, financial inclusion defined as access to formal financial services contributes to economic well-being and food security through multiple channels, including enabling households to invest in income-generating activities, improving risk-coping mechanisms, and fostering agricultural productivity through access to credit and insurance (Beck et al., 2007). The primary assumption of the theory is that well-functioning financial markets reduce information asymmetry and transaction costs, thereby fostering economic growth and poverty reduction (Levine, 2005). However, critics argue that financial development does not automatically translate into financial inclusion, particularly in rural

areas where structural barriers such as poor financial infrastructure, high transaction costs, and lack of financial literacy hinder access to financial services (Demirgüç-Kunt et al., 2018).

2.2.2. Vulnerable Group Theory of Financial Inclusion

The Vulnerable Group Theory of Financial Inclusion, proposed by Karlan and Morduch (2010), emphasizes that financial exclusion disproportionately affects marginalized groups such as low-income individuals, women, and rural populations, exacerbating economic vulnerability and food insecurity. The theory asserts that financial inclusion can serve as a buffer against economic shocks by enabling vulnerable groups to build savings, access credit for livelihood activities, and obtain insurance for risk mitigation (Dupas & Robinson, 2013). A fundamental assumption of the theory is that financial market imperfections, such as discrimination and informational asymmetry, limit access to financial services for vulnerable populations (Beck et al., 2009). However, critics argue that financial inclusion alone cannot eliminate structural poverty and food insecurity without complementary interventions such as social protection programs and agricultural development initiatives (Collins et al., 2009).

2.2.3. Systems Theory of Financial Inclusion

The Systems Theory of Financial Inclusion, articulated by Bateman (2014), views financial inclusion as a component of a broader economic system where various elements such as financial institutions, regulatory policies, and socioeconomic conditions interact to shape access to financial services. According to this theory, financial inclusion influences food security through systemic linkages between credit availability, investment in agricultural

productivity, and income stability (Matei, 2020). The theory assumes that financial systems function optimally when there is synergy between formal financial institutions, microfinance initiatives, and informal savings mechanisms (Cull et al., 2018). However, a notable limitation is that it assumes an idealized financial ecosystem where all actors function efficiently, overlooking market failures and the exclusionary nature of some financial policies (Bateman, 2014).

2.2.4. Community Echelon Theory of Financial Inclusion

The Community Echelon Theory of Financial Inclusion, introduced by Ledgerwood (2013), posits that financial inclusion should be structured at different community levels or echelons, ranging from the individual, household, and village to the regional and national levels. This theory argues that financial inclusion operates as a hierarchical process, where local financial access influences household economic stability, food security, and poverty alleviation. Through financial inclusion mechanisms such as microfinance, credit cooperatives, and savings groups, households can gain access to the financial resources necessary to smooth consumption, invest in agricultural activities, and mitigate food insecurity risks (Ledgerwood, 2013). A key assumption of this theory is that financial inclusion is more effective when tailored to the specific needs and structures of local communities, ensuring that marginalized groups such as rural farmers and low-income households benefit from financial services (Cull et al., 2014). However, critics argue that the localized nature of community-based financial inclusion models may lead to inefficiencies, financial instability, and limited scalability (Beck et al., 2009).

2.3 Concept of food security

Food security refers to the condition in which every individual has consistent and unrestricted access to an adequate supply of safe and nutritious food that fulfils their dietary requirements and personal food choices, enabling them to lead an active and healthy life (World Health Organization, 2022). The term encompasses four characteristics of food security: availability, access, utilisation, and the stability of both availability and access (World Health Organization, 2022). A household is considered to be food secure when it fulfils all four aspects of food security (Irtysheva et al., 2020).

Food insecurity, which is often used synonymously with food security, refers to the insufficient availability of food necessary for sustaining life (World Health Organization, 2019). Food insecurity primarily arises from the inability to fulfil any of the four aspects of food security. Food security cannot be achieved if individuals lack access to food due to its unavailability or if there are physical, social, or legal obstacles preventing them from obtaining it. The availability of food is intricately linked to poverty and economic development (FAO, 2021). Koomson and Danquah (2021) proposed that those who are economically disadvantaged often do not have the resources to get meals in the required amounts. Furthermore, Mbongo (2017) categorised food security into two levels: macro-level and micro-level. The overall level of global food production determines the accessibility of food worldwide. On the other hand, national food security is primarily indicated by national food availability, which includes factors such as the quantity of food production, food reserves, and net food imports of a country.

2.4 Concept of financial inclusion

Financial inclusion refers to the availability and use of a wide range of financial services and products, particularly by those who are marginalised or unable to access conventional banking institutions (Arshad, 2022). Furthermore, Park (2021) assert that financial inclusion refers to the capacity to access, afford, and effectively use a given set of financial services. These services may be classified into four main types: transaction and payment services, savings and investment products, credit and financing products, and risk management products.

Financial inclusion has transformed into a holistic concept that brings concrete advantages to people and countries. These benefits include reducing poverty and inequality, enhancing food security, and promoting general economic development (Omar & Koori, 2022). Financial inclusion empowers small-scale farmers by providing them with access to funding, which enables them to participate in agricultural operations. This, in turn, leads to increased crop yields and income, directly contributing to the overall goal of food security (Koomson et al., 2023; Arshad, 2022). In addition, the Maya Declaration highlights the worldwide acknowledgment of financial inclusion as a policy need, especially for marginalised groups in developing nations. Despite extensive international efforts, substantial obstacles continue to exist, notably in Africa, where a major proportion of the populace remains without access to banking services, especially in rural regions (Demirguc-Kunt et al, 2017). Gender differences exacerbate these difficulties since women are disproportionately marginalised from formal financial services across the continent (Fanta & Mutsonziwa, 2016). Although

mobile money has the potential to increase financial access, there are still significant gaps in African financial systems that highlight the need for ongoing efforts to establish inclusive financial ecosystems (Ardic, Heimann, & Mylenko, 2011).

2.4.1 Transaction and payment services

Primary transaction accounts are essential for securely depositing, withdrawing, and electronically receiving government support or salaries (World Bank, 2018). Mobile money services are a notable advancement that allows for secure and effective transmission of money within communities and access to larger marketplaces (Omar & Koori, 2022). Transaction and payment services, such as primary transaction accounts and mobile money services, play an important role in improving lives and ensuring food security, especially in rural regions (World Bank, 2018). These services enable the secure and efficient transmission of payments, allowing people to receive government subsidies, wages, or remittances without being physically present (Arshad, 2022). This is especially crucial in rural locations with little banking infrastructure. Transaction accounts contribute to financial stability by offering a dependable method for depositing and withdrawing money (Ameena, 2022). This enables households to efficiently manage their resources, plan for future needs, and participate in income-generating activities that can better their lifestyles.

Furthermore, mobile money services have greatly increased financial inclusion in underserved regions by enabling users to engage in a wider range of economic activities, such as accessing larger markets (Omar & Koori, 2022). With this access, households are able to buy food and other essential items from a wider range of competitive suppliers, which

has the potential to reduce costs and enhance food security (Koomson & Danquah, 2021). Moreover, mobile money platforms can assist in reducing the consequences of financial shocks, such as crop failures or medical crises, by enabling swift access to funds (Giller, 2020). This, in turn, prevents food insecurity and enhances overall resilience in livelihoods.

2.4.2 Savings and investment products

Savings products are essential for strategically managing future food requirements and reducing the impact of seasonal variations. These include official banking accounts, micro-savings accounts provided by microfinance organisations, and informal savings collectives within communities (Arshad, 2022). Savings and investment goods have a substantial impact on people's livelihoods and overall well-being, especially when it comes to ensuring food security (Ameena , 2022). These products can help reduce the negative effects of unforeseen events, such as crop failures or sudden medical costs, which frequently jeopardize food security by equipping people and households with good financial management skills (Mishra & Rampal, 2020). Savings accounts can serve as a financial buffer during times of financial hardship, enabling individuals to buy food without resorting to detrimental coping strategies such as lowering meal portions or pulling children out of school (World Health Organization, 2019).

Furthermore, investment items offer consumers the opportunity to generate additional funds, which they can use to purchase food, enhance their nutrition, and enhance their overall well-being (Arshad, 2022). Moreover, the availability of savings and investment options might enable individuals, especially women, to engage more extensively in the economy (Arshad,

2022). These items can assist in amassing assets and generating income, thus aiding in breaking the cycle of poverty and enhancing long-term food security (Ameena , 2022). In addition, the inclusion of financial services might enable individuals to easily get other vital services, such as healthcare and education, which indirectly enhance food security and overall welfare.

2.4.3 Credit and Risk management products

Microcredit has significantly transformed the availability of modest loans for agricultural purposes, including the acquisition of seeds, fertilisers, and animal purchases (Koomson et al., 2023). These loans greatly improve agricultural output and revenue, directly affecting food security. Access to credit can enable individuals and households to invest in productive assets, such as agricultural inputs or small businesses, thereby increasing income and reducing vulnerability to shocks (Balogun & Mudau, 2023). This can lead to improved food security by enhancing agricultural productivity, facilitating diversification of income sources, and providing a safety net during times of crisis (Koomson et al., 2023). Additionally, credit can support education, healthcare, and housing, which contribute to overall well-being and resilience (Ameena , 2022). However, it is essential to ensure that credit is accessible, affordable, and sustainable to maximise its positive impact on livelihoods. Micro-insurance products provide essential coverage against agricultural failures caused by weather conditions, diseases affecting animals, and other unexpected occurrences that have the potential to interrupt the food supply chain (Ribeiro, 2021). They protect the capacity of families to get healthy meals, hence guaranteeing food security.

