Assessing food security status among low-income households in Tshwane, South Africa

By

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DECLARATION

I declare that this dissertation, which is submitted for the degree of M.Com Agricultural Economics at the University of Pretoria, is entirely my own work and has not been submitted anywhere else for the award of a degree or otherwise.

Any error in thinking and omissions are entirely my own responsibility.

Signed ……..

Name: Lebogang Mashile

February 2019

DEDICATION

I dedicate this dissertation to my late mother, Florence Mashile, who has been a great source of strength and a pillar throughout my life. Thank you for making a woman out of me, mama, and thank you for always encouraging me to develop myself and for teaching me that education is the best investment I could ever make in my life. I would not have achieved all this if it had not been for your love, support and prayers. Thank you, mom.

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ABSTRACT

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Food insecurity has traditionally been viewed as a rural problem, and intervention programmes have been mainly focused on increasing food production to achieve food self-sufficiency. However, these intervention programmes have been inadequate in addressing food insecurity in urban areas, where households have limited access to farming land and rely mostly on cash income to realise their food security needs. Understanding household food security in urban areas therefore requires different intervention strategies to those for food security in rural areas.

The main objective of this study was to investigate the food security status among low-income households in Tshwane in order to determine the extent and the nature of food insecurity in these communities. The food security status of the households was calculated using Food Security indicators that were based on the 6-item questionnaire derived from the Household Food Insecurity Access Scale (HFIAS) as suggested by the U.S. Department of Agriculture (2000), as well as from the South African 4-item questions used in the General Household Survey of 2012. The study consisted of a population size of approximately 700 000 people who visited health care centres in the district of Tshwane, and a total sample of 66 383 individuals was selected for this study. The data was not collected from each household member but rather from a member of the household who visited the health care centres in the time that the study was conducted. The results indicated that a significantly large number of the sampled households are food secure; however, the dwelling conditions of those who were found to be food insecure were rather very poor.

In addition, the study assessed the factors associated with food security status among low-income households in these urban areas, and the results indicated that there was a statistically significant relationship between the level of food security and water source, type of dwelling, condition of dwelling, ownership of dwelling, and availability of electricity among others. It was discovered that households that have an electricity connection were more likely to be food secure, as compared with households that do not have electricity connection. Moreover, households that have access to piped water in the house or in the yard were likely to be more food secure than households that did not have access to piped water. Households that had better dwelling conditions and better housing were more likely to be food secure than the households whose dwelling conditions were poorly maintained.

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ACRONYMS

CCHIP	Community Childhood Hunger Identification Project
CHW	Community Health Workers
COPC	Community Oriented Primary Care
DD	Dietary Diversity
DHIS	District Health Information Systems
DOA	Department of Agriculture
DOH	Department of Health
DU	Dwelling Unit
FAO	Food and Agriculture Organization
FP	Food Poverty
GHS	General Household Survey
GNI	Gross National Income
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HIV	Human Immune Virus
HSRC	Human Sciences Research Council
IES	Income and Expenditure Survey
IFPRI	International Food Policy Research Institute
IFSS	Integrated Food Security Strategy
NAMC	National Agricultural Marketing Council
NFCS	National Food Consumption Survey
PSU	Primary Sampling Unit
SADC	Southern African Development Cooperation
SASAS	South African Social Attitudes Survey
Stats SA	Statistics South Africa
TB	Tuberculosis

USAID	United States Agency for International Development
USDA	United States Department Of Agriculture
WBOTS	Ward Based Outreach Teams
WHO	World Health Organization

CHAPTER ONE:
INTRODUCTION

1.1 PROBLEM STATEMENT

While South Africa is classified as the most developed country in Africa, its key human development indicators do not match favourably with those of other countries, such as the rate of unemployment, the rates of crime, hunger and poverty, and the level of food insecurity, as well as other key socio-economic factors. Although the Constitution of South Africa provides that every citizen has the right to sufficient food and water (The Presidency, 1996), there are large numbers of South African households who are food insecure or who are vulnerable to food insecurity. Access to adequate food and nutrition is an essential/basic human right. This is a broad term which has been defined in various ways, and it mainly describes a condition whereby all individuals have access to adequate resources or entitlements for obtaining sufficient food for a nutritious diet (FAO, 2006a).

In South Africa, national food security is being achieved, and the country is able to produce sufficiently to meet its food needs; however, household food security has not yet been achieved, as there are households that do not have sufficient food because of numerous factors that relate to poverty in the country (Manyamba *et al*. 2012). Although national food security in South Africa has been reported over the decades, there are still alarming and unacceptable household food security levels that exist in the country (Hendriks & Olivier, 2015). The right to food for all, which is enshrined in the Constitution, is being undermined by a lack of food security legislation in the country, thereby making it difficult for the country to achieve its national growth targets, as well as eradicate the hunger and food insecurity predicament (Hendriks & Olivier, 2015). With respect to enforceable legislative measures for food security, it is a very difficult task to properly evaluate the impact of the food security programmes implemented in South Africa due to the lack of a food security framework as well as a lack of coordination between the various implemented programmes (Hendriks, 2014).

Traditionally, the problem of food insecurity has been viewed as a rural problem where the focus has been placed mainly on food availability; thus, the responses to food insecurity have been targeted more on production through small-scale and subsistence farming. Although these responses may have increased production, they are inadequate in addressing food insecurity in

urban areas (Battersby, 2012). A large number of households in urban areas do not have access to production land and they do not produce their own food, which renders them net-buyers of the food they consume. As a result, household food security in urban areas is highly dependent on income (Van der Merwe, 2011). Since food access in urban areas depends on income, food prices are an important determinant of food security in urban areas (Van der Merwe, 2011). A study conducted by OXFAM revealed that poor households have 'good access to bad food and bad access to good food', meaning that they have limited choices when they purchase food and they are often forced to consume food that is of poor quality (OXFAM, 2014:25). High food prices have a significantly negative impact on the urban poor who purchase most of their food from the local Spaza shop (a South African term used to describe a small informal shop in townships) in very small quantities because of their limited income (Van der Merwe, 2011).

Low-income urban households are characterised by low wages and high unemployment, large family sizes, high dependence on the social grants for survival, and lack of productive assets such as land, water and other agricultural resources (OXFAM, 2014). In urban areas, food insecurity cannot be attributed to absolute food shortages, but rather to the inability of households to access the available food, and since this occurs at household level, it requires households to come up with a range of coping strategies in order to deal with their inability to access food (Battersby, 2012). The findings from the Johannesburg case study of the Regional Network on AIDS, Livelihoods and Food Security (RENEWAL) research project indicate that residents in the urban informal settlements were faced with high rates of unemployment, have low dietary diversity scores, and are more likely to experience food shortages than those who reside in urban formal settlements (Drimie, 2013). According to the results of the 2012 General Household Survey (GHS), the Gauteng province accounts for about 19.2% of households who have reported that, at some point, they did not have enough money to buy food or who had to reduce their meal sizes or skip meals because they did not have enough food (Stats SA, 2012). It is evident from all these studies that food insecurity is a growing problem in South Africa, and especially urban food insecurity which is often hidden by its nature since people in urban areas may be assumed to be socio-economically better off than their rural counterparts mainly because they are geographically positioned closer to markets and thereby affording them more opportunities. There is therefore a serious need to address food insecurity challenges, especially for those households who do not have access to productive resources and therefore cannot produce their own food.

The problem of food insecurity is multifaceted in nature, with multiple manifestations and causations, thus making it a problem that requires comprehensive solutions (Hendriks, 2015). How different people experience deprivation remains a perplexing question and this has been a limitation as far as monitoring food insecurity interventions is concerned (Headey & Ecker, 2013). It is important to note that food insecurity is not a static condition but occurs in a sequence of stages of food deprivations that are followed by behavioural patterns that occur as a result of increasing resource constraints (Hendriks, 2015, citing Rose *et al.* 1995). In order to completely understand the complexity of food (in)security and effectively target interventions, we need to clearly define the experiences and causes, as well as the consequences, of food insecurity and fully understand how every single dimension of food insecurity contributes and reinforces the problem (Hendriks, 2015).

Although improving food security is a national priority in South Africa, the country still lacks a food security monitoring and evaluation framework that could be used to inform policies and effectively assess the effects of food security intervention programmes (Hendriks *et al.* 2016). The approach of food security interventions in South and Southern Africa have taken a 'disaster management ' approach, rather than having a more longer-term development focus, and it has primarily focused on food production as the main determinant of food security (Misselhorn, 2009, citing Holloway, 2003). Although national food security in South Africa is being achieved, the rates of household and individual food insecurity, as well as under-nutrition rates, are at unacceptable levels and that should be a major priority for the national government (Hendriks & Olivier, 2015).

The findings of the South African National Health and Nutritional Examination Survey (SANHANES-1) have revealed that only 45.6% of the population in South Africa were food secure, while 28.3% were at risk of hunger, and 26.0% were food insecure (Shisana *et al.* 2013:145). The findings also reported that the largest percentage of households that experienced food insecurity is located in urban informal settlements (32.4%) and in rural formal dwellings (37.0%). which are mainly comprised of people from the black African and coloured population groups (Shisana *et al.* 2013:145). The findings of the SANHANES-1 study provide evidence that urban food insecurity is a reality that is experienced by a significant number of households in South Africa, and this presents the need for interventions to be made that are targeted at relieving these households from this condition. Failure to address this national threat will result in more households being pushed into food insecurity and poverty,

thus increasing vulnerability to Non-Communicable Diseases (NCDs) and other health issues, such as malnutrition.

Although the percentage of households who experience hunger in South Africa has significantly declined during the period between 2002 and 2013 from 23.8% to 11.4%, respectively, the percentage of households who experienced difficulty in accessing food was reported at an alarming rate of 23.1% in 2014 (Stats SA, 2014:59). In 2016, the percentage of households with inadequate access to food was reported at 22.3% (Stats SA, 2016:59). This indicates that there was no significant improvement in the rate of households who experienced inadequate access to food between the period 2014 and 2016 in South Africa . It is against this backdrop that this study examined the extent of food insecurity in the urban households of Tshwane and identified factors that are associated with food insecurity thereof. It can be noted that this study will not be attributing causality[1] to the factors that are found to be statistically significant in their association with food insecurity.

1.2 RESEARCH OBJECTIVES

The main objective of this study was to investigate the food security status among low-income households in Tshwane in order to determine the extent and the nature of food insecurity in these communities.

The specific objectives of the study are to:

1. Assess the food insecurity status among low-income households in Tshwane.
2. Identify factors associated with food security status among low-income households in Tshwane.
3. Assess the prevalence of food insecurity by age-group among low-income households in Tshwane.
4. Assess the extent of own production of fruits and vegetables among food-insecure households.

[1] Causality refers to a relationship whereby variations in one variable results in a change in another variable (Oppewal, 2010).

5. Assess the extent of external support in the form of food parcels among food insecure households.

1.3 HYPOTHESES

Although this study is exploratory in nature, previous work conducted in different parts of the world, in a similar context, allow the formulation of expectations about the relationship between the outcome variable, food security status, and the set of explanatory variables. The following hypotheses, in line with the study objectives, were constructed.

- Based on the notion that South Africa is food secure at a national level, at least at the time of survey, it was hypothesised in this study that more than 50% of the sampled households in urban areas, such as Tshwane, will be food secure.

- The literature (Mannaf & Uddin, 2012; Zakari, Ying, & Song, 2014) suggests that socioeconomic variables are associated with food security status. In this study, it was hypothesised that the place of residence, type of dwelling, condition of dwelling and availability of electricity, among other factors, have a statistically significant association with household food security status.

1.4 SIGNIFICANCE OF THE STUDY

This study contributes to the knowledge of urban household food security by focusing on the access dimension of food security for urban households who purchase most of the food they consume, and who may not have access to farmland or plots for gardening to produce their own food in order to realise their food security needs. The valuable knowledge generated from this study will add to the growing literature that appreciates the multi-dimensional nature of household food security beyond the traditional focus on food production, thereby improving the effectiveness and efficiency of policies that are targeted at alleviating food insecurity in urban settlements, where most households rely mainly on income to gain access to food.

1.5 OUTLINE OF THE DISSERTATION

This dissertation is organised as follows: Chapter One gives background information and the problem statement, the research objectives, and the hypotheses of the study. Chapter Two provides a review of relevant literature on the definitions and concepts, as well as the conceptual framework of food and nutrition security. The chapter also reviews literature on the different measurements and indicators that are used to determine household food security status, as well as literature on the prevalence of hunger and food insecurity in South Africa. Chapter Three presents a detailed outline of the methodology used, as well as background information on the study area, survey instruments, sampling procedure and the questionnaire design. Chapter Four provides the results of the study and the discussion thereof. Lastly, Chapter Five provides a summary, conclusions, and the policy recommendations of the study.

CHAPTER TWO:
MEASURING FOOD SECURITY: CONCEPTS AND METHODS

2.1 INTRODUCTION

The main objective of this study was to assess the food security status of low-income households in the area of Tshwane, South Africa. In this chapter, literature on the measurement of household food security in urban areas is reviewed. The chapter commences by discussing definitions and concepts regarding urban household food security and the evolution of these concepts over time. The prevalence of hunger and food insecurity among urban households in South Africa is then discussed, followed by a review of some of the empirical studies on food security that have been conducted in South Africa. The chapter concludes by discussing the different measurement tools that are used in measuring household food security.

2.2 Defining food security

2.2.1 The evolution of food security over the years

Historically, food security has been defined with regard to the household and community, regional, national and global supply of food. However, as the concept has evolved over time, the definitions have been modified and broadened to include not only food supply, but also other dimensions such as access, vulnerability and sustainability (Maxwell, 1996). The term "food security" became more apparent in the 1970s in developing countries where food availability was seen as the main obstacle to achieving sufficient food for all (Coates, 2013). During this period, national policies were aimed at increasing food production in order to achieve "food self-sufficiency" – which is the ability to produce enough food to feed the population through domestic channels alone (Coates, 2013).

Over time, Amartya Sen (1981) introduced a paradigm shift to the concept of food security through his famous argument that focused on "a lack of entitlements, rather than a lack of food which eventually birthed the access dimension of food security" (Sen, 1981). This was evidently seen in the World Bank's widely used definition of food security at that time, which defined food security as "access by all people at all times to enough food to lead an active and healthy life" (FAO, 1996, citing World Bank, 1986). At that stage, food security and nutrition

were viewed in isolation. Food security was closely related to agriculture, while nutrition was viewed as a health sector issue (Coates, 2013).

Maxwell and Frankenburger (1996, citing Maxwell, 1996) summarised the conceptual literature on food security according to four important aspects, namely:

1. There is a need to specify that the concept of "enough" food is a subjective concept, as it refers to the number of calories that are required by an individual for an active and healthy lifestyle (Maxwell, 1996).
2. Access to food is dependent on food entitlements which can be derived at individual, household or state level from a variety of resources, including human and physical capital (Maxwell, 1996).
3. The level of vulnerability to food insecurity is determined by the extent of the risk of entitlement failure (Maxwell, 1996).
4. Food insecurity can exist permanently (chronic food insecurity), temporarily (transitory food insecurity) or in cycles (Maxwell, 1996).

As the concept of food security evolved over the years, more and more deconstructed definitions were developed. The Food and Agricultural Organization (2006) defines food security as a situation that exists when there is economic access to enough food that is safe and nutritious for every person to meet their dietary needs as well as their food preferences, and to live a healthy and active lifestyle at all times (FAO, 2006b). DAFF (2011) defines food security as the ability of every individual to obtain sufficient food on a daily basis.

Food security is multi-directional in nature, meaning that food security exists in different dimensions, namely: the availability dimension, which refers to the production of sufficient food at national level; the food use dimension, which refers to the ability of households or individuals to utilise food appropriately with the relevant basic nutrition information; and the access dimension, which refers to the ability of every individual to obtain sufficient and nutritious food on a sustainable basis (DAFF, 2011). For an individual or household to be considered as food secure, they must have access to food that is: (1) sufficient in quantity; (2) adequate in nutritional quality; (3) culturally acceptable; (4) safe; and (5) certain and stable (Coates, 2013).

Figure 2.1 below illustrates some of the factors that contribute to the different dimensions of food insecurity. The second panel, for example, shows the different factors that affect food security at household level, such as high market prices and low income due to a lack of education and skills (International Federation, 2004:8). All these factors are summarised as factors that may result in inadequate access to food for the household. At the individual level, factors that may result in inadequate utilisation of food include cultural beliefs that restrict the consumption of certain foods, as well as not having sufficient knowledge about nutrition, which can result in a loss of certain nutrients during food preparation (International Federation, 2004:8). It is important to note that this figure, although very useful in understanding the different factors that affect the different dimensions of food security, does not represent the fourth dimension, which is stability.

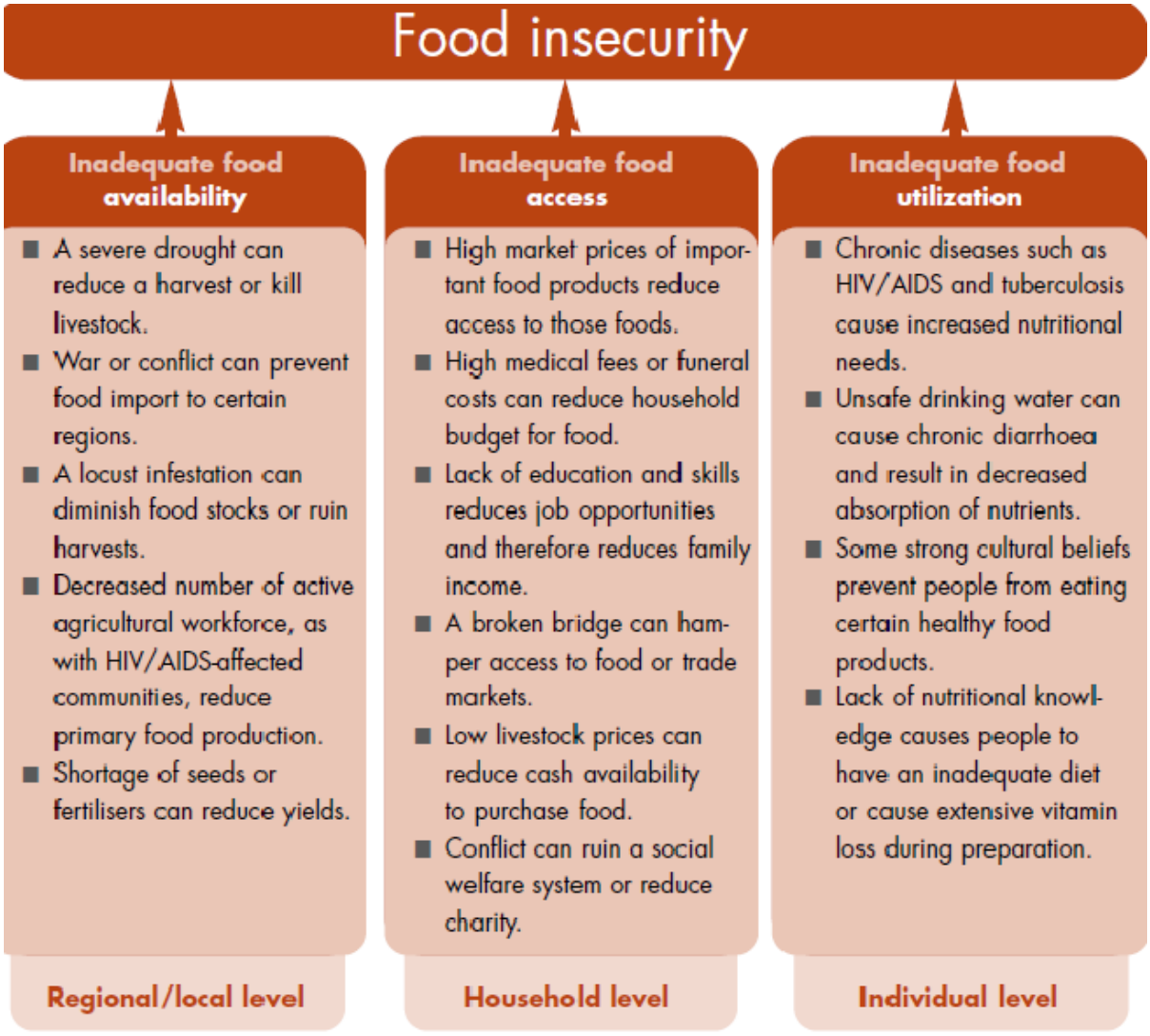

Figure 2.1: Different dimensions of food insecurity

Source: International Federation of Red Cross and Red Crescent Societies (2004)

2.2.2 The food security conceptual framework

Figure 2.2 below illustrates the conceptual framework of food and nutrition security that has been extracted from Smith *et al*. (2000:201). This framework provides a useful way to view the food security dimensions and how they relate, as well as the level at which they exist (i.e., global, national, household, and/or individual). The dimension that relates to the global and national level is food availability, which talks to food production as well as the available food supply, while at household and individual levels, the critical issue is the ability to access the available food, which relates to household and individual income (Carletto *et al*. 2013). The framework makes a distinction between food and nutrition security, whereby food security is viewed as a basic need and a foundation to determine nutrition security (Carletto *et al*. 2013). The fourth dimension of food security, which is stability or resilience, speaks to the adequate access to food that is independent of any economic- or climate-related shocks, and it can affect food security at global and national, as well as household and individual, levels (Carletto *et al*. 2013).

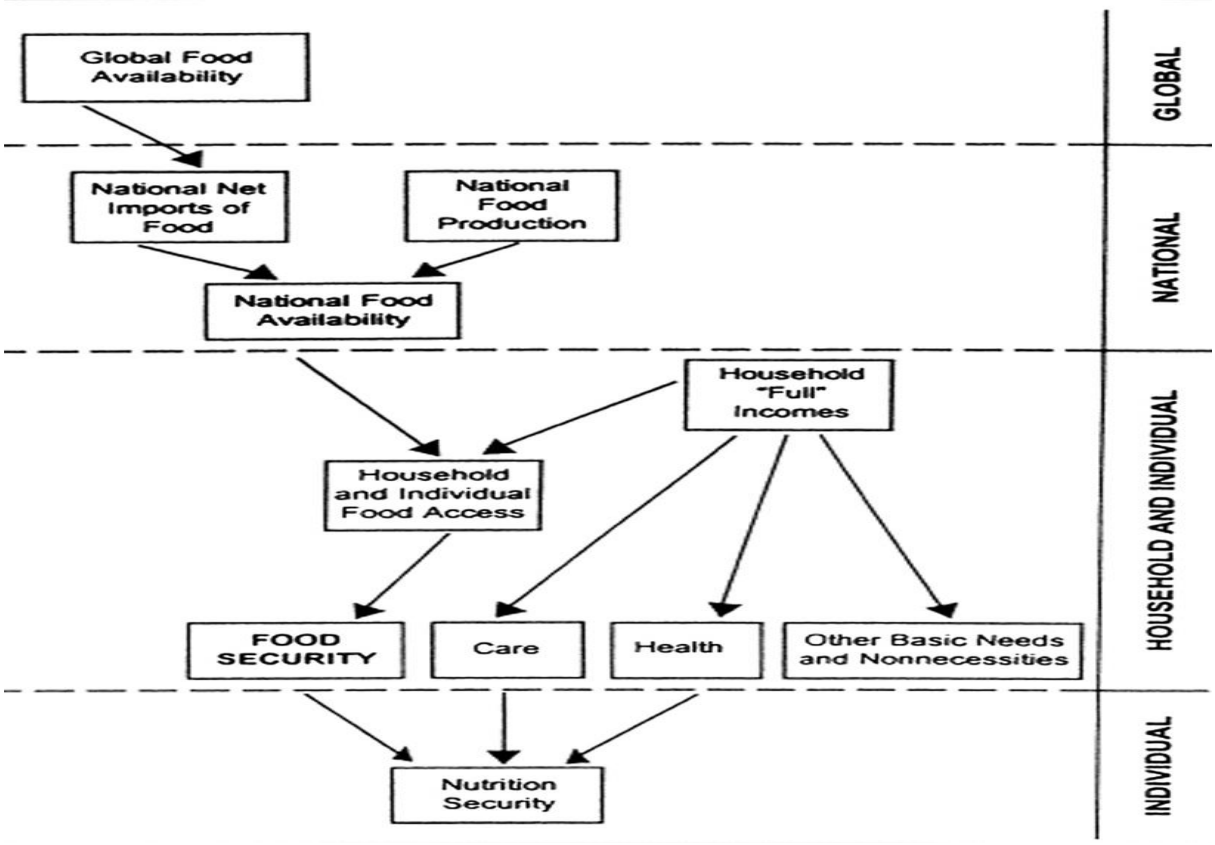

Figure 2.2: The Conceptual Framework of Food and Nutrition Security

Source: Smith et al. (2000)

2.3 THE PREVALENCE OF HUNGER AND FOOD INSECURITY AMONG URBAN HOUSEHOLDS IN SOUTH AFRICA

In South Africa, national food security is being achieved as the country is able to produce sufficiently to meet its food needs and according to Hendriks & Olivier (2015:1) the country has reported national food security for over decades. However, universal household food security has not yet been achieved, as there are households who do not have sufficient food because of numerous factors that relate to poverty in the country (Manyamba *et al*. 2012). Due to the structural inequalities and income distribution that exist in South Africa, not every individual is able to access sufficient food. As a result, chronic poverty and food insecurity exist (Hart, 2009). There is a need for intervention programmes to be developed that are targeted at ensuring individual and household food security for all in this nationally food-secure country.

The growing number of households migrating from rural to urban areas poses new societal challenges for urban populations all over the world (Gina, 2003). Urban areas are vulnerable to population urban influx, as people migrate from less economically favourable places (such as most rural areas) to urban areas in search of better economic opportunities. This urban influx can result in problems such as lack of housing, sanitation, and increased numbers of hunger and food insecurity (Van der Merwe, 2011). The main challenge with ensuring food security in urban areas is that the bulk of the urban population does not produce any of the food they consume and have to rely on purchases to meet their food security needs. This implies that food security is highly dependent on the ability of every individual or household to generate enough money to purchase the food that they need (Van der Merwe, 2011).

Food insecurity has historically been classified as a rural problem (Battersby, 2012). Although hunger has historically been seen as a rural problem, urbanisation has played a vital role in the shift of poverty from rural to urban parts of the country (Walsh & Van Rooyen, 2015). The food problem in urban areas cannot be attributed to food shortages, but rather to the inability of households to access the available food (Battersby, 2012). It is necessary to highlight the point that in the urban context, food insecurity is not viewed as a problem of food availability, but rather as one of food access. Urban food insecurity is a major developmental concern and it has been reported that in 2013, 26% of South African households suffered from food insecurity, while 28,3% of households were at risk of food insecurity (Shisana *et al*. 2013:144).

The majority of these households that are either food insecure or vulnerable to food insecurity reside in rural formal as well as urban informal settlements (Shisana *et al*. 2013:145).

In addressing these challenges, it is important to realise that although being involved in agricultural activities can contribute positively to food security, this option may not necessarily be appropriate in urban informal settlements where there is limited or no access to production land. It is therefore necessary for intervention programmes to be developed to also consider those who cannot be involved in agricultural activities due to limited agricultural resources, such as land and water. The results of the GHS (2010) indicated that 25% of rural households had inadequate access to food, relative to 18% in the urban areas (Stats SA, 2010:6). The significant difference can be attributed to a number of factors, such as higher food prices for food items not produced in rural areas relative to urban areas; which result in the long traveling distances to the market as well as poor infrastructure. Another factor could be sparse income opportunities, since there are limited employment opportunities in the rural areas, as compared with urban areas.

According to the findings of SANHANES-1, the largest percentages of households that experienced food insecurity in South Africa are in urban informal settlements (32,4%) and in rural formal dwellings (37,0%) (Shisana *et al.* 2013:145). These alarming statistics require policy interventions that are directed towards addressing these issues. A study was conducted to investigate the household food security and hunger status in rural and urban communities in the Free State Province of South Africa (Walsh & Van Rooyen, 2015). The study discovered that although hunger and household food insecurity are prevalent in both rural and urban areas in the province, there were higher levels of hunger and food insecurity in the urban areas (Walsh & Van Rooyen, 2015). The study also reported that urban households showed greater vulnerability to food insecurity, when compared with rural households in the Free State. Urban households experienced significantly higher food shortages, relative to the rural households, where 81% of urban households and only 46% of rural households reported that they experienced food shortages, while the unemployment rates were 56,3% and 25,5% in the urban areas and rural areas, respectively. Own food production (which was assessed by looking at the percentage of households who had vegetable gardens in their backyard for sustenance) was significantly lower in urban areas (37% urban; 43% rural), rendering them more dependent on income to meet their food needs (Walsh & Van Rooyen, 2015:11).