2.5 Empirical Evidence

This section of the study reviewed empirical literature on the relationship between financial inclusion and food security both globally and in the context of Namibia. It also examines the relationship between financial inclusion and food security in male and female headed households both globally and in the context of Namibia.

2.5.1 The effect of financial inclusion on food security

Several studies have been conducted linking financial inclusion and food security. Recently, a study by Balana and Olanrewaju (2024) examined the effects of financial inclusion on adoption and intensity of use of agricultural inputs and household welfare indicators using data from the nationally representative Nigerian LSMS wave-3 (2015/2016) survey. For this, the authors constructed a financial inclusion index from four formal financial services access indicators (bank account, access to credit, insurance coverage, and digital transaction) using multiple correspondence analysis (MCA). They used Cragg's two-step hurdle, instrumental variables for binary response variables, and a Generalized Method of Moments (GMM) models in the econometric analysis. Results show that households with access to formal financial services are more likely to adopt agricultural inputs and to apply these more intensively. These same households are less likely to experience severe food insecurity and are more likely to consume diverse food items. The study found that these effects are less for female farmers regardless of formal financial inclusion, suggesting that they may bear more non-financial constraints than their male counterparts. The results suggest a need for targeted

interventions to increase access to formal financial services of farm households and gender-responsive interventions to address the differential constraints women farmers face.

Similarly, Tan et al. (2024) empirically examined the impact of digital inclusive finance on multi-dimensional food security based on panel data from 30 provinces in China from 2011–2020. The research found that China’s multi-dimensional food security level from 2011–2020 showed a stable yet rising trend, with the spatial pattern of each location generally consistent with the overall trend. The Theil index for China’s multi-dimensional food security showed an upward trend from 2011–2020. Digital inclusive finance can promote multi-dimensional food security. The breadth of coverage and depth of use of digital inclusive finance have a significant promoting effect on safeguarding multi-dimensional food security, while the degree of digitization has not played a promoting role. Digital inclusive finance mainly ensures multi-dimensional food security through two pathways: promoting urbanization levels and enhancing marketization levels. Furthermore, Tsongo et al. (2024) assessed the impact of financial inclusion on food security and also examines the moderating impact of educational development in this relationship. The study adopts kilocalories per capita and the prevalence of undernourishment as indicators of food insecurity while financial inclusion is proxied by the number of bank accounts, bank branches, ATM users, total bank deposits and liquid liabilities. After adopting the GMM strategy to control for potential endogeneity in a panel of 38 African countries between 2000 and 2021, the findings indicate that financial inclusion has a significant positive effect on kilocalories per capita in Africa. After conducting a sensitivity analysis employing the prevalence of undernourishment as an indicator of food security, the result remains consistent, indicating

that financial inclusion enhances food security in Africa. The findings further reveal that educational development plays a positive role in modulating the effects of financial inclusion on food security, as indicated by the positive synergistic effects of education enrolments. The results suggest that to raise per capita calorie intake and lower the incidence of undernourishment, banking services should be promoted through educational development.

Meanwhile, Yasmin and Setia (2023)'s study investigated the global impact of financial inclusion on food security, with a focus on both developing and developed countries. The study constructs a financial inclusion index using the Sarma method and secondary data sourced from IMF and World Bank databases. System GMM is employed as the estimation method due to its effectiveness in addressing endogeneity issues and its efficient and consistent use of instruments. The analysis reveals that financial inclusion has a positive and statistically significant effect on food security across all research sub-samples. In addition, the study incorporates interaction variables between financial inclusion and the COVID-19 pandemic to explore how the crisis alters the relationship between financial inclusion and food security. The findings indicate that the COVID-19 crisis has globally diminished food security and moderates the impact of financial inclusion on food security. Overall, the study confirms that financial inclusion is a crucial factor in enhancing food security worldwide, with no substantial disparity between developed and developing countries. Nevertheless, the global COVID-19 pandemic has demonstrated a capacity to weaken the beneficial effects of financial inclusion on food security.

Arshad (2022) examined the impact of financial inclusion and food security in developing countries, using panel data for the time 2004-2019. The study used secondary data obtained from various websites including WDI, FAO, UNICEF and UNESCO. The study used the two-stage least-squared, and system generalized method of moments estimation techniques to analyse the data. It was found in the study that there is a positive relationship between financial inclusion and food security. The findings showed that, if there is more financial inclusion in a country, it will help poor people cope with difficult situations they face and protect them from food insecurity. The analysis also showed that financial development, per capita income, agriculture growth, and education positively affect food security.

Annim and Frempong's (2018) examined the effects of access to credit and income on dietary diversity in Ghana, where they found a positive relationship between financial inclusion and food security. The study was carried out using two rounds of the Ghana Living Standards Survey (GLSS). Their survey collected information on incomes and expenditures of households. It also contained information on food expenditures for a six-day period with GLSS 4 and a ten-day period for GLSS 5. The GLSS is a Ghanaians nationwide survey conducted by the Ghana Statistical Service to provide the government with information on the socio-economic circumstances of Ghanaians. After merging various sections of the datasets, final sample of 5779 and 8312 households for GLSS 4 and GLSS 5 was obtained respectively. In addition, the study applied an instrumental variable estimation technique to address the endogeneity between household nutritional status and credit. Results from both

surveys showed that access to credit contributes to the consumption of a diversified diet in Ghana. Hence, it was found that household access to credit increases food diversity.

Another study conducted by Baborska *et al.* (2020) looked at the impact of financial inclusion on rural food security from low -and middle-income countries. The study analysed the impact using single, combinations and the range of three different formal financial services – savings, credit, and payments across 88 low-and middle-income countries. The study took advantage of the Global Findex database and Food Insecurity Experience Scale (FIES) – both included in the 2014-round of Gallup World Poll that collected data at individual-level and comparable worldwide. Different non-experimental impact evaluation methods such as entropy balancing, propensity scores matching and fully interacting linear matching were employed to ensure the consistency of the results. It was found that, only saving services, whether they are used alone or combined with credit and payment reduce the individual’s probability of experiencing food insecurity in rural areas of low-and middle-income countries. The study further found that, when savings are absent, use of payment services has no effect on food insecurity and taking a loan increase significantly the individual’s probability of experiencing food insecurity. Such results suggest that financial services can have different impacts on food security in rural areas of low-and middle-income countries, depending on the type of service being used. Thus, individual country specific evidence is required for better public policy on food insecurity.

On the other hand, Namayengo *et al.* (2018) found a negative correlation between financial inclusion and food security in rural Uganda. The study investigated the effect of participation into a microcredit program on household food security parameters of female borrowers in a rural setting in Uganda. The study conducted a cross-sectional analysis comparing old clients to newly registered first-time borrowers using panel design. The study found that long-time borrowers have lower dietary diversity compared to new borrowers, and new borrowers experience larger reductions in dietary diversity after one year. The reduction in dietary diversity is attributed to a decrease in animal-source food, fruit, and sugar intake. Additionally, the study highlighted the importance of smallholders in providing food in Sub-Saharan Africa, with women playing a significant role. The study also discussed the challenges of selecting comparison groups for microfinance programs and present findings from a panel analysis. Overall, the study suggested that participating in the microcredit program may negatively impact the food security of households in rural Uganda. It indicated that, women typically devote a higher share of their income than men to everyday subsistence and nutrition. Data for this research was obtained from The Uganda Food Consumption Survey.

In a study done by Baborska *et al.* (2018), it was shown that individuals experiencing food insecurity tend to rely heavily on credit as a means of coping. The utilisation of savings accounts experiences a notable decline; however, the utilisation of payment services does not have an impact on an individual's likelihood of encountering food insecurity. Financial inclusion has the potential to impact food security at both the micro- and macro-levels. On a macro scale, there is proof that the advancement of the financial sector offers a broader variety of services with more depth. This advancement may help reduce poverty and

inequality as well as stimulate economic growth, ultimately improving food security (Levine, 2012; Sarma & Pais, 2011). Financial services such as credit, payments, insurance, and savings assist families in making more informed investment choices, which in turn helps them enhance food security by generating income from those investments (Dercon & Krishnan, 2005; Beaman *et al.*, 2014). Hence, existing evidence demonstrates that having enough access to financial inclusion services may assist families in managing the risks linked to consumption (Dupas & Robinson, 2013; Jack & Suri, 2014), and it also enhances food security in households receiving assistance (Dupas *et al.*, 2018). In their study, Steinert *et al.* (2018) performed a comprehensive analysis in Sub-Saharan Africa and discovered that the use of financial inclusion services may lead to a significant improvement in family welfare and food security. Dupas *et al.* (2018) had comparable findings. Multiple studies have also shown that financial inclusion has an impact on results at both the business and home levels (Adu, 2013; Owen & Pereira, 2018). Allen *et al.* (2014) argue that financial inclusion enables people to effectively manage situations of food insecurity.

Zeller *et al.* (2021) conducted a study that found that the primary barrier preventing households from accessing financial services such as credit and savings is the presence of transaction expenses. Transaction costs include all charges incurred during the exchange of products or services, except the actual price of the asset or service. Transaction costs arise from the need to look for information and enter or quit the market for borrowers, savers, and financial intermediaries. Research has shown that having access to financial services, such as savings accounts, may contribute to economic growth by promoting consumer stability, aiding the accumulation of wealth, and supporting investments in health and education. This,

in turn, leads to improved food security (Owen & Pereira, 2018). Utilising any official financial service will be advantageous for the person. In their study, Baborska *et al.* (2018) found that conserving money contributes to achieving food security; however, using credit hinders the food security situation. Additionally, they observed that making payments does not have a major impact on people's food security.

Food insecurity in developing nations mostly stems from poverty, which hinders people's ability to get food (Gyasi, Phillips, & Adam, 2021). The primary factors contributing to food insecurity in Africa include high price levels (Bureau & Swinnen, 2017), inflexible trade liberalisation (SOFI, 2019), declining commodity exports (FAO, 2017), conflicts and political instability (FAO, 2017), climate variability (SOFI, 2019), as well as poverty and inequality (Manyame, 2002). These issues contribute to an insufficient domestic food supply for both families and individuals.

2.5.2 Financial inclusion and food security by gender of household head

Koomson *et al.* (2022) conducted research on financial inclusion and food insecurity, whereby the study examined the link between financial inclusion and food security in Ghana. The study further highlighted that financial inclusion had greater effect in male headed households in rural areas, however, it is not significantly associated with food insecurity in urban areas and in female-headed households. The research used the ordinary least squared method to estimate the link between financial inclusion and food insecurity. Furthermore, it extracted data from round seven of the Ghana Living Standards Survey to conduct its

research. The findings of this research showed a positive relationship between financial inclusion and food security as the findings showed that financial inclusion has the potential to decrease food insecurity as financially included households are less likely to be food insecure in Ghana.

Research examining the association between gender and food security in urban environments has been conducted, and inequalities have been found. Olumba *et al.* (2023) emphasised the disparity in economic resources and opportunities between families led by females (FHHs) and households led by males (MHHs) in cultures that follow a patriarchal system. This disparity results in gender-based differences in food security. Utilising data from the 2018–2019 Nigeria Living Standards Survey, the research used a nonlinear Blinder-Oaxaca decomposition model to examine food spending data and classify families as either food secure or food insecure. The results showed considerable disparities in food security between FHHs and MHHs, with variations in the use of family resources and assets accounting for 56% of the gender-based food security discrepancies found. These results emphasise the significance of policies that advocate for equal access to economic resources in order to improve food security for both males and females in metropolitan areas.

Furthermore, Ashagidigbi *et al.* (2022) conducted research using data from the 2018–2019 Living Standard Measurement Survey to examine the link between gender, empowerment, and the food security status of households in Nigeria. The research used analytical methods like the empowerment index, dietary variety score, Tobit, and ordered probit regression

models to examine the extent of empowerment. The findings revealed that there are minimal levels of empowerment in the country, especially among women. The findings revealed that being female, living in a rural area, and residing in the North West region were correlated with elevated levels of food insecurity and inequality. This study highlights the significance of developing policies that promote empowerment and address issues related to access and control of resources, with a specific focus on women and residents in rural and North-West regions. These policies are crucial for achieving Sustainable Development Goals related to eliminating hunger and promoting gender equality. Another study by Ozioko *et al.* (2020) looked into the livelihood activities, food security situation, restrictions, and coping mechanisms of 72 female-led families. The findings revealed that the main sources of income were centred on cultivating crops and trading palm products. The research revealed that families encountered different levels of food insecurity, with poverty being highlighted as a significant contributing factor. The study's recommendations included initiatives by the government and development organizations to support capacity-building and give women-led families' productive resources in order to increase food security. In light of this, the author is only aware of a small number of studies that examine the connection between financial inclusion and food security in Namibia. Previous studies in Namibia looked at informal deserts and food insecurity (Crush, Nickanor & Kazambe 2019), food insecurity and quality of life in informal settlements (Mbongo, 2017). In addition, Mukong and Amadhila's (2021) examined financial inclusion, but they zeroed in on how it affected household wellbeing. This study seeks to contribute to the literature by examining the relationship between financial inclusion on food security in rural Namibia.

2.6 Chapter Summary

Generally, evidence from the empirical literature review showed that financial inclusion has a significant and positive relationship with food security, suggesting that an increase in the level of financial inclusion increases the level of food security or reduces the level of food insecurity. However, a few studies showed that some indicators of financial inclusion such as credit has a negative impact on food security. Thus, evidence from the review suggest that financial services can have different impacts on food security in rural areas of low-and middle-income countries, depending on the type of financial inclusion indicator being used. It is for this reason that individual country specific evidence is essential or required for better public policy on food insecurity. The current study contributes to this literature by investigating the effect of financial inclusion on food security in rural Namibia, a country with one of the highest inequality in the world and where such evidence is missing.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter looks at the research methodology the study incorporated in order to address the study's research objectives. This chapter examines the study's research philosophy, research approach, and research design. The chapter goes further to look into the data types and sources used in the study. It also looks at the data analysis procedures used to answer the three (3) specific objectives of the study (to investigate the effect of access and usage of financial services on food security in Namibia and to examine the effect of access and usage of financial services on food security in male and female-headed households and in rural-urban Namibia).

3.2 Data Type and Sources

The study used secondary data from the Namibian Financial Inclusion Survey (NFIS) of 2017. The 2017 NFIS is the latest national dataset known to date to provide detailed information on financial literacy and use of financial services in Namibia. This is a national representative survey data set collected by the Namibian Statistics Agency (NSA) and funded by the Bank of Namibia and the World Bank Group. The survey is designed to provide information on individual and household characteristics including access to food, financial knowledge, access and use of financial services.

The survey considered individuals aged 16 years and older. This is the legal age that allows individuals to own formal financial products in Namibia. A three-stage stratified sampling

procedure was used in the data collection process. In the first stage, individuals were classified according to the Constituency of residence, in the second stage households were selected from each constituency and in the third stage eligible individuals that have resided in the selected household for at least 6 months' prior the survey were selected. The survey used the Constituency enumeration areas (EAs) created during the 2011 Population and Housing Census. Data was collected from 151 constituencies selected from all the 14 regions of Namibia. A sample of 2,114 households was drawn from these constituencies. Power allocation procedures were adopted to distribute the samples across the regions so that the smaller regions get adequate samples. The survey collected information on the measures of financial literacy, adoption and use of financial products, individual and household socioeconomic and demographic characteristics.

3.3 Data analysis and model specification

To re-iterate, the term food security encompasses four characteristics namely; availability, access, utilisation, and the stability of both availability and access (World Health Organization, 2022). However, it is important to note that this focuses on access to food as a measure of food security. Food security is the dependent variable for this study. To elicit respondents' food security levels, respondents were asked, "*How often have you or your household had to skip a meal because you didn't have enough money to buy food?*" The respondents were required to choose from the following options that best describe their situation: *always, often, sometimes and never*. Thus, the level of food security for each of these cases was merged into four tiers defined as very low (*always*) low (*often*), high (*sometimes*) and very high (*never*).

Thus, the dependent variable (food security) is categorical and ordinal with clear ordering. Several scholars have argued that the ordered logit and/or ordered probit models are appropriate statistical models that can be used to explain such an ordinal variations (Cameron & Trivedi, 2005; Loke, 2016). The ordered probit model was chosen for its appropriateness in dealing with an ordinal dependent variable, where the categories possess an inherent order but the intervals between them may not be uniform (Loke, 2016). Food security is assessed using a four-tier scale, which includes the categories of *very low*, *low*, *high* and *very high*. The ordered probit model posits the existence of a latent variable (food security) that follows a continuous distribution and is then associated with the observed ordinal categories. The ordered logit or probit models are suitable because they can accurately calculate the likelihood that a certain individual belongs to one of the four food security groups, taking into account the impact of financial inclusion indicators and other relevant factors (Loke, 2016).

Food security was therefore coded as 0, 1, 2 and 3 which indicates very low, low, high and very high level of food security. Consider Y to be the ordered dependent variable, then the underlying response variable Y_i^* is defined as a function of financial inclusion and a vector of other explanatory variables I_i as follows:

$$Y_i^* = \beta_0 + \sum \beta_k F_k + \sum \beta_i I_i + \varepsilon_i \quad (1)$$

Where Y^* is the latent variable measuring the level of food security coded as 0, 1, 2, 3; F_k is a vector of financial inclusion indicators (savings, credit and bank account ownership); I_i is

a vector of individual and household characteristics. The observed and the coded discrete levels of food security y , is derived as follows:

The probability that individual i belongs alternative j is:

$$y = 0 \text{ (very low), if } y^* < \alpha_1 \quad (2)$$

$$y = 1 \text{ ((low)), if } \alpha_1 < y^* < \alpha_2 \quad (3)$$

$$y = 2 \text{ (high), if } \alpha_2 < y^* < \alpha_3 \quad (4)$$

$$y = 3 \text{ (very high), if } y^* > \alpha_3 \quad (5)$$

Where α_1 , α_2 and α_3 are unknown threshold variables and can be estimated by the maximum likelihood ordered probit model. The probability that individual i belongs alternative j is:

$$p_{ij} = p(y_i = j) = p(\alpha_{j-1} < y^* \leq \alpha_j) = F(\alpha_j - X_i\beta) - F(\alpha_{j-1} - X_i\beta) \quad (6)$$

The marginal effects for the independent variables are obtained from the maximum likelihood estimates by differentiating equation 6 for the respective probabilities. The marginal effect of a change in a regressor on the probability of selecting alternative j is:

$$\frac{dp_{ij}}{dx_i} = \{F'(\alpha_j - X_i\beta) - F'(\alpha_{j-1} - X_i\beta)\}\beta \quad (7)$$

3.4 Measurement of Variables

3.4.1 Financial Inclusion

The focus of this study is to investigate the effects of financial inclusion on food security. The study employed several measures of financial services. This includes the decision to savings, own a bank account and access to credit. The saving decision is binary and equivalent to one if individual saved when they could and zero otherwise. Regarding bank account ownership and access to credit, they are all dummy variables recorded as one if an individual had each of them at the time of the survey (see Table 3.1). These are the measures of financial inclusion commonly used in the literature (Dupas and Robinson, 2013; Karlan *et al.*, 2014; Klapper and Singer, 2014; Murendo and Mutsonziwa, 2017; Koomson & Danquah, 2021; Koomson *et al.*, 2022). Other control variables used in the study are described in Table 3.1.