A situational analysis conducted in the informal settlements in South Africa, using a problem and an objective tree to analyse the situation of the poor, found that the main challenges that are faced by urban households residing in informal settlements are chronic urban household food insecurity, the prevalence of malnutrition, and income poverty (Rutengwe, 2004). Over 10 years later, these problems still have a detrimental impact on the livelihoods of many South African households and this poses a threat to the future development of the country.

2.4 OVERVIEW OF SOME STUDIES PRESENTING DATA ON FOOD SECURITY CONDUCTED IN SOUTH AFRICA

As issues of food (in)security become a growing concern, more studies are being launched and there is a growing body of literature with regard to food (in)security in South Africa. This section provides an overview of some of the national studies that have been conducted in South Africa, as well as a brief summary of their key results, in order to motivate the significance and relevance of the current study. It is important to note that food security is not homogenous in nature and it cannot be easily measured in economic, energy availability, or anthropometric terms, and that a "perfect single measure that captures all aspects of food insecurity" does not exist (Hendriks, 2016:4, citing Webb *et al*. 2006).

2.4.1 General Household survey (GHS)

The General Household Survey (GHS) is a national survey that is conducted annually on South African households, measuring different socio-economic factors that affect the living circumstances of households (Statistics South Africa, 2016). Some of the data collected include data on education, health, social development, housing, access to services and facilities, food security, and agriculture. To measure Household Food Security, the GHS makes use of the Household Food Insecurity Access Scale (HFIAS) which is aimed at determining households' access to food (the HFIAS is explained in Section 2.8 of this chapter). According to the results of the GHS, there was a substantial decrease in the percentage of households that experienced inadequate or severely inadequate access to food in the period between 2010 and 2016, from 23,9% to 22,3%, respectively (Stats SA, 2016:59). Over the same period (the years 2010–2016), there was also a decrease in the percentage of households that experienced hunger, from 23.8% to 11.8%. In addition, the percentage of individuals that experienced hunger decreased from 29,3% to 13,4% over the same period (Stats SA, 2016:59).

The GHS also indicates that the percentage of households that are vulnerable to hunger has substantially decreased over the years. Comparing the results of the survey for the years 2002, 2005 and 2011 shows that the percentages of households that were vulnerable to hunger were 23,5%, 16%, and 11.5%, respectively, indicating a tremendous improvement (Stats SA, 2012:41). These results indicate that, generally, South Africa was making substantial progress with regard to achieving food security for all, and they also indicate that adequate access to food is improving at both household and individual levels. Hart (2009) argues that, when it comes to the assessment of food security, the GHS has advantages as well as disadvantages. One advantage being the fact that the questionnaire contains questions that are subjective in nature, thus indicating self-reported experiences on hunger, while a disadvantage is that it does not report on the quantity and quality of food, or on the consumption patterns of the household (Hart, 2009).

2.4.2 The National Food and Consumption Survey (NFCS)

The 1999 National Food and Consumption Survey (1999 NFCS) is a cross-sectional survey that was conducted in South Africa with the aim of determining the anthropometric status of children aged 1 to 9 years old, as well as their nutrient intake and factors that influence their dietary intake (Labadarios *et al.* 2005). By using data from the 1996 Census, a nationally representative sample of 2894 children, representing all the 9 provinces, was obtained and by means of a questionnaire, the socio-demographic status, food purchasing practices, dietary intake, hunger, and other socio-economic factors were assessed. Moreover, anthropometric measurements were used to determine the nutritional status of the sampled children (Labadarios *et al.* 2005).

The results of this study indicate that at national level, nearly one in five children are stunted (height-for-age < -2SD from the NCHS reference median), while the children living in urban informal areas were more affected by stunting than were the children living in formal urban areas (16%) (Labadarios *et al.* 2005). These results emphasize the importance of research objectives 1 and 2, as defined in section 1.2. Other results of the 1999 National Food and Consumption Survey indicate that only one in four households (25%) is food secure, while one in two households (52%) and one in four households (23%) is experiencing hunger and is at risk of hunger, respectively (Labadarios *et al.* 2005:536). Energy and micronutrient

deficiencies were found to be very common in children at national level, hence the alarmingly high prevalence of stunting that was discovered (Labadarios *et al.* 2005:536).

The 1999 NFCS became a vital source of information for the South African Department of Health (DOH) as it provided a strong basis for the food fortification legislation that was implemented in October 2003, whereby manufactures are now obliged to add Iron, Zink, Vitamin A, Thiamine, Riboflavin and Vitamin B to maize and flour (Labadarios *et al.* 2007). The study has helped to spread awareness to the public, as the Department of Health used the results of the study to develop and distribute educational material on the effects of micronutrient deficiencies, especially on the growth and development of young children (Labadarios *et al.* 2005). The NFCS was conducted again in 2005 and the percentage of households experiencing hunger was reported at 51.6%, while 28% of the households were at risk of hunger, and only 20% were food secure, indicating a slight improvement when compared with the 1999 NFCS results (Labadarios *et al.* 2007:254).

These results are significantly higher than the results reported by the GHS are. The GHS reported that 16% of households in South Africa were vulnerable to hunger in 2005, while the NFCS reports a percentage of 51.6 households over the same period. The discrepancies could be attributed to the different methodologies applied, as well as the sampling size (Jacobs, 2009).

2.4.3 The Income and Expenditure survey (IES)

The Income and Expenditure Survey is a nationally represented survey that is conducted by Statistics South Africa, main objective of which is to determine the average expenditure patterns and calculate the Consumer Price Index that determines the basket for consumer goods in the country (Stats SA, 2002). The survey is conducted every five years and it is very useful in determining food security, as it contains data on food expenditure, the composition of the food basket in the household, and dietary diversity, which can be used as a proxy for estimating the level of household security (Stats SA, 2002). According to Hart (2009), although the Income and Expenditure survey contains data on household food expenditure, it does not provide adequate information for estimating food security, such as the quality and the quantity of food purchased, and the survey does not reflect the socio-economic status of the household (Hart, 2009).

The results of the IES indicate that, with regard to food poverty (an indication of household food access), there has not been an improvement in South African households in the period from 1995 to 2010/2011, and instead, food poverty has increased substantially over this period (Stats SA, 2011). In 1995, food poverty was recorded at 43% (i.e. 43% of the households in South Africans were not able to purchase a nutritionally adequate diet in order to achieve food security), while in 2000, food poverty was recorded 40%. Furthermore, in the periods 2005/2006 and 2010/2011, 70% and 80% of the households were unable to purchase a nutritionally adequate diet, respectively (Stats SA, 2011). The alarming increases in the food poverty rates could be attributed to; among other factors, the food price hikes that have been experienced in South Africa which affect affordability and thus food access ,thereby rendering more and more households and individuals vulnerable to food insecurity.

2.4.4 The 2008 South African Social Attitude Survey (SASAS)

The South African Social Attitude Survey (SASAS) is a national survey whose primary objective is to collect, analyse and disseminate data on the country's political and economic structures, as well as on the attitudes, beliefs and behaviour patterns of its diverse populations (Pillay, Roberts & Rule, 2006). The survey was introduced in 2002 and it has been conducted at regular intervals ever since, thus providing long-term assessments of continuity and changes on key socio-economic factors, as well as on the attitudes and behavioural patterns of the South African population (SASAS 2nd report, 2010). A nationally representative sample of about 5000 adults over the age of 16 is obtained in order to conduct this time series survey (SASAS 2nd report, 2010). A hunger component was introduced in the 2008 round of the SASAS, whereby the CCHIP index questions were used to evaluate the perceptions of hunger held by the interviewees, and these responses are used to derive the state of hunger in the households (Pillay *et al.* 2006). The results of the 2008 SASAS indicated that the percentage of households that experienced hunger/food insecurity, nationally, was 25,9% (Pillay *et al.* 2006). These results are, however, inconsistent with the results of the GHS (13%) over the same period, which could be attributed to methodological differences.

2.5 MEASURING FOOD SECURITY

Food security is not homogenous in nature – it is a condition that can change over time, and these changes may be temporary, cyclical, medium-term or even long-term (Hendriks, 2015).

The occurrence of these different food security conditions leads to changes in the status of food security, moving the individual or household along a continuum of being sometimes more or less food secure at a given period of time (Hendriks, 2015). Moreover, since food insecurity can be used to describe a condition whereby individuals or groups of individuals (such as households) are unable to access food, it is therefore possible to measure it in terms of its severity (Cafiero, 2019:2). Food insecurity as a measurable construct therefore implies that at a given point, one can clearly compare the individual's or household's level of food insecurity in terms of the severity of their condition (Cafiero, 2019:2).Therefore, it is imperative that when food (in)security is measured, a distinction must be made regarding the dimension of food security (availability, access, utilisation, and stability) that is measured, as well as the level at which it is measured (individual, household or community, etc.).

The complexity and multidimensionality of food security comprise one of the reasons why, even after so many decades, we still lack a food security measurement that can be applied across any context and that is universally accepted (Hendriks *et al.* 2016). Because of their complexity, food security indicators can be challenging as far as ensuring their validity, and this can be attributed to the fact that there is no one, universally accepted indicator of food security that can capture all the dimensions of food security (Leroy *et al.* 2015). Just like any other indicators, food security indicators are expected to be valid, well-constructed, reliable, and accurate, and in addition to this, food security indicators are expected to clearly specify which dimension or component of food security is being assessed (Leroy *et al.* 2015). Indicators that are commonly used in the assessment of food security, more specifically the access dimension of food security, will be reviewed in the following section.

The food security indicators are grouped into three categories, based on their conceptual content as well as their construction; namely consumption behaviour (coping strategy) indicators, and experience-based indicators, as well as dietary diversity (Maxwell, Coates & Vaitla, 2013; Leroy *et al.* 2015).

2.5.1 Consumption behaviours

Consumption behaviours comprise an indirect measure of food insecurity by measuring the behaviours that are related to the consumption of food (Maxwell *et al.* 2013). The Coping Strategies Index (CSI) is a typical example of this type of food security indicator (Maxwell *et*

al. 2013). Coping strategies can be defined as the reactions that people make in response to their food insecurity, as well the actions that they take to mitigate their adverse conditions (Leroy *et al.* 2015). Four basic categories are used to organise coping strategies, namely changes in diet, short-term measures to increase food availability in the household, short-term measures to decrease the number of people to feed, and rationing approaches or managing the shortfalls (Leroy *et al.* 2015).

2.5.1.1 The Coping strategy index (CSI)

The CSI is a food security indicator that uses a set of questions about how households cope with food shortages; the answers to these questions are then combined to form a simple numeric score which is then weighted to form an index that will indicate the food security status of the household (CARE/WFP, 2003). The intended purpose of the CSI was to determine the causes, consequences, and the early warnings of food insecurity in order to identify households that are vulnerable to food insecurity (Leroy *et al.* 2015). Firstly, the CSI measures frequency (how often the coping strategies are used) and then severity (the degree of food insecurity that is suggested by the coping strategies employed) (CARE/WFP, 2003).

The reliability of the CSI has not been demonstrated yet and its construction relies on focus group discussions (Leroy *et al.* 2015). It is important to also note that, although coping strategies comprise a useful tool in understanding behavioural patterns of households when their access to food is compromised, coping strategies do not necessarily measure the access dimension of food security since their adoption is highly dependent on their availability to the household or group of interest (Leroy *et al.* 2015). Table 2.1 below illustrates a list of the types of questions that can be used for understanding coping behaviours. This is, however, not a generic list of questions that can be applied in all situations; sometimes the list has to be adjusted to the local community standards or norms (CARE/WFP, 2003).

Table 2.1: The Coping Strategy Index

In the past 30 days:
1. How many days have you had to eat food that you would not prefer because you do not have, or do not have money to buy the preferred food?
2. How many days have you had to borrow food, or buy on credit because you do not have money to buy food?
3. How many days have you had to rely on wild foods, or harvest immature food crops?
4. How many days have you had to consume seed stock?
5. How many days have you had to leave your children to beg, scavenge or fend for themselves?
6. How many days have you had to ration portion size because you do not have enough food, or do not have money to buy food?
7. How many days have you had to restrict your consumption to make sure the children get enough to eat because you do not have, or do not have money to buy food?
8. How many days has your family had to go the whole day without eating?

Source: CARE/WFP (2003)

CARE/WFP (2003) summarises the following typical coping strategies that households faced with food insecurity are likely to employ. It is important to note that there are two types of coping strategies, namely short-term coping strategies (immediate adjustments in consumptions patterns) and long-term coping strategies (longer-term adjustments, altering income earnings) (CARE/WFP, 2003). These strategies are as follows (CARE/WFP, 2003):

a. First, households may change their diet. For instance, households might switch food consumption from preferred foods to cheaper, less-preferred substitutes.
b. Secondly, the household can attempt to increase their food supplies using short-term strategies that are not sustainable over a long period. Typical examples include borrowing or purchasing on credit. More extreme examples include begging or consuming wild foods, immature crops, or even seed stocks.
c. Thirdly, if the available food is still inadequate to meet the needs, households can attempt to reduce the number of people that they must feed by sending some of them elsewhere (sending children to a neighbour's house when those neighbours are eating).
d. Finally, and most commonly, households can attempt to manage the shortfall by rationing the food available to the household (cutting portion sizes or the number of meals, favouring certain household members over other members, or going whole days without eating.

2.5.2 Experience-based measures

Experience-based indicators are very useful for monitoring changes in food security among households as well as for providing information about the consequences of household food security (Leroy *et al.* 2015). These measures combine behavioural and psychological measures to assess the level of food security (Maxwell *et al.* 2013). Examples of this type of measure include the Household Food Security Scale, the Household Food Insecurity Access Scale (HFIAS), and the Community Childhood Hunger Identification Project .The following section provides a more detailed discussion of these experimental measures.

2.5.2.1 The Household Food Security Scale

The Household Food Security Scale constitutes a set of food security questions that were combined to form a scale that measures the severity of food insecurity that is experienced at household level (Bickel *et al.* 2000). The scale uses numerical values, ranging from zero to ten, with zero indicating that the household has not experienced any condition of food insecurity, while a score of ten will indicate that the household has experienced all the conditions of food insecurity within the specified period (Bickel *et al.* 2000). The following questions in Table 2.2 below illustrate the kinds of food security questions that are included in the Household Food Security Scale (Bickel *et al.* 2000).

Table 2.2: Food security questions included in the Household Food Security Scale

1.	Did any child in the household cut the size of their meal or go without food with the consequences of hunger within the specified period?
2.	Did the household have any anxiety that the household food budget or food supply may be insufficient to meet basic needs within the specified period?
3.	Did the household experience any food shortages, without money to obtain more within the specified period?
4.	Is the food eaten by household members inadequate in quality or quantity?
5.	Did any adult in the household make any adjustments to normal food use, substituting fewer and cheaper foods than usual; or reduce food intake within the specified period with the consequences of reduced intake such as the physical sensation of hunger or loss of weight?

Source: Household Food Insecurity Access Scale Indicator Guide

The food security questions listed in Table 2.2 illustrate the point that households go through different phases of food insecurity. The first phase is where households start experiencing anxiety about the sufficiency of their food supplies and they respond by making some adjustments to their budgets as well as to the type of food that they eat. Secondly, the household goes through a phase whereby adults have to cut the sizes of their meals or go without any food. As the situation worsens, the adults will then experience hunger, but they spare their children from this experience. In the third phase, which is the most severe instance, children also go through periods of hunger as a result of reduced food intake, or in extreme cases, periods of no food at all (Bickel *et al.* 2000). While these questions are sufficient for determining the food security status of the household, it is important to note that these questions do not address the nutritional adequacy of the food consumed. If such information is required, further studies will need to be conducted (Bickel *et al.* 2000). The Household Food Security Scale uses four categories to classify households according to the severity of the conditions, depending on how they responded to the food security questions. The categories are:

- **food secure** where all members of the households show no signs of food insecurity,
- **food insecure without hunger** whereby individuals in a household start displaying signs of food deprivations,
- **food insecure with hunger (moderate)** where adults in the households start reducing food intakes in the presence of a hunger sensation and,

- **food insecure with hunger (severe)** which is the most severe category whereby all individuals in a household including children have experienced periods of hunger with no or reduced food intakes (Bickel *et al.* 2000).

2.5.2.2 Household Food Insecurity Access Scale

The Household Food Insecurity Access Scale (HFIAS) was developed by the US Agency for International Development (USAID), through the Food and Nutrition Technical Assistance Project (FANTA), to assist development organisations in evaluating their food security programmes in developing countries (Leroy *et al.* 2015). It measures household food insecurity (access) by using a set of questions (which are known as the domains for food insecurity experiences) based on the assumption that households who are faced with food insecurity often follow a pattern of 'predictable responses' (Coates *et al*. 2007). The set of questions comprises what is known as the universal domains of household food insecurity and they are compiled into a questionnaire, which is then be used to assign households along a food security continuum, ranging from food secure to severely food insecure. This information is then collated to determine the prevalence of household food insecurity in the given population. Table 2.3 below illustrates the generic questions that are used for the HFIAS. It can be observed from the questions that the questionnaire mainly targets three aspects of inadequate access: anxiety and uncertainty about the household food supply, insufficient quality (includes variety and preferences of the type of food), and insufficient food intake and its physical consequences.

Table 2.3: Generic questions used for the HFIAS –Anxiety and uncertainty about the household food supply

1. Did you worry that your household would not have enough food?
Insufficient quality (includes variety and preferences of the type of food):
2. Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
3. Did you or any household member have to eat a limited variety of foods due to a lack of resources?
4. Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
Insufficient food intake and its physical consequences:
5. Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
6. Did you or any household member have to eat fewer meals in a day because there was not enough food?
7. Was there ever no food to eat of any kind in your household because of a lack of resources to get food?
8. Did you or any household member go to sleep at night hungry because there was not enough food?
9. Did you or any household member go a whole day and night without eating anything because there was not enough food?

Source: Household Food Insecurity Access Scale Indicator Guide

Table 2.4 below illustrates an example of how these questions would appear in a questionnaire. It shows that these questions consist of two components; the first one deals with occurrence and the other is concerned with the frequency of the occurrence over a period of 30 days (Coates *et al.* 2007).

Table 2.4: Example of how questions would appear in a questionnaire

In the past four weeks, did you worry that your household would not have enough food?
0 = No (skip to Q2)
1 = Yes
a. How often did this happen?
1 = Rarely (once or twice in the past four weeks)
2 = Sometimes (three to ten times in the past four weeks)
3 = Often (more than ten times in the past four weeks)

Source: Household Food Insecurity Access Scale Indicator Guide

2.5.2.3 Community Childhood Hunger Identification Project Index (CCHIP index)

The Community Childhood Hunger Identification Project Index (CCHIP index) is an eight-question scale that has been developed in order to determine household, individual, and child food insecurity, food shortages, perceived food insufficiency and altered food intake as a result of a constraints on resources (Labadarios *et al*. 2005). Table 2.5 below sets out the eight questions from the CCHIP.

Table 2.5: Questions on food insecurity and child hunger, Community Childhood Hunger Identification Project index

Household-level food insecurity
1. Does your household ever run out of money to buy food?
2. Do you ever rely on a limited number of foods to feed your children because you are running out of money to buy food for a meal?
3. Do you ever cut the size of meals or skip meals because there is not enough money for food?
Individual-level food insecurity
1. Do you ever eat less than you should because there is not enough money for food?
Child hunger
1. Do your children ever eat less than you feel they should because there is not enough money?
2. Do your children ever say they are hungry because there is not enough food in the house?
3. Do you ever cut the size of your children's meals or do they ever skip meals because there is not enough money to buy food?
4. Do any of your children ever go to bed because there is not enough money to buy food?

Source: Labadarios et al. (2005)

2.5.2.4 Dietary diversity and food frequency

Dietary diversity and food frequency indicators measure food security by capturing the number of different food groups that are consumed by people, as well as the frequency of that consumption (Maxwell *et al.* 2013). An example of this type of indicator is the World Food Program's Food Consumption Score (FCS), as well as the Household Dietary Diversity Score (HDDS), which is mostly used by the Food and Agricultural Organization (FAO) of the United Nations (Maxwell *et al.* 2013). The Statistics SA Income and Expenditure Survey is one example of a national survey that makes use of the dietary diversity food security indicator (Stats SA, 2002). The IES uses dietary diversity as a proxy for determining the food security status by using a nationally represented sample of adults who are 16 years and older (Stats SA, 2002).

2.5.3 Self-assessment measures

These measures are very subjective in nature and easy to manipulate, as they involve asking individuals to assess their current food security status as well as any changes in their livelihood over a period of time (Maxwell *et al.* 2013). One example of such a measure is the self-assessed food security measure, whereby households are asked to describe their food security status as compared with a "normal" year on a scale (Maxwell *et al.* 2013). Self-assessment measures (SAFS) are highly subjective in nature and very easy to manipulate, thereby compromising their usefulness as far as analysis is concerned.

2.5.4 Selected method for the current study

The various indicators and measurements are very useful in determining the food security status of households, as well as of individuals. They are also applicable to both rural and urban food security. As with any other measurement or indicator, the food security indicators that were discussed in the previous section are all subject to measurement problems and disadvantages. In the current study, food security was determined by making use of the Household Food Insecurity Access Scale (HFIAS) to compile food security questions. The U.S. Department of Agriculture (2000), as well as the South African 4-item questions from the General Household Survey were also used as guidelines to compile the questionnaire.

The Household Food Insecurity Access Scale (HFIAS) was selected mainly because it is relatively simple to administrate and it provides a user-friendly approach for measuring the access dimension of household food insecurity. The HFIAS captures household behaviours that will highlight food insufficiency as well as any anxiety that the household could be experiencing over their ability to access food (Maxwell *et al.* 2013).The questionnaire was compiled using the HFIAS questions as a guideline since the HFIAS strongly captures what is known as the universal domains of household food insecurity which can be used to classify the households into a food security continuum that ranges from food secure to severely food insecure (Coates *et al.* 2007). In the case of the current study, the prevalence of food insecurity was then determined by compiling the responses from the food security questions which were further collated and classified in a food security continuum that was categorised as food secure, food insecure without hunger, and food insecure with hunger.

2.6 SUMMARY

Food insecurity is no longer viewed as a food production problem, but rather as being multi-faceted and multi-dimensional in nature. For an individual or household to be considered as food secure, they must have access to food that is sufficient in quantity, adequate in nutritional quality, culturally acceptable, and safe, without having any worry about their ability to access food in the near future. South Africa is classified as a nationally food-secure country that is able to produce sufficiently to meet its food needs. However, household food security has not yet been achieved in some parts of the country, and there are households who still do not have enough food to eat, as well as households that may be vulnerable to food insecurity. Urban food insecurity is a major developmental concern – in urban areas, food insecurity is not viewed as a problem of food availability but rather as one of food access. It is not a problem that can be attributed to food shortages, but rather to the inability of households to access the available food.

Achieving food security in urban areas is highly dependent on the ability of every individual or household to generate enough money to purchase the food that they need, since they are unlikely to grow their own food and most likely to have no access to farmland; hence, food security in urban areas is highly affected by income. Much food security literature is emerging, as more and more studies are being conducted to determine food security at different levels (individual, household and national levels), measuring different dimensions of food security.

In this chapter, different nationally conducted surveys were analysed, namely the General Household Survey, The National Food and Consumption Survey, The Income and Expenditure Survey, and the South African Attitudes Survey. Each of these surveys had a component of food security or a proxy thereof, and they were each analysed and compared were possible, bearing in mind their methodological and sampling differences.

Different indicators that are used in measuring food security were discussed in this chapter. These indicators were mainly classified into three categories namely; consumption behaviour (coping strategy), experience-based, and dietary diversity indicators. It is important to note that these different indicators are all subject to measurement problems and they all have their advantages as well as disadvantages in measuring the different components of food security. In the current study, the indicator that was selected to measure household food security is the Household Food Insecurity Access Scale (HFIAS) because of its ability to capture food insufficiency and any anxiety that the household could be experiencing over their ability to access food which makes it very useful when measuring the access dimension of food security.

CHAPTER THREE:
METHODOLOGY

3.1 INTRODUCTION

The Department of Family Medicine at the University of Pretoria, in consultation with other stakeholders such as medical specialists, social scientists, the Tshwane Municipality and the Tshwane District Department of Health, have conducted a study that aimed to investigate the factors that partly determine maternal and neonatal outcomes in communities that are serviced by Ward Based Outreach Teams (WBOTs) in Tshwane, South Africa. This study aimed to develop WBOT interventions that are locally specific for the prevention of maternal and neonatal mortality and morbidity. The study was based on the initiative of the Department of Health that was formed as a result of the problems experienced in the provision of primary health care services in South Africa after 1994 (Bam *et al.* 2013). The numbers of people with non-communicable diseases, as well as poor maternal and child health, in South Africa were growing substantially, leading the Department of Health to start a health care reform programme in 2009, known as the '2010 Revitalisation of Primary Health Care'. This is a reform that is more proactive, household and community focused, which led to the formation of what is known as the Community Oriented Primary Care (COPC) (Bam & Hugo, 2013).

The basic idea of the COPC is based on the notion that people's health is determined by their social environment, which basically means that primary health care cannot be achieved without considering other social factors at community and individual levels (Bam & Hugo, 2013).The Department of Family Medicine at the University of Pretoria, the Tshwane District office of the Gauteng Department of Health and Social Development, and other stakeholders then developed the framework for implementing the COPC through WBOTs in Tshwane (Bam & Hugo, 2013). The implemented WBOTs consist of approximately 20 Community Health Workers (CHWs) who are under the supervision of a professional nurse (team leader).

This study uses the data that was collected by the University of Pretoria, Department of Family Medicine, in consultation with other stakeholders, as described above. In order to explain the methodology used for this study, we shall make a clear distinction between the two studies by referring to the University of Pretoria's study as the 'main study', while this current study (food security study) will be referred to as the 'current study'. The following section will discuss the

research area, research design, sampling, development of the survey instruments, and the data analysis.

3.2 STUDY AREA

The main study was exploratory in nature and it was conducted in the district of Tshwane in South Africa. It involves about 40-50 WBOTs and it was rolled out for approximately 700 000 people, with the ratio of 1 WBOT:14 000 people. In terms of the population's socio-economic profile, the study area included some of the most deprived communities in Tshwane (Bam & Hugo, 2013). In order for WBOTs to operate optimally, they require information about each person in the community; therefore, to satisfy this need, the Department of Family Medicine/UP, the Foundation for Professional Development (FPD) and Mezzanine Ware developed a mobile phone application that captures all this information in real time. This mobile application is called AitaHealth and it is used by Community Health Workers. Ethics approval for the main study has been granted by the Research Ethics Committee of the University of Pretoria. The AitaHealth application includes several consent statements that are signed by every interviewee to give consent to the data that is electronically captured being used for research purposes. All the collected data was transferred into a data warehouse and encrypted. Access is restricted and limited to only registered users, and only through a username and password.

3.3 SAMPLING

Data was obtained from a household member who was registered by the Community Health Worker (CHW), which means that the data was not necessarily collected from each household member individually, but through the household member who was registered by the CHW therefore it is important to note that this introduced sample selection bias and thus generalisation beyond this sample may be inappropriate . A simple random sampling method was applied in the initial sampling process, since every individual that visited the health centre had an equal chance of being selected for the interview, across all the wards in the Tshwane District.

In addition, the WBOTs that had at least 500 registered individuals at the time when the sampling process was conducted were selected for this current study. A total of 19 Ward Based

Outreach Team (WBOTs) was selected to be part of this study, which is a sufficient representation of the population of interest since it represents about 38% of the total number of WBOTs (19 of the 50 WBOTs). Table 3.1 below illustrates the WBOTs that were included in our sample, as well as the number of individuals who were registered in each WBOT during the period of the survey.

Table 3.1: Sample distribution

WBOT	Number of people registered
Nellmapius Skills Centre Outreach	10 542
Stanza 2 Clinic Outreach Team	9 501
Phahameng Clinic Outreach Team	7 307
Stanza Sports Ground Outreach	6 424
Lusaka Outreach Team 2 - W010	5 140
Lusaka Outreach Team 1 - W010	3 842
KT Motubatse CHC Outreach Team	3 474
Mamelodi West Clinic Outreach	3 264
Soshanguve Block T Outreach Team	2 659
Soshanguve Block TT Clinic Outreach	2 030
Jafta Mahlangu Secondary School	1 992
Ikageng Outreach Team 2 -W040	1 951
Municipal Office Komane Outreach	1 576
Recovery Centre Outreach Team	1 540
Soshanguve Block JJ Outreach Team	1 196
Ikageng Outreach Team 3 - W040	1 090
Ikageng Outreach Team 1 - W040	1 084
Rethabile Sports Ground Outreach	1 079
Daspoort Poli Clinic Outreach	692
Grand Total	**66 383**

3.4 SURVEY INSTRUMENT DEVELOPMENT

In order to effectively develop the survey instruments, reasonable time had to be spent on literature sources in order to gather all the necessary resources. Firstly, it was imperative to determine the nature of the data to be collected, bearing in mind the purpose as well as the use value of the information required. Considerable effort also had to be placed in determining the methods for collecting this data in a systematic and on-going way.