Table 3.1: Measurement of variables

Dependent Variable	
Variables	Description
Food Security	0 = very Low (Always skip meals) 1 = Low (Often skip meals) 2 = High (Sometimes skip meals) 3 = High (Never skip meals)
Independent variables	
Savings account	0: if household has no savings and 1: if informal savings and 2: if formal savings
Access to credit	1: if household has access to credit, 0: if no access to credit
Bank account ownership	1: if household owns a bank account and 0: if no bank account.
Insurance	1: if household has access to insurance services and 0: if no access to insurance services

Gender of household head	1: if female and 0: if male
Marital status	1: if married and 0: if not married
Education of household head	0: if no education, 1: if completed primary, 2: if completed secondary and 3: if completed tertiary
Age	Age of household head in years
Household Size	Number of household members
Monthly income	Household per capita monthly income

Source: Author computations (2024)

3.5 Research Ethics

The study used the Namibia 2017 Financial Inclusion Survey data. The Namibian Statistics Agency was tasked with implementing this survey and the research study relied on their ethical clearance. Furthermore, ethical clearance certificate was obtained from the University of Namibia Decentralised Ethics Committee (See appendix A). The data used in the study was treated with confidentiality and was not distorted, fabricated, or falsified.

3.6 Chapter Summary

Chapter 3 explored the research methodology used to investigate the link between financial inclusion and food security in Namibia. The study opted for a cross-sectional research design, which involves data from a representative sample to examine relationships between variables without manipulating the study environment. The data for the study were obtained from the Namibia Financial Inclusion Survey (NFIS) 2017, which is a household survey that represents the entire nation. The survey utilised a method called three-stage stratified sampling to select participants. A total of 1,862 individuals who were 16 years old or older

were successfully interviewed. The data analysis process consisted of classifying food security levels and utilising ordered probit models to elucidate the ordinal variations in food security, considering financial inclusion indicators and other household characteristics. The study placed great importance on ethical considerations, relying on the ethical clearance obtained by the Namibian Statistics Agency for the NFIS 2017 data. The study was conducted with strict adherence to confidentiality and integrity, ensuring the responsible handling of data.

CHAPTER FOUR: PRESENTATION OF RESULTS AND DISCUSSIONS

4.1. Introduction

The study looked at the relationship between financial inclusion and food security. This chapter addressed the objectives of the study: investigating the effect of access and usage of financial services on food security in Namibia with particular focus on the rural-urban households as well as female and male headed households. The study employed an ordered probit regression model, a statistical methodology well-suited for examining the influence of financial inclusion factors (such as savings, access to credit, bank account ownership, and being insured) on the ordered categories of food security (*very low, low, high and very high*) observed in Namibia. Furthermore, the results shown in this chapter are outputs of STATA Version 15 software and are presented in tables. Moreover, the chapter discusses the findings.

4.2. Results and Discussions

4.2.1. Descriptive Statistics

The descriptive statistics in Table 4.1. highlight key differences in financial inclusion, demographic characteristics, and food security in the entire sample and between rural, and urban households, offering key insights into the study's objectives. Financial inclusion variables reveal significant disparities, with urban households consistently showing higher access to credit of 18%, insurance 43%, and formal savings 73% of urban population compared to 5%, 18%, and 53% of rural households respectively. These findings indicate that urban households have better access to financial services, which may provide them with

more opportunities to mitigate economic shocks and improve food security. Rural households, on the other hand, rely more on informal saving mechanisms 29% compared to 10% for urban households, which reflects their limited access to formal financial institutions. The higher standard deviations for financial inclusion in urban samples suggest greater variability in access, pointing to inequalities within urban areas.

Table 4.1: Descriptive Statistics

Variable	Entire sample		Rural sample		Urban sample	
	Mean	Std.	Mean	Std.	Mean	Std.
Access to credit	0.111	0.314	0.047	0.211	0.184	0.388
Access to insurance	0.299	0.458	0.183	0.387	0.429	0.495
Have a bank account	0.700	0.458	0.607	0.489	0.806	0.396
Savings						
Informal saving	0.203	0.403	0.294	0.456	0.102	0.302
Formal saving	0.624	0.485	0.530	0.499	0.729	0.444
Age of household head	38.757	16.339	41.443	18.276	35.731	13.205
Urban residence	0.470	0.499				
Household head is male	0.432	0.496	0.431	0.495	0.434	0.496
Education of household head						
Primary education	0.253	0.435	0.360	0.480	0.132	0.339
Second education	0.540	0.499	0.461	0.499	0.629	0.483
Tertiary education	0.096	0.295	0.038	0.191	0.162	0.369
Food Security (skip a meal)						
Always	0.033	0.179	0.021	0.144	0.047	0.211
Often	0.087	0.283	0.098	0.298	0.075	0.264
Sometimes	0.437	0.496	0.453	0.498	0.419	0.494
Never	0.442	0.497	0.428	0.495	0.459	0.499
Household is married	0.331	0.471	0.356	0.479	0.303	0.460
Household income	6,486	50,410	1,883	3,924	11,725	73,269
Household size	4.147	3.014	4.316	3.110	3.957	2.890

Food security outcomes, measured by the frequency of skipping meals, show varied differences between rural and urban households. While the majority of households in both areas report “sometimes” or “never” skipping meals for not having enough money to buy food, urban households exhibit a higher percentage of those who reported “never” skipping a meal (46%) compared to their rural counterparts of 43%. Rural households exhibit a slightly higher proportion of those who reported that household members “often” skip meals because of no enough money (10%) compared to urban households with 8%. Interestingly, more households (4%) report always skipping a meal in urban household compared to 2% of rural households. Considering never skipping a meal an indicator of food security suggests that urban households are more food secured. At the same time, urban households have the highest percentage of food insecure households when “always” skipping meals is considered an indicator of food insecurity. Overall, there is greater vulnerability to food insecurity in rural areas and the current study wants to tease out whether this could partly be attributed their lower financial inclusion among other factors. Urban households, with better financial access are better positioned to ensure consistent food availability.

Higher mean of age of the household is observed in rural households (41 years) compared to urban households (36 years). This suggests that in terms of age of household heads, rural households may have an older population compared to their urban counterparts. The standard deviation for rural areas is also higher, implying greater age diversity, which could impact household economic behaviour and food security outcomes. Education levels show a marked

rural-urban gap, with urban households having higher proportions of those with secondary (63%) and tertiary education (16%) compared to rural households with 46% and 4%, respectively. This disparity suggests that urban residents may be better positioned to leverage financial inclusion opportunities, as education is often linked to financial literacy and access. The higher concentration of primary education in rural areas (36%) indicates structural challenges that may hinder rural households' participation in formal financial systems and/or making important decisions towards reducing food insecurity.

There is also an urban-rural divide regarding household income and household size. Urban households report significantly higher mean monthly incomes of N\$11,725 compared to rural households with N\$1,883, with a much higher standard deviation in urban areas, indicating substantial income inequality. The larger household sizes in rural areas (4.316 people per household) suggest a greater dependency burden, which may exacerbate food insecurity, particularly given their limited financial services and other opportunities. The descriptive statistics reveal rural-urban disparities in financial inclusion, income, education, and food security, which emphasizes the importance of targeted policies to address these inequities. While improving access to formal financial services and enhancing financial literacy through education could mitigate food insecurity and foster economic resilience, this could be of particular importance in rural communities. This study therefore tests these relationships statistically using the student-t test. These insights provide a foundation for analyzing the broader relationship between financial inclusion and food security in communities and among male- and female-headed households.

4.2.2. T-Test for differences in mean food security by the associated characteristics.

The t-test for differences in mean food security by household and individual characteristics are presented in Table 4.2. The t-test results for the “always” skipping meals category reveal significant differences for several financial inclusion variables and demographic factors (Table 4.2.). The significant negative differences between those with access to credit, insurance, having a bank account, and savings and those without suggest that household that are financially excluded are food insecure. That is, individuals who lack access to financial services are more likely to be food insecure. The significant positive difference for urban resident indicates that even urban residents may face challenges in achieving food security than their rural counterparts when “always” skipping a meal is considered. That is, those with extreme food insecurity are more prevalent in urban than rural communities. Tertiary education also shows a significant negative difference, implying that less educated individuals are more likely to experience extreme food insecurity. These findings highlight the critical role of financial inclusion and education in mitigating the risk of severe food insecurity.

Table 4.2: T-Tests for differences in mean food security by household and individuals characteristics.