A number of factors were considered with regard to the information required for the survey, namely the conceptual approach (Community Oriented Primary Care), the programmatic context (health priorities), scientific evidence supporting engagement with these priorities (effectiveness of interventions), the mandate of nurse-led CHW teams (legal framework), human resource availability and capability (number, level and quality of services), and financial resources (availability, scale and sustainability of services). In addition to this, it was imperative to consider how the data is going to support the on-going services of the organisation, as well as the follow up visits. This led to the process of creating useful data management tools, bearing in mind the problems of model specification.

Since this data had to be collected for monitoring and evaluation purposes, it was necessary to ensure that the Ward Based Outreach Teams (WBOTs) were functional, even at the most local level, and that they are aligned to the to larger information systems, such as the District Health Information Systems (DHIS), that they feed into. The Health Status Assessment was finally developed in 2010 by the University Of Pretoria Department Of Family Medicine, and implemented in conjunction with the Tshwane District Department of Health in 12 sites.

The questionnaire was divided into 3 sections. Section 1 elicited information on the demographic information of the sampled population, health-related questions, and socio-economic factors, such as the condition of dwelling, water and sanitation, food security and agricultural activities. Section 2 focused on individual registration and assessment, as well as the identification of vulnerable individuals who need targeted services and support. The last section comprised mainly an in-depth follow-up, covering the national health priorities such as child health, maternal and neonatal health, TB, HIV, and chronic/non-communicable diseases.

3.5 SURVEY IMPLEMENTATION

The project was implemented in Tshwane District, South Africa, involving 40 to 50 Ward Based Outreach Teams (WBOTs) and covered a population of ca. 700 000 people (ratio of 1 WBOT:14000 people). The survey implementation occurred after successfully completing a pilot study during the years 2011 and 2013 in 9 communities, which covered a total number of 80 000 people in Tshwane District, South Africa. The communities are among the socio-economically most-deprived communities in the District of Tshwane (Bam *et al.* 2014). Face-to-face interviews were conducted with households who visited any of the health centres listed in Table 3.1 above. Interviews were conducted at the health facility after assisting the patient. The purpose of the study was explained and consent was sought before implementing the survey. The data was captured through an information management system which has been developed by the Department of Family Medicine/UP, FPD and Mezzanine Ware. The system is based on a mobile phone application, called AitaHealth.

Each respondent was assigned with a unique individual identity number (ID) and every household was also assigned with a household ID. The individual ID will be unique and cannot be not be the same for each respondent however, it is possible for two respondents to have the same household ID if they coming from the same household. This was done in order to minimise double counting as well as to ensure that the dynamics of each household are properly captured in the data set.

3.6 VARIABLE DESCRIPTION

Data collected during the survey, for the purpose of answering the research questions, include the variables set out in Table 3.2 below.

Table 3.2: Variables used in the study

Variable	Description
Household Food security status	A categorical variable, 1 if household is food secure, 2 if household is food insecure without hunger, and 3 if household is food insecure with hunger.
Gender	Respondent's gender. A dummy variable, D = 1 if respondent is female and D = 0 if respondent = male.
Age	Respondent household member's age. A categorical variable, 1 if age ranges from 0 to 12 years (Child), 2 if age ranges between 13 and 19 years (Teen), 3 if age ranges between 20 and 29 (young adult), 4 if age ranges between 30 and 9 (Adult), and 5 if age is 50 years and older (Mature adult).
Dwelling Ownership	A dummy variable, D = 1 if household own the house they live in and D = 0 otherwise.
Receive Food Parcels	A dummy variable, D = 1 if household receives food parcels and D = 0 otherwise.
Water Source	A dummy variable D=0 if stand pipe is outside the yard and D=1 if piped water is inside the house or in the yard
Produce Fruits or Veg	A dummy variable, D = 1 if household has a fruit or vegetable garden in their yard and D = 0 otherwise.
Access to Electricity	A dummy variable, D = 1 if household have access to electricity and D = 0 otherwise.
Dwelling Type	Respondent's type of dwelling, A categorical variable which takes on the value of 1 household dwelling is a House, 2 if Room, 3 if Shack, 4 if Flat and 5 if Hut
Dwelling Condition	A categorical variable which gives a description of the respondent's condition of dwelling, 1 if the dwelling is poorly maintained, and 2 if somewhat maintained, 3 if well maintained.
Location of Toilet	A categorical variable which describes the location of the respondent's toilet, 1 if toilet is outside the yard, 2 if toilet is in the yard, 3 if toilet is inside the house.
Access to electricity	A dummy variable, D = 1 if household has access to electricity and D = 0 otherwise.

3.7 DATA ANALYSIS

A Microsoft Excel spreadsheet was created to capture the primary data before the data were imported into STATA, where further collation and analysis was done. Data details of 62 104 household members were analysed, with the aim to assess food security status of low-income households in Tshwane, to identify factors associated with food security status among low-income households in Tshwane, and to assess the prevalence of food insecurity, by age group, among low-income households in Tshwane.

3.7.1 Assessing food security status among low-income households in Tshwane

The assessment of food security status used in this study was guided by the 5-item questionnaire suggested by the U.S. Department of Agriculture, Guide to measure food security (2000) and the South African 4-item General Household Survey, 2012 adopted from the Household Food Insecurity Access Scale (HFIAS) . Food security status was categorised into three levels (food secure, food insecure without hunger, and food insecure with hunger). Based on six indicators, presented in Table 3.3 below, the food security status of the household was determined. The food security status is deduced from the sum of the responses to the indicators (θ, which ranges from 0 to 5). If the sum of all the responses takes on any value less than or equal to 1 then food security status (FS status) will be assigned a value of 3 which means that the household is food secure, If the sum of responses is between 1 and less than or equal to 3 then FS status takes on the value of 2 which will be interpreted as food insecure without hunger .Finally if the sum of the responses is greater or equal to 4 then FS status will be assigned a value of 1 which will be interpreted as food insecure with hunger; the most severe outcome possible in this analysis.

Table 3.3: A matrix for assessing food security status

Indicator	Household's response
Not enough food	Yes = 1 No = 0
Frequency[2]	Only one or two days=1 Some weeks but not every day=1 Some weeks but not every week=1 Almost every week=1
Eat less than what one should	Yes = 1 No = 0
Stay hungry because there is no food	Yes = 1 No = 0
Sleep hungry because there is no food[3]	Yes = 1 No = 0
Food security status (FS status) **Key:** **1 = food insecure with hunger** **2 = food insecure without hunger** **3 = food secure**	**A sum of the above responses (θ)** $FS\ status = \begin{cases} 1 & if \quad \theta \geq 4 \\ 2 & if\ 1 < \theta \leq 3 \\ 3 & if \quad \theta \leq 1 \end{cases}$

Source: Bam et al. (2013)

3.7.2 Factors associated with food security status among low-income households in Tshwane

An ordered outcome model was used to identify factors associated with food security status among low-income households in Tshwane. An ordered outcome model was used to predict the probability that a household would be food secure, food insecure without hunger, or food insecure with hunger. An ordered logit model was estimated and a range of tests (including Brant, Wolfe Gould, Score, Likelihood ratio and Wald tests) was implemented to determine if the assumptions of the ordered logit model were not violated. Following the results from these tests, it was evident that the parallel regression assumption was violated, and an alternative model (partial proportional odds or constrained generalised ordered logit model) was estimated. The ordered outcome models (logit and the partial proportional odds model) are explained below.

[2] The variable frequency will be used as a follow up question to the first question in order to determine the severity of the condition therefore it can only take up one and not all of the stipulated options.
That therefore justifies why each response was given the value of 1.

[3] Sleeps hungry refers to a condition where the respondent or represented household had to go to bed hungry due to a lack of an evening meal, while the former (stays hungry) refers to a condition whereby the respondent or represented household had to spend the day without any food intake due to a lock of food.

3.7.2.1 The ordered logit model

An ordered logit model was used to identify factors associated with food security status among low-income households in Tshwane. The model was deemed sufficient for the task since the dependent variable (food security status) is not only categorical but also has a natural ordering. Equation (1) below presents the ordered logit model.

$$Y_i^* = \sum_{k=1}^{K} \beta_k X_{ki} + \varepsilon_i = Z_i + \varepsilon_i \qquad i = 1, 2, \ldots, I \qquad (1)$$

where Y_i^* a continuous is latent or unobserved variable with various thresholds, β_k is a vector of parameters to be estimated, X is a vector of factors hypothesised to be associated with food security status, and ε is a random error component. Values of the unobserved latent variable Y_i^* are mapped to values of the observed discrete Yi variable by a threshold crossing rule.

$$Y_i = k \quad if \quad \delta_{k-1} < Y_i^* \leq \delta_k \qquad k = 1, 2, \ldots, K \qquad (2)$$

The δ's in Equation (3) are cut-points that demarcate the continuous latent variable into sections associated with each discrete outcome Y_i. The latent variable is unobserved and assumed to be normally distributed (Williams, 2015). In our case where K = 3, we have two cut-points (δ_0 and δ_1) and we observe;

$$\mathrm{Y} = \begin{cases} 1 & if \quad \delta_0 > Y^* \\ 2 & if \quad \delta_0 \leq Y^* \leq \delta_1 \\ 3 & if \quad \delta_1 \geq Y^* \end{cases} \qquad (3)$$

The model is deemed appropriate for the task since the dependent variable (food security status) in the study is categorical and has a natural ordering. Although other models such as multinomial logit have the capacity to handle a dependent variable with more than two categories, their inability to recognise the natural ordering in the categories rendered them unfit for the current study.

One critical question surrounding ordered outcome data is whether the categories of the ordered outcome variable are significantly different from each other. The answer to this question is

crucial for justifying the chosen categories of the outcome variable[4]. The task is to determine if the three categories of food security status are significantly different from each other. The ordered logit model ancillary parameters (cut-point and their standard errors) provide useful information in this regard. While the information provided by these ancillary parameters is necessary, it is not sufficient to justify the three categories and it only gives an indication of whether or not the cut-points are significantly different from zero. An additional test is required to assess if these cut-point are significantly different from each other, and a t-test was used for this purpose (Greene & Hensher, 2009).

3.7.2.2 Partial proportional odds model (constrained generalised ordered logit model)

One advantage of the partial proportional odds model is that is does not impose the parallel regression assumption. Unlike the unconstrained generalised logit model that relaxes the parallel regression assumption for all the coefficients, the constrained generalised logit model only relaxes the assumption for those coefficients that violate and impose it on those which satisfy the parallel regression assumption.

3.7.3 The prevalence of food insecurity, by gender, among low-income households in Tshwane

A cross-tabulation of household food security status and gender was implemented, with a particular focus on the row percentages of each gender category. The aim was to identify the gender most affected by the challenge of food insecurity.

3.7.4 The prevalence of food insecurity, by age-group, among low-income households in Tshwane

A cross-tabulation of household food security status and age-group was implemented, with a particular focus on the row percentages of each age-group category. The aim was to classify the prevalence of food security among households by different age-group in order to identify the most vulnerable age-group categories.

4 For instance, an ordered outcome variable with three categories (1, 2 and 3) where categories 2 and 3 are not significantly different from each other will translate to binary variable. Having category 3 would not add value to the analysis.

3.7.5 Assessment of the extent of own production of fruits or vegetables and external support

A cross-tabulation of food security status and production of fruits or vegetables was implemented. The focus was on food-insecure households, comparing those who are in the category "food insecure with hunger" with those in the category "food insecure without hunger". Similarly, with the extent of external support in the form of food parcels, a cross-tabulation of food security status and "household received food parcel" was implemented.

3.8 SUMMARY

This chapter presented the methodological approaches adopted in the study. The major purpose of this chapter was to explain in detail how the methods used in the study were implemented and to highlight their strengths and weaknesses. The chapter also provided a description of the variables used in the study. Careful handling of the data was implemented and in order to avoid double counting; each respondent was assigned with a unique individual identity number (ID) and every household was assigned with a household ID. In as much as the individual ID will remain unique for every respondent, it is possible for two or more respondents to have the same household ID if they coming from the same household. Food Security status was determined by obtaining the sum of responses of the food security questions adopted from the Household Food Insecurity Access Scale (HFIAS) furthermore; Food security status was categorised into three levels (food secure, food insecure without hunger, and food insecure with hunger).

Two variants of an ordered model (ordered logit and partial proportional odds models) were used to assess factors associated with food security status. Descriptive statistics analysis was used to assess the prevalence of food security, by age group and gender, among low-income households in Tshwane, and also to assess the extent of own production of fruits or vegetables and external support.

CHAPTER FOUR:
RESULTS AND DISCUSSION

4.1 INTRODUCTION

The findings of this study, as well as the discussion of the findings, are presented in this chapter. The main objective of this study was to investigate the food security status among low-income households in Tshwane in order to determine the extent and the nature of food insecurity in these communities. The first section of the chapter (section 4.2) presents findings on the socio-economic characteristics of the sampled respondents. Sections 4.3 ,4.4, 4.5 and 4.6 will discuss the findings of the study by relating the findings to the specific objectives of the study. The chapter will be concluded by providing a summary of the overall findings of the study.

4.2 SOCIO-ECONOMIC CHARACTERISTICS OF THE HOUSEHOLDS

Table 4.1 below presents the socio-economic characteristics of the household members included in the sample. The sample consists of 45.85% females and 54.15% males, and children account for nearly a third of the sample. A significant number in the sample (66.35%) live in houses and nearly 27% live in shacks, with 80.15% of the households owning the dwelling in which they reside. A small proportion (8.24%) of the sampled households live in a structure that is poorly maintained, and 25.25% and 66.51% live in a structure that is 'somewhat maintained' or 'well maintained', respectively[5].

[5] It is important to note that the dwelling condition question is one which is rather subjective in nature and therefore this result should be interpreted with caution

Table 4.1: Socio-economic characteristic of households

Characteristic of interest	Percentage of the sample (%)
Gender	
Female	45.85
Male	54.15
Age group	
Child (0-12 years)	28.47
Teen (13-19 years)	11.86
Young adult (20-29years)	21.87
Adult (30-49 years)	26.99
Mature adult (50years and above)	10.80
Dwelling type	
House	66.35
Room	6.03
Shack	26.71
Flat	0.56
Hut	0.15
Dwelling condition	
Poorly Maintained	8.24
Somewhat Maintained	25.25
Well Maintained	66.51
Dwelling ownership (owner of dwelling)	
Yes	81.15
No	18.85
Location of toilet	
Outside the yard	4.67
In the yard	49.42
Inside the house	45.63
Receive food parcel	
Yes	1.32
No	98.68
Produce fruits or vegetables	
Yes	12.71
No	87.29
Water source	
Piped in the house or stand pipe in-yard	54.61
Stand pipe outside the yard	45.39
Access to electricity	
Yes	84.57
No	15.43

Figure 4.1 below shows that the variable “age” is slightly skewed to the left, implying that there are more young people in the sample. The observed distribution is in line with expectation, given that nearly a third (28.98%) of the population is between the ages of 0 and 14 years, whereas 65.67% of the population is between ages 16–64, and only 5.34% is 65 years and older (Stats SA, 2019).

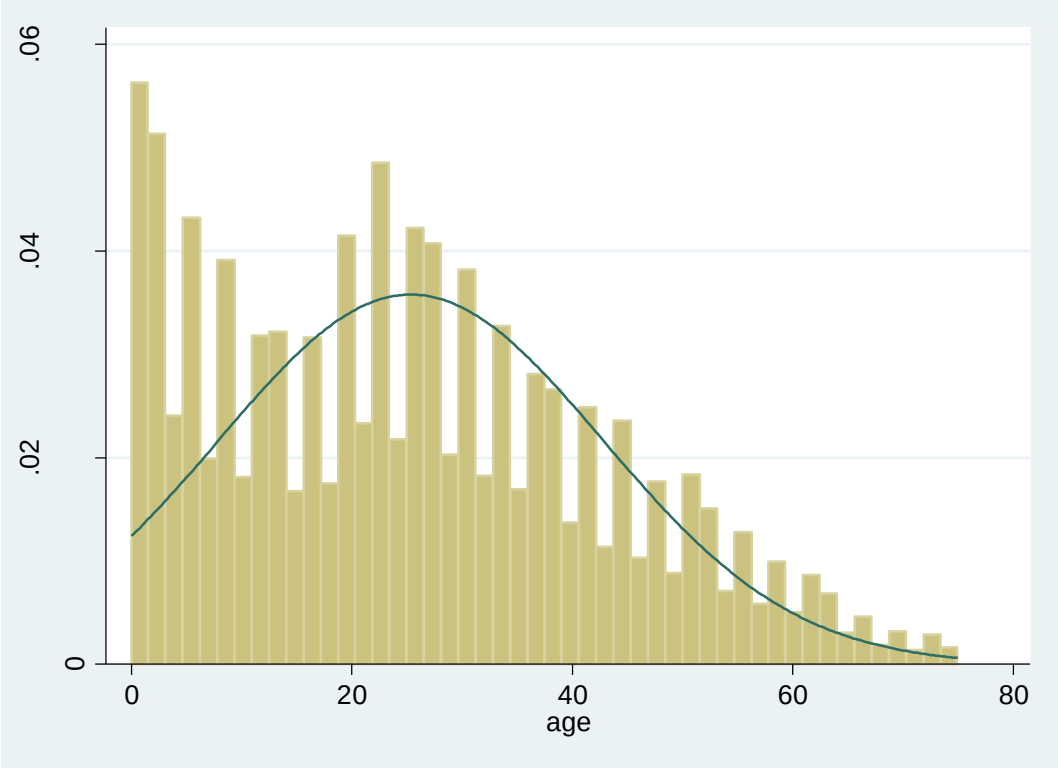

Figure 4.1: Age distribution in the sample

4.3 OBJECTIVE 1: ASSESS THE FOOD INSECURITY STATUS AMONG LOW-INCOME HOUSEHOLDS IN TSHWANE.

The result indicate that a significant number (95.77%) of the sampled households were food secure, while 3.50% were food insecure with hunger, and less than one percent (0.73%) were food insecure without hunger; this is illustrated on Figure 2.4 below. These results are in line with the expectation as highlighted in the hypotheses section that the sampled households will be predominantly food secure. The results are also consistent with national results, as it was reported by Statistics South Africa that in 2017;78.7% households were found to have adequate access to food while only 15.8% and 5.5 % of the households were reported to have inadequate and severely inadequate access to food respectively at national level (Stats SA, 2019). Provincially, 84.0% of the households in Gauteng had adequate access to food while 12.9% and 3.1% of the households experienced inadequate and severely inadequate access to food respectively (Stats SA, 2019).

Furthermore, the GHS has reported a decrease in the percentage of households that experienced hunger, from 23.8% to 11.8% in the period of 2010 and 2016 (Stats SA, 2016). It is evident that South Africa is predominantly food secure however, there is still a substantial number of individuals who are experiencing hunger and food insecurity as well as those who might be experiencing difficulty in their access to food and are still vulnerable to food insecurity.

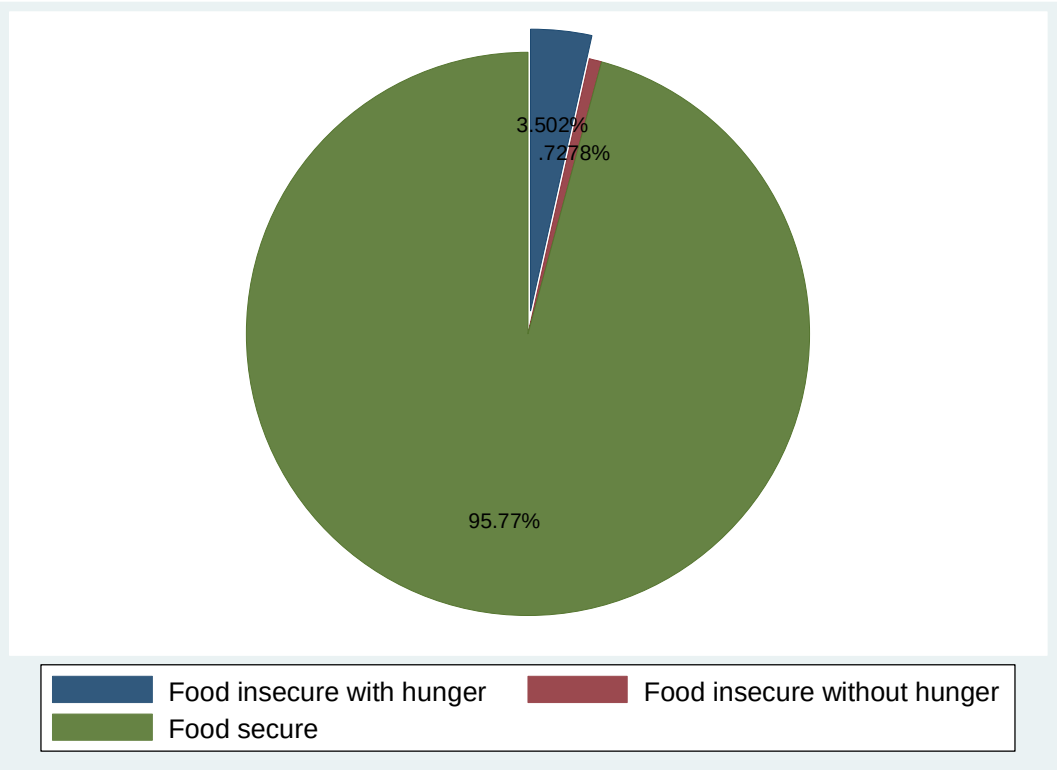

Figure 4.2: Food security status among low-income households in Tshwane

Table 4.2 below presents descriptive statistics of households, by food security status. The results show that, in general, living condition (type and condition of dwelling) for households who were found to be food insecure with hunger are relatively poor, as compared with households who were found to be food secure. The results also show that own production of food (fruits or vegetables) is low, irrespective of the food security status. However, in relative terms, own production of food is high among households who were found to be food insecure with hunger (22.11%), as opposed to 12.16% of food secure households. In terms of distance to water source, a vast majority of households (86.32% of food secure and 84.65% food insecure with hunger) have water in the yard or in the house.

Table 4.2: Descriptive statistics of households, by food security status

Characteristic of interest	Percentage of the sub-sample (%)	
	Food secure	Food insecure with hunger
Gender		
Female	54.14	54.38
Male	45.86	45.62
Age group (mean)	25.3	24.7
Dwelling type		
House	66.07	70.68
Room	6.24	2.48
Shack	26.81	25.23
Flat	0.58	0.31
Hut	0.13	0.52
Dwelling condition		
Poorly Maintained	7.56	22.24
Somewhat Maintained	25.07	28.94
Well Maintained	67.37	48.81
Dwelling ownership (owner of dwelling)		
Yes	80.84	85.54
No	19.16	14.46
Location of toilet		
Outside the yard	4.67	5.06
In the yard	49.30	51.66
Inside the house	45.81	41.79
Produce fruits or vegetables		
Yes	12.16	22.11
No	87.84	77.89
Water source		
Piped in the house or stand pipe in-yard	86.32	84.65
Stand pipe outside the yard	13.68	15.35
Access to electricity		
Yes	84.69	80.23
No	15.31	19.77

Table 4.3 below presents food security status by gender category. This is aimed at answering the question "does poverty have a woman's face", which developmental economists often contend with (Association of Women for Action and Research, 2018; Shriver, 2014). The result shows that, in the sample, food security status is not associated with gender. The proportion of males and females across the different food security status is virtually the same. About 4.63% of the sampled females fall in the category "food insecure with hunger" and the proportion of males in the same category is 4.59%. In the category "food insecure without hunger" the proportion of males and females is identical.

Table 4.3: Food security status, by gender category

Food security status	Female	Male	Total
Food insecure with hunger	1 582	1 327	2 909
	4.63%	4.59%	4.61%
Food insecure without hunger	290	247	537
	0.85%	0.85%	0.85%
Food secure	32 298	27 360	59 658
	94.52%	94.56%	94.54%
Total	34 170	28 934	63 104
	100%	100%	100%

Table 4.4 below presents the results of a t-test of equality of means age between households who were found to be food secure and those who were found to be food insecure with hunger. The results show that there is a significant difference ($p < 0.05$) in mean age between the two groups (see Figure 4.3 below). The results further show that the mean age of food-secure households is higher than that of households who are food insecure with hunger.

Table 4.4: T-test of equality of mean age across food status

Group	Observations	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
					Lower	Upper
Food insecure with hunger	2 909	24.738	0.336	18.112	24.079	25.396
Food secure	59 658	25.336	0.071	17.361	25.197	25.476
Combined	62 567	25.309	0.070	17.397	25.1726	25.445
Difference		-0.599	0.330		-1.246	0.049

```
    diff = mean(0) - mean(1)                                      t =  -1.8119
Ho: diff = 0                                     degrees of freedom =    62565

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0350         Pr(|T| > |t|) = 0.0700          Pr(T > t) = 0.9650
```

Figure 4.3: T-test ancillary output

4.4 OBJECTIVE 2: FACTORS ASSOCIATED WITH FOOD SECURITY STATUS AMONG LOW-INCOME HOUSEHOLDS IN TSHWANE

Table 4.5 below presents results of the ordered logit model for factors associated with food security status among low-income households in Tshwane. The results indicate that food

security status is associated with water source, type of dwelling, condition of dwelling, ownership of dwelling, and availability of electricity. Specifically, households who have water source "piped outside the yard" are less likely to be food secure as compared to households that have access to water in the house and in the yard. These results indicate that water source is one of the factors that affect the level of household food security, i.e. households who have access to water in their house or in the yard are more likely to be more food secure than the households who only have access to water which is outside their yard.

There are several benefits to having access to water in the house or in the yard, including gardening and sustenance small-scale farming (provided that there is sufficient garden space), if water is accessible. Food preparation also becomes relatively easier than when households have to travel for a significant distance in order to access water when they want to prepare food. Other benefits include hygiene for food handling and storage, as well as having enough water for consumption. The type of dwelling was also found to be associated with household's food security status. Specifically, households who reported that their dwelling was a hut were less likely to be food secure than those households who reported that their dwelling was a house.

These results are in line with expectation, since staying in a hut may be regarded as an indication of resource constraints, relative to a households whose dwelling is a house. Households whose dwelling was 'somewhat maintained' were more likely to be food secure, relative to those whose dwelling was 'poorly maintained', and likewise, those whose dwelling was 'well maintained' were most likely to be food secure. Households who have a connection to electricity were more likely to be food secure, relative to those who do not have electricity. In the context of the current study, connection to electricity is not assumed to be a proxy for affordability, since the costs associated with household connection to electricity are mainly funded by government. However, benefits such as food storage due to availability of electricity afford the connected households the opportunity to buy in bulk, thus taking advantage of the lower prices of bulk items and thereby being able to purchase more food than households who do not have access to electricity and are forced to buy smaller quantities of fresh food and meat products. Finally, households who have a toilet facility in the house were found to be more food secure, relative to those who have a toilet facility either in the yard of elsewhere.

As referred to in the methodology chapter, one of the critical questions pertaining to ordered outcome models is whether the different categories of the outcome variable are statistically different from each other. The ancillary outputs in Table 4.5 below indicate that the two cut-points (cut1_cons and cut2_cons) are statistically different from zero, $p < 0.01$. The last task to test is whether the two cut-points are statistically different from one another. The null hypothesis (H_0) cut-point1 = cut-point 2 is tested using a t-test. The equality of the two cut-points implies that segmenting the variable is not warranted. The results show a Chi value of 528.37 and *p*-value of 0.0000, indicating that the null hypothesis is rejected at a 99% level of confidence; therefore, the conclusion is that the two cut-points are significantly different from each other and that there is a significant difference in subject across different categories. The results reveal that type of water source, dwelling type, dwelling condition, location of toilet, and dwelling ownership were good predictors of food security status. For instance, households with water piped in-yard were less likely to be food insecure and households with access to electricity were found to be more food secure than households with no electricity connection. Throughout the analysis, there were no counter-intuitive findings that emerged.