Variable	Always			Often			Sometimes			Never		
	Yes	No	Difference	Yes	No	Difference	Yes	No	Difference	Yes	No	Difference
Access to credit	0.014	0.036	-0.021*	0.024	0.095	-0.071***	0.261	0.459	-0.198***	0.070	0.410	0.290***
Access to insurance	0.005	0.045	-0.040***	0.059	0.100	-0.040***	0.325	0.485	-0.160***	0.610	0.371	0.240***
Have a bank account	0.024	0.056	-0.032***	0.070	0.130	-0.059***	0.409	0.502	-0.093***	0.497	0.314	0.184***
Have saving	0.027	0.065	-0.039***	0.073	0.155	-0.082***	0.425	0.494	-0.069**	0.475	0.286	0.189***
Urban residence	0.047	0.021	0.026***	0.075	0.098	-0.023**	0.419	0.453	-0.034*	0.459	0.428	0.031*
Individual is male	0.032	0.034	-0.002	0.075	0.097	-0.023**	0.424	0.447	-0.023	0.470	0.422	0.048**
Education												
No formal education	0.034	0.032	0.002	0.172	0.075	0.096***	0.480	0.433	0.047	0.314	0.459	-0.145***
Primary education	0.045	0.028	-0.017**	0.131	0.071	0.060***	0.512	0.414	0.098***	0.313	0.487	-0.174***
Secondary education	0.031	0.034	0.003	0.059	0.118	-0.059***	0.447	0.429	0.018	0.463	0.419	0.044**
Tertiary education	0.006	0.035	-0.030**	0.022	0.093	-0.070***	0.152	0.469	-0.317***	0.820	0.403	0.418***
Individual is married	0.032	0.034	0.001	0.081	0.091	-0.009	0.443	0.434	0.009	0.443	0.442	0.001

*** p<0.01, ** p<0.05, * p<0.1

In the “Often” skip meals category, there is a significant and persistence differences for most financial inclusion variables. There are negative and significant differences of “often skipping meals” among those with access to credit, access to insurance, having a bank account, and savings. This suggests that individuals without access to these services are more likely to frequently or often skip a meal. Urban residence shows a small but significant negative difference, indicating that rural residents are more affected in this category. Interestingly, primary and tertiary education levels both show positive differences, suggesting that individuals with these education levels are less likely to fall into this food security category. These findings reinforce the importance of financial inclusion in reducing food insecurity, as well as the protective role of education in buffering against frequent meal skipping.

For the “Sometimes” skip meals category, the results show that those who are financially included such as having access to credit, access to insurance, having a bank account, and savings continue to be more food secure compared to their counterparts without access to these services. This indicates that individuals with access to these financial services are less likely to report food insecurity occasionally. Urban residence has a marginally negative difference, suggesting that rural households are slightly more affected by intermittent food insecurity. Interestingly, primary education and tertiary education show contrasting patterns, with tertiary education providing a stronger protective effect against food insecurity. These findings suggest that while financial inclusion remains vital, educational attainment plays a significant role in mitigating occasional food insecurity, particularly in rural areas.

Concerning the “Never” skip meals category, financial inclusion indicators show positive and significant differences. That is, access to credit, access to insurance, having a bank account, and savings are all positively associated with this food security outcome. These findings highlight that individuals with access to financial services are more likely to report consistent food security. Urban residence and tertiary education also show positive and significant differences, indicating that urban residents and individuals with higher education levels are more likely to enjoy consistent food security. Conversely, primary education and no formal education show negative differences, revealing the importance of higher educational attainment in achieving food security.

By implication, the T-test results provide compelling evidence that access to financial services significantly reduces the likelihood of falling into lower food security categories and increases the probability of achieving consistent food security. Access to credit, insurance, bank accounts, and savings mechanisms emerges as critical factors in mitigating food insecurity. Urban residence and higher educational attainment further contribute to positive food security outcomes, while the absence of financial services and lower education levels exacerbate food insecurity. These findings show the necessity of expanding financial services and education access, particularly in rural areas, to combat food insecurity effectively.

4.2.3. Effect of Financial Inclusion on Food Security in Namibia

The results from Table 4.3 indicate that financial inclusion indicators have a positive and significant effect on food security across all samples. The positive coefficients for the entire sample, urban sample, and rural sample imply that individuals who are financially included with are more likely to move to higher food security categories (see Table A1 and A2 of the appendix). The threshold/intercept parameters are significantly different from each other, suggesting that the four (4) categories of food security should not be combined – supporting the appropriateness of the ordered models. The marginal effects corroborate this finding. For example, in the entire sample, having a bank account decreases the likelihood of being in the “always” skip meals category by 1% but increases the likelihood of being in the “Never” skip meals category by 10%. Similar trends are observed for the urban and rural samples, with slightly higher effects in urban areas. In rural communities, having access to a bank account decreases the probability of being in the “Always” skipping meals category by 1% but increases the probability of being in the “Never” skipping meals category by 9%. In urban areas, having a bank account decreases the probability of “Always” skipping meals by 2% but increases the probability of “Never” skipping meals by 12%.

Access to credit has a positive and significant effect on food security in the entire sample and urban sample, but not in the rural sample. This suggests that access to credit is particularly beneficial in urban areas, where financial systems are more robust. The marginal effects show that for the entire sample, access to credit decreases the probability of “Always” skipping meals by 2% and increases the probability of “Never” skipping meals by 12%. The urban

sample shows even stronger marginal effects, whereas the rural sample shows that access to credit has no significant effect on food security outcomes.

Table 4.3: Marginal effect estimates of financial inclusion on food security

Variables	Always	Often	Sometimes	Never
Panel A: Marginal effect for the entire sample				
Have a bank account	-0.01*** (0.00)	-0.03*** (0.01)	-0.06*** (0.02)	0.10*** (0.03)
Access to credit	-0.02** (0.01)	-0.03** (0.01)	-0.07** (0.03)	0.12** (0.05)
Informal saving	-0.02* (0.01)	-0.03** (0.01)	-0.03** (0.02)	0.08** (0.04)
Formal saving	-0.03*** (0.01)	-0.05*** (0.01)	-0.08*** (0.01)	0.16*** (0.03)
Have insurance	-0.02*** (0.00)	-0.04*** (0.01)	-0.08*** (0.02)	0.14*** (0.03)
Observations	1,473	1,473	1,473	1,473
Panel B: Marginal effect for urban sample				
Have bank account	-0.02** (0.01)	-0.03** (0.01)	-0.08** (0.03)	0.12** (0.05)
Access to credit	-0.03*** (0.01)	-0.04*** (0.01)	-0.11*** (0.04)	0.17*** (0.06)
Informal saving	-0.03 (0.02)	-0.03 (0.02)	-0.05 (0.03)	0.11 (0.07)
Formal saving	-0.04*** (0.02)	-0.05*** (0.02)	-0.10*** (0.02)	0.19*** (0.05)
Have insurance	-0.03*** (0.01)	-0.04*** (0.01)	-0.11*** (0.03)	0.18*** (0.04)
Observations	690	690	690	690
Panel C: Marginal for rural sample				
Have a bank account	-0.01** (0.00)	-0.03** (0.01)	-0.05** (0.02)	0.09** (0.04)
Access to credit	0.01 (0.01)	0.03 (0.04)	0.04 (0.05)	-0.08 (0.10)
Informal saving	-0.01 (0.01)	-0.02 (0.02)	-0.02 (0.02)	0.05 (0.05)
Formal saving	-0.02** (0.01)	-0.05** (0.02)	-0.06*** (0.02)	0.13*** (0.04)
Have insurance	-0.01* (0.01)	-0.03* (0.02)	-0.04* (0.02)	0.08* (0.04)
Observations	783	783	783	783

Note: The analysis control for household characteristics such as age, education and marital status of the household head, household size and household income. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The effects of saving type and access to insurance on food security highlights that for the entire sample, informal saving reduces the probability of “Always” skip meals by 2% and increases the probability of “Never” skipping meals by 8%. Formal saving shows a strong and positive effect on food security across all samples, with coefficients significant at the 1% level in the entire, urban, and rural samples (See Table A2). This suggests that formal saving mechanisms play a critical role in enhancing food security. The marginal effects in Table 4.3 show that formal saving consistently reduces the likelihood food insecurity (e.g., “Always” skip meals) by 4% and significantly increases the likelihood of "Never" skipping meals for all samples, with the strongest effects observed in urban households. Access to insurance positively affects food security for the entire sample and urban sample, with a weaker but still significant effect in the rural sample (Table A2). The marginal effects in Table 4.3 show that access to insurance reduces the probability of “Always” skipping meals and increases the probability of “Never” skipping meals for the entire sample by 3%. The effects are stronger for urban households, while rural households exhibit weaker but still positive impacts (see Panel B and Panel C of Table 4.3 for comparisons).

Regarding household characteristics, secondary education has a positive and significant effect on food security for the entire sample and both sub-samples. Tertiary education also has a strong positive effect, especially in the entire sample and urban sample, though its effect is weakly significant in rural areas. These results suggest that higher education levels of household head improve food security outcomes, particularly in urban areas, likely due to better financial literacy and earning potential. Household income positively affects food

security across all samples, with coefficients significant at the 1% level (entire sample, urban and rural). Higher income significantly reduces the probability food insecurity and increases the likelihood of “Never” skipping meals (see Table A1 and A2 of the appendix).

Household size negatively impacts food security in the entire sample and urban sample, though the effect is insignificant in the rural sample. This suggests that larger households face greater food security challenges, especially in urban areas where the cost of living is higher. Residing in urban areas reduces the probability of food security in the entire sample, indicating that rural households might have higher baseline resilience, possibly due to subsistence farming. However, this does not hold for urban-specific results, as urban areas show better financial inclusion.

Notably, the findings highlight the important role of financial inclusion in improving food security. For example, having a bank account and formal savings significantly enhance food security outcomes, particularly in urban areas where formal financial systems are more accessible. This indicates the importance of expanding financial services to rural areas to bridge the gap in food security. Access to credit and insurance also emerge as key determinants of food security, with urban households benefiting the most. The weaker effects in rural areas suggest that the availability of credit and insurance might be limited or that these services are not effectively tailored to rural needs. Policymakers should focus on creating rural-friendly financial products.

The positive effects of education on food security demonstrate that higher educational attainment equips individuals with the skills and knowledge for better opportunities and to adapt to changes living conditions. This emphasizes the need for investments in rural education to improve financial literacy and empower households to achieve better food security. Income plays a fundamental role in food security, as higher household income directly reduces food insecurity. However, the negative impact of household size, especially in urban areas, highlights the pressure of dependents on household resources. This indicates the need for targeted social support programs to assist larger families, particularly in urban settings. Overall, the results emphasize the multifaceted relationship between financial inclusion and food security. Efforts to improve financial access, coupled with targeted interventions for vulnerable populations, are essential for addressing food insecurity in Namibia.

4.2.4. Effect of Financial Inclusion on Food Security by Gender of Households Head

Across all panels in Table 4.4, having a bank account consistently decreases the likelihood of falling into the lowest food security category (“always” skipping a meal) and increases the likelihood of being in the highest food security category (‘Never’ skip meals). For example, in female headed households (Panel A), having a bank account reduces the probability of being in the ‘Often’ skip meals category by 5%, and increases the probability of ‘Never’ skipping meals by 19%. The effects are stronger for female-headed households where the likelihood of being in the ‘sometimes’ skip meals category reduces significantly by 13%. For male-headed households (Panel B), having a bank account does not show any significant effects, suggesting limited impact on food security outcomes. In other households where the

gender of the household is not specified, the effects are highly significant, suggesting that having a bank account in this households reduces the probability of always skipping meals by 1% and increases the probability of never skipping meals by 10%. Essentially, the positive effect of having a bank account on food security highlights the importance of formal financial inclusion within female headed households in Namibia. The stronger impact for female-headed households may be attributed to women’s tendency to prioritize household food security when managing financial resources.

Table 4.4: Marginal effect of financial inclusion on food security in Female and male headed households.

Variables	Always	Often	Sometimes	Never
Panel A: Female headed households				
Have a bank account	-0.02* (0.01)	-0.05** (0.02)	-0.12** (0.05)	0.19** (0.08)
Access to credit	-0.01 (0.02)	-0.01 (0.04)	-0.03 (0.10)	0.04 (0.16)
Informal saving	-0.03 (0.02)	-0.05 (0.04)	-0.07 (0.05)	0.14 (0.10)
Formal saving	-0.04 (0.02)	-0.06* (0.03)	-0.12*** (0.04)	0.21** (0.09)
Have insurance	-0.00 (0.01)	-0.01 (0.02)	-0.02 (0.06)	0.04 (0.09)
Observations	211	211	211	211
Panel B: Male headed households				
Have a bank account	0.01 (0.01)	0.01 (0.01)	0.03 (0.04)	-0.05 (0.07)
Access to credit	-0.01 (0.02)	-0.01 (0.03)	-0.04 (0.08)	0.07 (0.12)
Informal saving	-0.03 (0.03)	-0.03 (0.03)	-0.08 (0.05)	0.14 (0.10)
Formal saving	-0.03 (0.03)	-0.03 (0.03)	-0.07* (0.04)	0.12 (0.09)
Have insurance	-0.02 (0.02)	-0.03* (0.02)	-0.09* (0.05)	0.14* (0.08)
	251	251	251	251
Panel C: Others (gender of household head not clearly defined)				
Have a bank account	-0.01** (0.00)	-0.03*** (0.01)	-0.05*** (0.02)	0.10*** (0.03)
Access to credit	-0.01 (0.01)	-0.03 (0.02)	-0.05 (0.03)	0.09 (0.05)
Informal saving	-0.01 (0.01)	-0.03 (0.02)	-0.03 (0.02)	0.07 (0.04)

Formal saving	-0.03*** (0.01)	-0.05*** (0.02)	-0.08*** (0.02)	0.15*** (0.04)
Have insurance	-0.02*** (0.01)	-0.04*** (0.01)	-0.07*** (0.02)	0.12*** (0.03)
Observations	1,011	1,011	1,011	1,011

Note: The analysis control for household characteristics such as age, education and marital status of the household head, household size and household income. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Access to credit shows no statistically significant effects in both male and female headed households, indicating that this variable does not have a substantial impact on food security outcomes in the context of this study. While positive marginal effects are observed for the higher food security categories ('Sometimes' and 'Never'), these effects are not statistically significant, implying that access to credit may not be a reliable determinant of the gender differential in food security in Namibia.

The results for informal saving are statistically insignificant in both male and female headed households. This suggests that informal savings do not provide sufficient financial security to mitigate food insecurity risks. The weak and insignificant results for informal saving reflect its limited capacity to address food insecurity differential among male and female headed households. Informal saving mechanisms often lack the structure and reliability of formal savings, making them less effective in mitigating food insecurity risks. Formal saving however, shows a significant and consistent positive impact on food security outcomes. In female-headed households, formal saving reduces the probability of being in the 'Sometimes' category by 12% and increases the probability of being in the 'Never' category by 21%. No significant effects are observed for male-headed households, suggesting that formal savings are more beneficial for female-headed households. Thus, formal saving emerges as a critical factor in improving food security, particularly for female-headed households. The significant

effects on reducing food security suggest that formal saving mechanisms provide households with the financial stability needed to ensure consistent food access.

Finally, the effect of access to insurance is significant in female-headed households (Panel A), where it reduces the probability of being in the ‘Often’ category by 8% and ‘Sometimes’ category by 19% while increasing the likelihood of being in the ‘Never’ skip meals category by 30%. These results indicate that insurance products may be more effectively utilized by female-headed households, potentially due to their reliance on risk mitigation mechanisms. Notably, the significant impact of access to insurance for female-headed households highlights its importance as a risk management tool. Insurance helps households mitigate the financial shocks associated with unexpected events, thereby supporting consistent food access. This is particularly relevant for female-headed households, which often face greater vulnerability to economic shocks. By implication, the results indicate that financial inclusion mechanisms such as bank accounts, formal savings, and insurance play a critical role in enhancing food security, particularly for female-headed households. However, the limited impact of credit and informal savings underscores the need for targeted interventions to address structural barriers in financial systems. Tailored financial products and improved access to formal financial services are essential to leveraging financial inclusion as a tool to reduce food insecurity in Namibia.

4.3. Discussions

4.3.1. The Effect of Financial Inclusion on Food Security in Namibia

The empirical results of the study on the effect of financial inclusion on food security in Namibia align closely with and, in some cases, diverge from findings in the broader empirical literature. These results provide valuable views into how financial services such as bank accounts, savings, credit, and insurance influence food security, especially in rural and urban areas and between female and male headed households. The following discussion contextualizes the empirical results in relation to existing studies, highlighting similarities and differences while drawing on evidence from the literature provided.

The study's finding that having a bank account positively affects food security across all samples is consistent with existing literature. For instance, Baborska *et al.* (2020) demonstrated that savings, as facilitated through formal financial services like bank accounts, reduce the probability of experiencing food insecurity in rural areas of low- and middle-income countries. Similarly, Allen *et al.* (2014) argued that access to financial services, such as bank accounts, helps individuals better manage food insecurity by enabling savings and income smoothing. This study's results reinforce these arguments, especially in rural Namibia, where bank accounts contribute to higher food security by enabling households to manage consumption during economic shocks. The study finds that access to credit positively influences food security in urban areas but is insignificant in rural Namibia. This contrasts with Annim and Frempong's (2018) findings in Ghana, where credit access improved dietary diversity in rural households. The divergence may be explained by differences in rural

financial infrastructure and credit accessibility. As Baborska *et al.* (2020) found, credit use without complementary financial services such as savings can increase food insecurity. This aligns with the Namibian view, where credit access may not be sufficiently tailored to the needs of rural households, potentially limiting its effectiveness in enhancing food security.

The study indicates that informal saving has a positive effect on food security for the entire sample but lacks significance in urban and rural subsamples. This partially aligns with Baborska *et al.* (2020) findings, which emphasize the critical role of formal savings rather than informal savings in mitigating food insecurity. Informal savings, while helpful as a coping mechanism, may lack the security and growth potential of formal savings, explaining their limited impact in specific settings such as rural Namibia. The positive and significant effect of formal saving on food security across all samples is strongly supported by the literature. Baborska *et al.* (2020) found that savings reduce the likelihood of food insecurity when used independently or in combination with other financial services. Similarly, Dupas and Robinson (2013) highlighted that access to formal savings enhances household resilience by enabling better consumption smoothing and investment in food security. The strong results in Namibia, particularly in urban areas, may reflect better accessibility and trust in formal financial systems, showing the importance of expanding formal savings mechanisms in rural regions.