Table 4.5: Ordered logit – Factors associated with household food security status

Variable	Coef. (Std. Err.)
Water piped in-house	-0.047 (0.054)
Water piped in-yard	-0.238*** (0.054)
Water piped outside yard	-0.173*** (0.053)
Dwelling type (house)	0.000 (0.000)
Dwelling type (room)	1.131*** (0.119)
Dwelling type (shack)	0.788*** (0.065)
Dwelling type (flat)	0.834** (0.342)
Dwelling type (hut)	-0.688** (0.290)
Dwelling type (other)	-1.295*** (0.243)
Dwelling condition (Poorly Maintained)	0.000 (0.000)
Dwelling condition (Somewhat Maintained)	0.982*** (0.055)
Dwelling condition (Well Maintained)	1.398*** (0.052)
Location of toilet (In the street)	0.000 (0.000)
Location of toilet (in the yard)	0.075 (0.097)
Location of toilet (in the house)	0.374*** (0.108)
Location of toilet (elsewhere)	-1.201*** (0.206)
Dwelling ownership	-0.250*** (0.055)
Electricity	0.358*** (0.069)
cut1_cons	-1.646*** (0.130)
cut2_cons	-1.464*** (0.130)
N	61 645

The other crucial aspect of model specification is testing of the assumptions if the model were not violated by the data. Specifically, in this study, the parallel slopes assumption was tested using a range of tests, presented in Table 4.6 below. This assumption implies that the variables in the model change at the same rate (parallel slopes). A post-estimation command (*oparallel*) was used to test for the parallel slope assumption. The null hypothesis for these tests is that the

slopes are parallel. All the five tests (Table 4.6) (produced by the above-mention code) indicate that there is sufficient statistical evidence ($p < 0.01$) to reject the null hypothesis, therefore allowing the conclusion that the parallel slopes assumption is violated.

Table 4.6: Tests of the parallel regression assumption

Name of test	Chi2	df	P>Chi2
Wolfe Gould	212.7	15	0.000
Brant	1036	15	0.000
Score	710.9	15	0.000
Ratio	470	15	0.000
Wald	174	15	0.000

Following this realisation, an alternative model (constrained generalised ordered logit, also known as the partial proportional odds model) was estimated. Table 4.7 below presents STATA output of the constrained generalised ordered logit model. The same set of regressors, as mentioned above, was used in the partial proportional odds model.

Table 4.7: Constrained generalised ordered logit – Factors associated with household food security status

Food security status	Variable	Coef. (Std. Err.)
Food insecure with hunger	Water piped in-house	-0.002 (0.192)
	Water piped in-yard	-0.846*** (0.195)
	Water piped outside yard	1.248*** (0.240)
	Dwelling type	0.588*** (0.080)
	Dwelling condition	5.397*** (0.169)
	Location of toilet	-2.090*** (0.149)
	Dwelling ownership	-0.304 (0.186)
	Electricity	2.248*** (0.237)
	_cons	-1.221** (0.476)
Food insecure without hunger	Water piped in-house	-0.238 (0.175)
	Water piped in-yard	-0.846*** (0.195)
	Water piped outside yard	-0.364** (0.164)
	Dwelling type	0.588*** (0.080)
	Dwelling condition	3.229*** (0.096)
	Location of toilet	0.156 (0.130)
	Dwelling ownership	-0.705*** (0.169)
	Electricity	0.516*** (0.168)
	_cons	-1.591*** (0.440)
N		61,645

4.5 OBJECTIVE 3: THE PREVALENCE OF FOOD INSECURITY, BY AGE GROUP, AMONG LOW-INCOME HOUSEHOLDS IN TSHWANE

A cross-tabulation of household food security status and age group was implemented, with a particular focus on row percentages of each age category. Table 4.8 below shows that children constitute 30.84% and 20.68% of the households falling in the categories “food insecure with

hunger" and "food insecure without hunger", respectively. These results are consistent with national statistics. Stats SA reported in the GHS 2017 that while 80.8% of households with no children had adequate access to food, only 62.8% of households that have more than 3 children were reported to have adequate access to food (Stats SA, 2019:17). Moreover; while only 14.3% of households without children had inadequate access to food, an alarming 29.6% of households with more than 3 children were found to have inadequate food access (Stats SA, 2019:17). This implies that households with more children are more vulnerable to inadequate food access.

In South Africa, it was reported that there are 13,1% households that have children under the age of five years who were found to have experienced hunger and 56.1% of those households reside in urban areas (Stats SA, 2019:20). This indicates that child hunger is a reality that affects many children in South Africa, and a much more harsh reality if we take into account that about two thirds of the south African population reside in urban areas(Stats SA, 2019:20). These findings expose the severity of the situation considering that it has been reported that by the age of three years, 80% of brain development in children has taken place and by the age of five years, 90% of the development would have occurred (The urban child institute, 2019). It is at these early stages of human life that good nutrition and adequate access to food among other things are of paramount importance in order to stimulate proper childhood development and it is rather despairing to think that a significant number of children may be compromised in this regard.

Table 4.8: The prevalence of food insecurity, by age group

		Age group				
Food security status	**Number of households members**	**Child**	**Teen**	**Young adult**	**Adult**	**Mature adult**
Food insecure with hunger	2 909	30.84%	14.16%	20.08%	22.45%	12.48%
Food insecure without hunger	537	28.68%	15.08%	20.67%	20.11%	15.46%

4.6 OBJECTIVE 4 & 5: ASSESSMENT OF THE EXTENT OF OWN PRODUCTION OF FRUITS OR VEGETABLES, AND EXTERNAL SUPPORT

Table 4.9 below presents the results of a potential food insecurity coping strategy, by food insecurity levels; producing any fruit or vegetables by households. It is worth noting that the data used in the study only allowed the assessment of the quantitative dimension of own food production (how many household produced some of the food they consumed), and not the qualitative dimension (how much food they produced). It is apparent from the results that only a small portion (22.11%) of food-insecure households produce fruits or vegetable for own consumption. This is, however, not surprising, given the peri-urban location of the majority of the households, where land and water are scarce resources. The results show no significant difference in the proportions of households who engage in fruits or vegetable production across the two levels of food insecurity.

Table 4.10 below presents the proportions of households who receive external support in the form of food parcels. It is evident from the results that a vast majority of the food-insecure households do not receive external support in the form of food parcels. However, unlike in the case of food production, there is a notable difference across the levels of food insecurity, in the proportion of households who received external support. More precisely, households who were found to be food insecure with hunger were more likely to receive external support than those who were food insecure without hunger. This result presents evidence of a good prioritisation in resources, in the context of social protection, nonetheless; it is important to note that there is still a great work that needs to be done as far as external support is concerned since 91% of households who were found to be food insecure with hunger do not receive any food parcels

Table 4.9: Food insecure households' engagement in production of fruits or vegetables

	Household produce fruits or vegetables		
Food security status	**Yes**	**No**	**Total**
Food insecure with hunger	642 (22.11%)	2 262 (77.89%)	2 904
Food insecure without hunger	118 (22.10%)	416 (77.90%)	534
Total	760 (22.11%)	2 678 (77.89%)	3 438

Table 4.10: Food insecure households' external support in the form of food parcels

	Received food parcels		
Food security status	**Yes**	**No**	**Total**
Food insecure with hunger	267 (9.25%)	2 620 (90.75%)	2 887 (100%)
Food insecure without hunger	9 (1.70%)	520 (98.30%)	529 (100%)
Total	276 (8.08%)	3 140 (91.92%)	3 416 (100%)

4.7 SUMMARY

This chapter presented the empirical findings and a discussion of the study. The findings of the study reveal that food security was associated with type of dwelling, connection to electricity and dwelling condition, among other things. The study also showed that a relatively large portion of food-insecure individuals are children under the age of 12 years; this is a critical age-group because that is the stage of human life where most of the development takes place therefore it is important for intervention programmes to focus on this most vulnerable group of individuals. The participation in own food production, among food insecure households, was found to be very low, this could be attributed to a lack of farming land as it has been highlighted that most people in urban settlements may not necessarily have access to farming space and have to rely on income to realise their food security. Finally, the study revealed that external food support is targeted primarily at people who are food insecure with hunger, which displays sound prioritisation.

CHAPTER FIVE:
SUMMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY AND CONCLUSIONS

The main objective of this study was to investigate the food security status among low-income households in Tshwane in order to determine the extent and the nature of food insecurity in these communities. This objective was achieved by calculating the food security status of the households through using Food Security indicators, which were based on the 6-item questionnaire suggested by the U.S. Department of Agriculture, Guide to measure food security (2000), while the South African 4-item General Household Survey, 2012; adopted from the Household Food Insecurity Access Scale (HFIAS), was also used to assess households' food security status. Households were then categorised into three distinctive levels of food security, namely Food Insecure with hunger, Food Insecure without hunger, and Food Secure (Food Insecure with hunger being the most severe outcome).

In addition, this study aimed to identify factors associated with household food security status among low-income households, and in order to achieve this objective, an ordered logit model was estimated. However, the model did not meet all the requirements of an ordered logit model, specifically in that the parallel slopes assumption was violated. As a result, an alternative model (constrained generalised ordered logit model, also known as the partial proportional odds model) was estimated. The results indicated that household food security status among low-income households is associated with water source, type of dwelling, condition of dwelling, ownership of dwelling, and availability of electricity. Moreover, the study assessed the prevalence of food insecurity, by age group as well as the extent of own production of fruits and vegetables, among food-insecure households. The extent of external support in the form of food parcels for households that are food insecure was also investigated.

The results of this study indicate that 94.54% of the sampled households were food secure, while 4.61% and 0.85% of the sampled households were food insecure with hunger and food insecure without hunger, respectively. According to these results, significantly large numbers of the sampled households are food secure, which is consistent with the national food security status, since South Africa is classified as a predominately food secure country, However, the

households which were found to be food insecure with hunger" and "food insecure without hunger'' constituted 30.8% and 20.7% of children under the age of 12 respectively.

It was deduced from this study that access to water sources, type of dwelling, connection to electricity and dwelling condition are some of the factors that are associated with the food security status of low income households in Tshwane. Furthermore, the study discovered that participation in agricultural activities was relatively very low among households that were found to be experiencing food insecurity. Minimum access to adequate farming land and other agricultural resources are some of the factors that may be associated with the minimal participation in agricultural activities. .

5.2 RECOMMENDATIONS

The following recommendations can be derived from this study:

- Food security intervention programmes should be aimed at assisting those households in urban areas who may be vulnerable to food insecurity with farming support and participation in agricultural activities. Such households could be assisted through community or school farming programmes, whereby community members are taught to grow their own fresh produce for consumption, as well as for possible income generation.
- It was discovered through this study that dwelling conditions can be associated with household food security status particularly; factors such as access to water sources as well as access to electricity. Households who have access to water in their house for instance were found to be more food secure than the households who only have access to water which is outside their yard. It is against this finding that this study recommends a more consolidated approach to food insecurity intervention programs where access to municipal services such as water and electricity are also prioritized especially in urban informal settlements.
- The results indicate that an alarming amount of households who were found to be food insecure with hunger (most severe food insecurity) constituted of 30.84% children. This age group is from birth to 12 years of age which is the stage of the human life where critical development occurs. Therefore, there is a pressing need for this group to receive

food and nutrition support to prevent lifelong health challenges. It is therefore a recommendation of this study that programmes aimed at alleviating food insecurity should have a key focus on children as they form the majority of those affected by food insecurity.

- Food security intervention programmes aimed at children should also be extended to pregnant woman and lactating mothers in order deal with their vulnerability to various health challenges that may develop early as a result of food shortages, such as malnutrition and other life-threatening diseases. This can be done through offering pregnant and lactating woman health supplements when they visit local clinics for their antenatal check-ups.
- Urban agricultural programmes need to be targeted towards the younger generation in order to cultivate interest in farming for the youth. This can be done through making communal land available for urban farming projects, as well as providing not only funding but also mentorship programmes that provide farming support and form communities to assist in market penetration and opening up business opportunities.

5.3 LIMITATIONS OF THE STUDY

This study sampled households who visited public health centres around Tshwane, and therefore those who did not have the need to go to a health centre, and those who visited private health facilities, were not part of the study sample. This introduced sample selection bias, and although the results are useful in understanding the socio-economic aspects of the sample, generalising beyond the sample may be inappropriate. The interviews were conducted at the health centres, away from the households' respective dwellings, and therefore the benefit of complementing self-reported information with observation was not harnessed. Finally, the income-related questions were not adequately answered by the sampled respondents, thus limiting our interpretation and analysis of their income levels. This is a limitation because income-related questions are critical for defining further policy implications from the study.

5.4 AREA FOR FURTHER RESEARCH

A comparative study that includes investigating the relationship between household food (in)security and income, employment as well as access to social grants is recommended as an

area for further research. Additionally, a comparative study, which seeks to understand the extent of food (in)security among rural and urban households, is recommended. A study that would identify coping strategies for food-insecure households could provide important empirical evidence that could feed into the different food security policies that are aimed at alleviating food insecurity among low-income households.

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APPENDICES

APPENDIX ONE: CONSENT LETTER

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Natural and Agricultural Sciences

Consent for participation in an academic research study

Department of Agricultural Economics, Extension, and Rural Development

Title of study

Assessing food security status among low-income households in Tshwane

Research conducted by:

MS Lebogang Mashile

Cell: 071 8302656

Dear Respondent

You are invited to participate in an academic research study conducted by Lebogang Mashile, Masters Student from the Department Agricultural Economics, Extension and Rural Development at the University of Pretoria.

The purpose of the study is to provide policy makers with the necessary information to make an informed decision on how to improve food security among households in Tshwane.

Please note the following:

This study involves an anonymous survey. Your name will not appear on the questionnaire and the answers you give will be treated as strictly confidential. You cannot be identified in person based on the answers you give.

1. Your participation in this study is very important to us. You may, however, choose not to participate and you may stop participating at any time without any negative consequences.
2. The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
3. Please contact our study leader, Dr H. Kinkel on tel. +27 124 203253 (e-mail: Hans.Kinkel@up.ac.za) if you have any questions or comments regarding the study.

Please sign the form to indicate that:

1. You have read and understood the information provided above.
2. You give your consent to participate in the study on a voluntary basis.

Respondent's signature _____ Date _____

APPENDIX TWO: SURVEY INSTRUMENT

WBOT Household Registration and Assessment

Version 1, 30 September 2013

Revised 09 December 2013

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

health and
social development
Department: Health and Social Development
GAUTENG PROVINCE

Foreword

Early 2013, the City of Tshwane committed to rolling out 23 Ward Based Outreach Teams (WBOT) in Tshwane. This initiative is assisted by the University of Pretoria, Department of Family Medicine.