The study's findings that access to insurance positively affects food security align with the broader empirical literature. Baborska *et al.* (2020) demonstrated that insurance mitigates food insecurity risks by providing a safety net during economic shocks. Steinert *et al.* (2018)

similarly emphasized the role of insurance in improving family welfare and food security in Sub-Saharan Africa. In Namibia, the weakly significant effect in rural areas may reflect limited penetration of insurance products tailored to rural households' needs, highlighting an area for policy intervention. The positive and significant effects of secondary and tertiary education on food security are well-supported by empirical evidence. Arshad (2022) found that education positively affects food security by enhancing financial literacy and access to economic opportunities. Annim and Frempong (2018) noted that education indirectly supports food security by improving dietary diversity. These findings suggest that investments in rural education in Namibia could yield long-term improvements in food security by ensuring households financial inclusion.

The study's results showing that higher household income significantly improves food security align with the broader literature. Arshad (2022) and Dupas *et al.* (2018) both highlighted the critical role of income in reducing food insecurity by enabling better access to nutritious food and financial resources. The strong effect observed in Namibia suggests that policies aimed at increasing household incomes, such as employment creation and social safety nets, could have a direct impact on reducing food insecurity. The negative effect of household size on food security is consistent with findings from the literature. Larger households, as noted by Manyame (2002) to face greater challenges in meeting food demands, especially in aspects of poverty and limited resources. This highlights the importance of targeted interventions, such as nutritional support programs, to alleviate the burden on larger households, particularly in urban settings with high cost of living.

The study finds that residing in areas reduces food insecurity in the overall sample, suggesting that rural households might have greater baseline resilience due to subsistence farming. This aligns with Zeller *et al.* (2021), who emphasized the role of transaction costs and limited market access in shaping food security outcomes. However, the better financial inclusion in urban areas may offset some disadvantages, as indicated by stronger effects of financial inclusion variables like bank accounts and formal savings in urban samples. Consequently, the empirical results of the study are broadly consistent with the findings in the literature while highlighting unique dynamics specific to rural Namibia. The results indicate the importance of tailored financial inclusion policies that address the distinct needs of rural households, including improved access to savings, credit, and insurance products. Additionally, enhancing education and household incomes remains critical for achieving sustainable improvements in food security.

4.3.2. Effect of financial inclusion on food security by gender of household head in Namibia

The study finds that having a bank account significantly improves food security for female-headed households, reducing the likelihood of food insecurity. This is consistent with findings from studies like Baborska *et al.* (2020), which highlighted that access to formal financial services like bank accounts reduces the probability of experiencing food insecurity in low- and middle-income countries. However, the insignificant effects in male-headed households aligns with findings by Koomson *et al.* (2022), who observed that financial inclusion have a greater impact in female-headed households in rural settings, likely because women tend to allocate resources towards household welfare and food security. The study's

results emphasize the unique role of bank accounts in improving food security among female-headed households, particularly in patriarchal societies where women often face greater economic vulnerabilities Olumba *et al.* (2023).

The absence of significant effects for access to credit in this study contrasts with findings from Koomson *et al.* (2022), where access to credit was associated with improved food security outcomes in rural Ghana. The lack of significant impact in rural Namibia may stem from structural barriers in rural credit markets, such as high transaction costs, limited financial infrastructure, or restrictive credit terms, as highlighted by Zeller *et al.* (2021). Furthermore, the reliance on informal credit sources, which may carry high interest rates or exploitative conditions, could explain why access to credit does not lead to tangible improvements in food security. These contextual limitations underscore the need for rural-specific credit products tailored to the unique economic and social conditions in Namibia. The weak and insignificant effects of informal saving on food security outcomes align with Baborska *et al.* (2020), who found that informal savings mechanisms lack the reliability and security needed to effectively mitigate food insecurity. Informal savings, while accessible, often fail to provide the stability required to buffer against economic shocks or seasonal food shortages. This finding highlights the critical importance of transitioning rural households from informal to formal savings mechanisms, as supported by Dupas and Robinson (2013), who demonstrated the superior efficacy of formal savings in enhancing household resilience and food security.

Formal saving emerges as an important determinant of food security, particularly for female-headed households. The study's results align with Baborska *et al.* (2020), who demonstrated that formal savings significantly reduce the likelihood of food insecurity when used independently or in conjunction with other financial services. The stronger impact observed among female-headed households in Namibia resonates with findings from Ashagidigbi *et al.* (2022), who emphasized the role of empowerment and access to economic resources in mitigating food insecurity among women. The significant positive effect of access to insurance for female-headed households mirrors findings from Steinert *et al.* (2018), who identified insurance as an important risk management tool that supports household welfare and food security in Sub-Saharan Africa. The study's results suggest that insurance products are particularly effective for female-headed households, who often face greater economic vulnerabilities and are more likely to prioritize household welfare.

By implication, the results reveal that female-headed households benefit more significantly from financial inclusion mechanisms such as bank accounts, formal savings, and insurance. This aligns with studies like Olumba *et al.* (2023), which emphasized the gendered disparities in economic resources and food security, with women often facing greater challenges but also showing higher resource efficiency in improving household welfare. The limited impact of financial inclusion on male-headed households may reflect systemic issues such as unequal access to financial resources or differing priorities in resource allocation. Consequently, the study's findings contribute to the growing literature on the intersection of financial inclusion, gender, and food security. While the positive impact of financial inclusion mechanisms on food security in female-headed households is evident, the limited effects for male-headed

households and the lack of significance for credit and informal savings highlight structural and contextual challenges. These results underscore the importance of designing gender-sensitive financial inclusion policies and tailored interventions that address the unique needs of rural households in Namibia.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusions and recommendations from the examination of the relationship between financial inclusion and food security in Namibia with particular focus on the rural-urban divide. This chapter consolidates the main results of the research, emphasising the substantial effects of financial services such as insurance, credit, savings, and banking on food security in families by gender of the household head. These findings are useful for policy recommendations for improving financial inclusion programmes with the goal of enhancing food security and advancing gender equality, particularly in rural areas. The chapter provides decision-makers and stakeholders with information that is useful to tackle food insecurity.

5.2. Summary and Conclusions

This study focused on analyzing the relationship between financial inclusion and food security in Namibia using an Ordered Probit model. The study is framed within the global effort to achieve Sustainable Development Goal 2 (SDG2), which aims to eradicate hunger and ensure food security. Despite significant progress, challenges such as population growth, climate change, and poverty continue to hinder the achievement of zero hunger. Food insecurity remains a critical issue, particularly in Africa, where the COVID-19 pandemic exacerbated the situation, leading to increased levels of hunger and malnutrition. Financial inclusion has been recognized as a key enabler in addressing poverty, inequality, and food

insecurity by facilitating access to financial services that support agricultural productivity, income generation, and economic resilience.

The main objective of this study was to examine the relationship between financial inclusion and food security in Namibia. Specifically, it sought to investigate the effect of access and usage of financial services on food security and explore its impacts on rural-urban households as well as female and male headed households. Evidence suggests that Namibia's significant food insecurity is exacerbated by high levels of poverty and reliance on agriculture particularly in rural areas. Despite prior research linking financial inclusion and food security globally, limited evidence exists on this relationship in many Africa countries, particularly in Namibia, indicating the relevance of this study. The significance of the study lies in its contribution to policy and practice. It provides evidence to inform public policy strategies aimed at alleviating food insecurity in Namibia, aligning with SDG2. It also offers insights for designing financial inclusion policies and initiatives that promote economic resilience, entrepreneurship, and income generation, benefiting rural communities, development stakeholders, and policymakers.

The literature review emphasized the potential of financial inclusion to enhance food security by providing access to savings, credit, and insurance, which enable households to manage risks, invest in productive activities, and ensure stable consumption. However, evidence from existing studies suggests that the impact of financial inclusion varies based on the type of financial service and contextual factors, emphasizing the need for localized research. The study used data from the Namibia Financial Inclusion Survey (NFIS) 2017 and the Ordered Probit technique was used to evaluate the relationship between financial inclusion variables

and food security. The empirical findings revealed that formal financial inclusion mechanisms, such as having a bank account, formal savings, and access to insurance, significantly enhance food security in Namibia. However, the limited impact of credit and informal savings in rural Namibia reflects structural inequalities and contextual limitations in rural areas. These findings highlight the need for targeted rural financial products and improved access to formal financial systems to leverage financial inclusion as a tool for reducing food insecurity.

The findings provide clear evidence that financial inclusion, as measured by having a bank account, formal savings, informal savings, access to credit, and insurance, significantly affects food security in Namibia. The positive and significant impact of having a bank account and formal savings on food security is consistent with literature (e.g., Baborska *et al.*, 2020; Dupas & Robinson, 2013), suggesting that access to secure financial mechanisms enables households to smooth consumption and manage risks, particularly during economic shocks. However, the weak impact of informal savings and the insignificance of access to credit in rural Namibia indicate structural barriers, such as limited financial infrastructure and the unsuitability of credit products for rural needs (Baborska *et al.*, 2020). This implies that formal financial services play a more critical role in enhancing food security than informal mechanisms in rural areas.

The weakly significant effect of access to insurance in rural areas shows the limited penetration of insurance products and highlights the need for policies tailored to rural

households. Empirical evidence (e.g., Steinert *et al.*, 2018) confirms that insurance provides essential risk mitigation that supports food security. Education also plays a pivotal role, with secondary education positively influencing food security outcomes, likely due to enhanced financial literacy and economic decision-making skills (Arshad, 2022). Conversely, household size negatively impacts food security in Namibia, consistent with findings by Manyame (2002), suggesting that larger households face increased resource constraints. These results collectively highlight the need for targeted interventions to enhance financial inclusion mechanisms in rural settings.

Overall, the study concludes that financial inclusion has a significant and multifaceted impact on food security in Namibia. While formal financial mechanisms such as bank accounts, formal savings, and access to insurance positively enhance food security, informal savings and access to credit are less effective for rural Namibia, pointing to structural limitations in rural financial systems. Education and household income further support food security, while larger household sizes present challenges. The study concludes that financial inclusion, particularly through formal mechanisms such as bank accounts, formal savings, and insurance, significantly improves food security in female-headed households in rural Namibia. These mechanisms provide critical financial stability, enabling households to prioritize food security. However, the limited effects observed for male-headed households and informal financial services highlight structural barriers and gendered disparities in accessing and utilizing financial resources. Addressing these gaps is crucial for leveraging financial inclusion as a tool to enhance food security.

5.3. Policy Implications

Policies should prioritize expanding rural access to formal financial services, such as bank accounts and formal savings mechanisms. This can be achieved through subsidies for banking infrastructure, the promotion of mobile banking solutions, and targeted education campaigns to enhance financial literacy particularly in rural Namibia. Regulatory frameworks should encourage the development of rural-specific credit and insurance products to address the needs of rural households effectively. Further, policies should focus on enhancing financial infrastructure in rural Namibia, particularly for women. Gender-sensitive financial inclusion strategies are essential to empower household heads, such as subsidies for opening bank accounts, reduced transaction fees, and tailored insurance products that address rural vulnerabilities.

Banks and microfinance institutions should design rural-friendly financial products, such as micro-insurance tailored to agricultural risks and low-interest credit for farming inputs. Formal savings schemes should be incentivized through interest rate bonuses or government-backed guarantees to encourage participation. Partnerships with community leaders can facilitate trust and participation in formal financial systems. In addition, banks and financial institutions must develop products tailored to the needs of rural households. Flexible credit terms, lower interest rates, and savings products designed for seasonal income variability in agriculture can enhance access and utility. Formalizing informal savings groups through partnerships with financial institutions can also improve financial inclusion. The findings show the need to integrate financial inclusion as a core strategy to achieve SDG 2. Expanding access to formal financial services in rural areas can significantly reduce food insecurity.

Gender-specific initiatives targeting household heads should be prioritized to maximize the impact.

Development agencies should partner with local financial institutions to pilot innovative financial products that combine savings, credit, and insurance for rural households. These initiatives should incorporate gender-sensitive approaches, recognizing the unique financial and food security challenges faced by household heads, specifically women. In essence, development programmes should focus on financial literacy campaigns to enhance rural households' understanding and utilization of financial products. Collaborations between NGOs and financial institutions can help bridge gaps in financial access and address barriers to inclusion.

The current researcher should advocate for evidence-based interventions by disseminating the study's findings through academic and policy platforms. Collaborations with policymakers and financial institutions can facilitate the practical application of these findings, ensuring that they contribute to reducing food insecurity in Namibia. In essence, the study highlights the need for further exploration of informal financial systems' role in rural Namibia and their integration into formal mechanisms. Future research could also examine the long-term impacts of financial inclusion interventions on food security to inform sustainable development strategies.

5.4. Future Research

Based on the findings and gaps identified in this study, several recommendations for future research are suggested to deepen the understanding of the relationship between financial inclusion and food security in rural Namibia and similar settings.

Exploration of Structural Barriers to Financial Inclusion - Future research should look at the specific structural and economic barriers that limit the effectiveness of financial tools like bank accounts, credit access, and savings accounts in rural Namibia. Qualitative studies could help capture varied insights from community members, providing a comprehensive understanding of factors such as financial literacy, accessibility, and cultural perceptions that may influence financial inclusion outcomes.

Impact of Financial Education Programs - As formal education was found to significantly impact food security in this study, further research could evaluate the role of targeted financial literacy and management programs. Investigating how financial education might empower rural households to maximize the benefits of financial tools could offer actionable insights for designing effective interventions.

Longitudinal and Comparative Studies - Long-term studies assessing the impact of financial inclusion tools on food security over several years or using longitudinal data could provide valuable insights into how these tools impact household resilience during periods of economic change or climate-related events. Comparative studies across similar African settings could also reveal patterns and best practices that might benefit rural Namibian settings.

Integration of Technology-Driven Financial Services - Further research could explore the potential of mobile money, digital savings, and other technology-driven financial services in improving food security. Given the growth of digital financial services, understanding its reach and effectiveness in rural areas could open up new avenues for enhancing access to financial services.

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APPENDIX A

APPENDIX B

Table A1: Coefficient estimates of account ownership and credit on food security

Variables	Entire	Urban	Rural	Entire	Urban	Rural
Have a bank account	0.261*** (0.073)	0.310** (0.125)	0.226** (0.091)			
Access to credit				0.301** (0.118)	0.437*** (0.139)	-0.207 (0.248)
Age of respondent	-0.000 (0.002)	-0.000 (0.004)	-0.000 (0.003)	0.001 (0.002)	-0.000 (0.004)	0.001 (0.002)
Individual is male	0.056 (0.062)	-0.068 (0.091)	0.169* (0.087)	0.055 (0.062)	-0.056 (0.091)	0.159* (0.087)
Primary education	-0.021 (0.101)	0.105 (0.190)	-0.094 (0.120)	0.007 (0.100)	0.136 (0.188)	-0.080 (0.120)
Second education	0.265*** (0.102)	0.355** (0.173)	0.235* (0.130)	0.346*** (0.099)	0.407** (0.167)	0.319** (0.125)
Tertiary education	0.975*** (0.167)	1.235*** (0.229)	0.350 (0.321)	1.006*** (0.167)	1.220*** (0.228)	0.454 (0.321)
Individual is married	0.026 (0.067)	0.073 (0.103)	0.013 (0.089)	0.020 (0.067)	0.046 (0.103)	0.018 (0.089)
Household income	0.000*** (0.000)	0.000*** (0.000)	0.000* (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000** (0.000)
Household size	-0.028*** (0.010)	-0.041** (0.016)	-0.012 (0.014)	-0.032*** (0.010)	-0.048*** (0.016)	-0.011 (0.014)
Urban residence	-0.240*** (0.065)			-0.223*** (0.065)		
Intercept cut1	-1.671*** (0.156)	-1.236*** (0.254)	-1.777*** (0.202)	-1.728*** (0.156)	-1.429*** (0.251)	-1.792*** (0.201)
Intercept cut2	-0.996*** (0.148)	-0.713*** (0.248)	-0.918*** (0.186)	-1.058*** (0.148)	-0.910*** (0.244)	-0.937*** (0.185)
Intercept cut3	0.466*** (0.147)	0.751*** (0.247)	0.554*** (0.185)	0.399*** (0.147)	0.556** (0.243)	0.528*** (0.184)
Observations	1,473	690	783	1,473	690	783

The intercept Cut1 to Cut3 parameters are used to check whether the categories of food can be combined into one. They are significant, suggesting that the categories should be combined into one. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A2: Coefficient estimates of savings and insurance on food security

Variables	Entire	Urban	Rural	Entire	Urban	Rural
Informal saving	0.205** (0.100)	0.285 (0.176)	0.136 (0.127)			
Formal saving	0.427*** (0.090)	0.493*** (0.132)	0.347*** (0.123)			
Access to insurance				0.352*** (0.075)	0.453*** (0.102)	0.213* (0.116)
Age of respondent	-0.001 (0.002)	-0.001 (0.004)	-0.000 (0.003)	-0.001 (0.002)	-0.002 (0.004)	0.001 (0.003)
Individual is male	0.058 (0.062)	-0.062 (0.091)	0.167* (0.087)	0.055 (0.062)	-0.059 (0.091)	0.166* (0.087)
Primary education	-0.018 (0.101)	0.103 (0.190)	-0.089 (0.120)	-0.005 (0.101)	0.142 (0.189)	-0.080 (0.120)
Second education	0.261** (0.102)	0.348** (0.171)	0.234* (0.129)	0.300*** (0.099)	0.341** (0.169)	0.300** (0.126)
Tertiary education	0.951*** (0.167)	1.205*** (0.228)	0.334 (0.321)	0.980*** (0.165)	1.198*** (0.226)	0.395 (0.321)
Individual is married	0.016 (0.067)	0.065 (0.103)	0.004 (0.090)	0.018 (0.067)	0.060 (0.103)	0.012 (0.089)
Household income	0.000*** (0.000)	0.000*** (0.000)	0.000* (0.000)	0.000*** (0.000)	0.000** (0.000)	0.000* (0.000)
Household size	-0.027** (0.010)	-0.038** (0.016)	-0.011 (0.014)	-0.028*** (0.010)	-0.042*** (0.016)	-0.012 (0.014)
Urban residence	-0.230*** (0.066)			-0.257*** (0.065)		
Intercept cut1	-1.566*** (0.170)	-1.147*** (0.263)	-1.706*** (0.222)	-1.759*** (0.156)	-1.415*** (0.250)	-1.811*** (0.202)
Intercept cut2	-0.888*** (0.163)	-0.623** (0.257)	-0.845*** (0.208)	-1.082*** (0.149)	-0.887*** (0.244)	-0.955*** (0.186)
Intercept cut3	0.582*** (0.163)	0.857*** (0.258)	0.631*** (0.208)	0.382*** (0.147)	0.593** (0.242)	0.512*** (0.185)
Observations	1,473	690	783	1,473	690	783

The intercept Cut1 to Cut3 parameters are used to check whether the categories of food can be combined into one. They are significant, suggesting that the categories should be combined into one. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1