This paper is the first in a series and outlines how households are going to be registered and assessed in Community Oriented Primary Care in Tshwane.

The paper sets out

- the topics to be covered at a household level,
- how these topics are inquired about
- The rationale behind the topics and questions.
- how they inform the structuring of mobile technology supported data management
- how they aspects of monitoring and evaluation of WBOT

The paper was developed by the University of Pretoria, Department of Family Medicine (UP DoFM) and the City of Tshwane (CoT) in the course of several workshops during July and September 2013 and represents the consensus achieved.

Authors of this paper: Dr Hans-Friedemann Kinkel (UP DoFM and Foundation for Professional Development [FPD]), Prof Tessa Marcus (UP DoFM), Nomonde Bam (UP DoFM), Prof Jannie Hugo (UP DoFM), Selma Smith (UP DoFM), Elfreda Oosthuizen (City of Tshwane)

Context

In a full, diverse and rich empirical world, we needed to determine what basic data to collect about a community in a systematic and on-going way. Our criteria for selection related to the purpose and use value the information would have for health care service provision and health outcomes.

Our starting point was that data should provide essential information that would enable WBOTs to provide community oriented primary care services to their defined communities. The first need was to identify the people who usually lived in the locality by household and individual and their domestic circumstances. In order to determine the services that WBOTs could or should provide, it was also necessary to consider what information to collection in terms of (i) our conceptual approach (Community Oriented Primary Care), (ii) the programmatic context (health priorities), (iii) scientific evidence supporting engagement with these priorities (effectiveness of interventions), (iv) the mandate of nurse led CHW teams (legal framework) (v) human resource availability and capability (number, level and quality of services) and (vi) financial resources (availability, scale and sustainability of services).

Secondly, the data need to support the organisation ongoing services and follow-up visits. This requires specific protocols that outline the rules for decision support. Creating useful data management tools that specify actions is a complex process. On the one hand there is the problem of over specification that may undermine discretionary thinking and decision making and may waste valuable service time to satisfy the administrative needs of hyper-complex systems. On the other hand, under specification may lead to loss of valuable, time-saving support built around reliable follow-up and referral services.

Thirdly, the data need to be collected for monitoring and evaluation purposes. This is necessary to ensure that WBOT services are working and effective at the most local level. Equally, they also need to be adequately aligned to larger information systems, such as the DHIS, that they feed into.

Fourthly, data need to be able to generate new knowledge about the health of communities. Research in the context of WBOT COPC, should simultaneously support improved practice and enhanced understanding without overwhelming the primary purpose, namely service delivery. Informational, therefore, there is a need to strike a balance between the scope and nature of discovery and that of service delivery.

The Health Status Assessment was initially developed in 2010 by the University Of Pretoria Department Of Family Medicine and implemented with the Tshwane District DoH in 12 sites.

What follows is a thorough team review of the HAS. It has been refined and expanded to cover the following:

1. Household registration, assessment and the identification of vulnerable households:
    - HH registration
    - HH triage
    - HH assessment

2. Individual registration, assessment and identification of vulnerable individuals or individuals in need of targeted services and support and follow-up:
    - Individual registration
    - Individual triage
    - Individual assessment

3. In-depth, follow up protocols covering the following national health priorities
    - Child health
    - Maternal and Neonatal Health
        - ANC
        - PNC/Neonatal Care
    - TB/DOTS
    - HIV/ART
    - Chronic/Non-communicable disease
    - HBC

The focus of this paper is on the first of the above, namely, household registration, assessment and the identification of vulnerable households. Subsequent papers will cover individual registration and assessment, and the six priority conditions.

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	[Q]	Chronic medication	1	17
	[Q]	Availability	1	20
	[Q]	Documentation	(3)	20
	Household Profile			**22**
	Household assessment			**23**
	HH demographics			23
	[Q]	Births	x	23
	[Q]	Deaths	x	24
	[Q]	In-migration	x	25
	[Q]	Out-migration	x	25
	HH characteristics			26
	[Q]	Dwelling type	1	26
	[Q]	Number of rooms	1	26
	[Q]	Windows	1	26
	[Q]	Condition of dwelling	1	26
	[Q]	Energy	9	27
	[Q]	Water	8	27
	[Q]	Toilet	1(-4)	28
	[Q]	Refuse	7	29
	[Q]	Environment	6	29
	[Q]	HH safety	1	30
	[Q]	Goods	9	30
	[Q]	Communication	7	31
	[Q]	Income	1(-2)	31
	[Q}	Business/Enterprise	1(-2)	32
	[Q]	Fruit & Vegetable	1	33
	[Q]	Animals	3(-5)	33
	[Q]	Food security	5(-6)	34
	Indigence			36
	[S/Q]	Indigence	(2-3)	36

Household registration

Registration of the household

A CHW is assigned to a WBOT. Once the CHW logs onto a handheld device (cell phone) with a password the ICT enabled system drives the process of characterising the household through a set of predetermined questions.

Each HH is characterised by

- The WBOT it is assigned to [narrows down several other characteristics already]
- The district [preset when the device is registered or the CHW logs in]
- The region within the district [preset through the CHW login]
- The GIS (physical) ward [drop down]
- The DHIS clinic area that each HH falls into [drop down]

Legend:

S: system generated

C: CHW to assess

Q: The person to be asked

Items	Comment/Rationale	References
S: Date of registration *[system preset]*		
S: CHW name registering the household		

[preset once the CHW logs in]		
S: WBOT (DHIS name) *[preset through the CHW logon]*	Names of the WBOT (suggested: serial number) yet to be defined	
C: GIS ward *[drop down menu]*	A WBOT may operate in more than one municipal ward. The system may allow only for options that apply to the respective WBOT selected above. Vice versa, a GIS ward may be serviced by multiple WBOTs!	

C: Clinic name (DHIS name) *[drop down menu, according to DHIS]*	The name of the clinic (as defined by the DHIS) in which's ambit the HH falls. A WBOT may operate in an area where households fall under different clinics, i.e. a household is reported differently to the DHIS. The clinic boundary and referral system is not necessarily congruent with municipal ward borders. This means that while one ward has no clinic and needs to refer people to a clinic in a neighbouring ward, other wards may be serviced by more than one clinic	
Q: Who is the head of the household? *[system requires Surname, Name, DOB, gender]*	Household definition: A *household* consists of a person, or a group of persons, who occupy a common dwelling (or part of it) for at least four days a week and who provide themselves jointly with food and other essentials for living. In other words, they live together as a unit. People who occupy the same dwelling, but who do not share food or other essentials, were enumerated in the census as separate households	Census 2001: http://www.statssa.gov.za/census01/census96/html/metadata/Docs/Dfntns.html
Q: Does the head of the household own the property? *A: Yes, No, DK, R*	*[requirement by CoT – indigent programme]*	
C: Address *[manually enter address]*	The physical address is used to help CHWs and the WBOT locate HHs. The ICT enabled system also captures GPS coordinates. However, as GPS coordinates cannot be translated into a physical address in the areas where WBOT currently operate, it is necessary to capture the physical address manually. The manual address also helps identify households in informal settlements where there are no plans ("extension" or "number" or "street name").	
S: GPS data of the household	The system should be able to match registration data to available maps from the respective area (Tshwane GIS section/Geoterra) in order to determine and visualise spatial coverage. A prerequisite is that the system recognises the plots/erf-*areas* on the maps in order to be able to attribute information to the respective maps	

S: Household identifier *[system generate]*	*[for system use only]*	
Q: What is the household's account number? *A: [enter number], no account number, DK, R*		
Q: What is the household's electricity meter number? *A: [enter number], no meter number, DK, R*		
C: Please enter contact number(s)*: [enter phone number(s)]*		

Registration of the household members

<table>
<tr>
<td>C: Register all household members
[display table: pre-entered head of HH already, otherwise: Surname, first name, DOB, BC/ID/PP, gender], Refuse, DK</td>
<td>Definition: We agreed to differ from the census definition which defines a member of the household as a person who usually sleeps four nights in the household. This defintion is used to avoid double counting. A household member is defined here as any person who “usually” sleeps at the household. (e.g. a member who is only in over the weekend because he/she sleeps elsewhere during the week etc.). Our decision is based on the need to register all people in a household who may impact postively and negatively on the household’s health and well-being.
Example:
<table>
<tr><td>Name</td><td>DOB</td><td>ID</td><td>Age</td><td>Gender</td></tr>
<tr><td>M... N...</td><td>12 Mar 1978</td><td>BC/ID/PP</td><td>[35 years]</td><td>female</td></tr>
<tr><td>M... P...</td><td>02 Jan 1938</td><td>BC/ID/PP</td><td>[75 years]</td><td>male</td></tr>
<tr><td>M... B...</td><td>29 Sep 2003</td><td>BC/ID/PP</td><td>[9 years]</td><td>female</td></tr>
<tr><td>[name]</td><td>[dd/mm/yyyy]</td><td>[...]</td><td>[age]</td><td>[drop down]</td></tr>
<tr><td>...</td><td></td><td></td><td></td><td></td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>C: Please assess the relationship of each HH member to the head of household
A: Immediate family member of the head of household (wife,child, mother, father, sister, brother), extended family member (inlaws, cousins, nieces and nephews), not related</td>
<td>The question aims to assess the kinship or relational ties among household members, which is suggestive of obligations and reciprocity among houshold members. A more detailed assessment, such as in the census, deemed not to provide more meaningful information.

Example:
<table>
<tr><td>Name</td><td>...</td><td>Age</td><td>Gender</td><td>Relation to HoHH</td></tr>
<tr><td>M... N...</td><td>...</td><td>[35 years]</td><td>female</td><td>Head</td></tr>
<tr><td>M... P...</td><td>...</td><td>[75 years]</td><td>male</td><td>immediate</td></tr>
</table>
</td>
<td></td>
</tr>
</table>

	M... B... | ... | [9 years] | female | immediate [name] | ... | [age] | [drop down] | [drop down] ... | ...	
C: Please assess the vulnerability of the HH members – *[partially system generated, list all HH members and choose form drop down menu[6]: Child {pre-set by system if DOB <18 years}, Pensioner {pre-set by system if DOB >60 years], Couple[7], Couple parent[8], Single[9], Single parent[10]*	*Requirement by CoT indigent programme* Definition Couple: Person lives with his/her partner in this household but they have no children living with them Definition: Couple parent: Person lives with his/her partner in the same household and they have a child/children living with them Definition Single: Person who does not have partner living with him/her in this household and does not have a child living with him/her in this household Definition Single parent: Person who does not have a partner living with him/her in this household but has a child/children living with him/her in this household These defintions derive from the indigent programme, *inter alia*, and are used to categorize vulnerable households. The categories suggested by the indigent programme are imprecise as they overlap. Eventually, considering also the individual assessments, the requirements for the indigent programme will be fulfilled. The answer options chosen here now, focus on age and marital/relationship situation as broad criteria of vulnerability. The assessment seeks to identify households made vulnerable by age and marital status. Children and people >65 and single parent families are at risk of greater economic and care/support	

[6] Definitions: The categories derive from the indigent programme, *inter alia*, and are used to categorize vulnerable households. The categories suggested by the indigent programme are imprecise as they overlap. Eventually, considering also the individual assessments, the requirements for the indigent programme will be fulfilled. The answer options chosen here now, focus on age and marital situation as broad criteria of vulnerability.
[7] Definition: Person lives with his/her partner in this household but they have no children living with them
[8] Definition: Person lives with his/her partner in the same household and they have a child/children living with them
[9] Definition: Person who does not have partner living with him/her in this household and does not have a child living with him/her in this household
[10] Definition: Person who does not have a partner living with him/her in this household but has a child/children living with him/her in this household

hardships. This list of vulnerability is insufficient, since disability and chronic illness as well as origin also render individuals and families vulnerable. Further more, than just one criterion of vulnerability may apply (e.g. disabled child, HIV infected single parent etc.) to one person and in any particular household. Because additional vulnerabilities are assessed at an individual level, the combined HSA makes it possible to get a more complex and composite understanding of household vulnerability.

Example:

Name	...	Gender	Relation to HoHH	Vulnerability
M... N...	...	Female	Head	Single parent
M... P...	...	Male	immediate	Pensioner
M... B...	...	Female	immediate	Child
[name]	...	[drop down]	[drop down]	[drop down]
...	...	...	...	...

Household triage

The following set of questions is a requirement by the NDOH (HH registration form). The purpose is to identify household members who should be referred immediately (e.g. TB suspects, pregnancy etc.) or should be prioritised for assessments (e.g. chronic care etc.), respectively. A number of NDOH questions, however, target conditions that do not require immediate action. They have not been removed. Rather, in keeping with the HSA information collection strategy, they are asked in the individual assessments and can be reported on, as required. Questions asked of individuals but not asked in the household triage are marked as such. In addition, a few questions (e.g. TB, pregnancy) were added or modified to optimise the questionnaire strategy and precision of information. Several questions were omitted as they can be system generated from data collected through the registration of household members (e.g. U5s, neonates)

The responses obtained to these questions will prompt prioritisation for immediate individual assessment. However, referrals have to be made according to the findings, if the person is present. If the person is not present, the CHW should book a follow up visit. Once a HH has been visited, the CHW should start doing the HSA according to the following priority ranking (suggestion)

1) Neonates (highly vulnerable)
2) Ante-natal/Post-natal women (highly vulnerable)
3) TB (potentially infectious)
4) Home based Care (vulnerable – care required)
5) May be pregnant women (vulnerable)
6) U5 children (vulnerable)
7) Chronic care (vulnerable)

The triage ends with labelling an individual with a “triage” status. As the triage status should interfere with the individual assessment as little as possible. the triage status must be formally resolved at the time when triage status is determined. Resolution here means that the triage status is linked with an “action” (e.g. immediate referral, immediate or priority individual assessment .

The household triage should only be repeated if the HH has not been visited for more than (4)-12 weeks or, if it has been visited in shorter intervals for any reason, only after (3)-6 months. This has practical reasons to reduce unnecessary and illogic repetition.

Item	Comment/Rational	Reference
Q: Does anyone in the household need immediate attention? *A: Yes, No, DK, R*		

Item	Comment/Rational	Reference
If Yes: *[Documentation prompt]- see individual triage*		
Q: Is anyone in the household currently taking TB medication? *[system displays list of all household members]* *A: Yes, No, DK, R* [no immediate action – assess within 1 week]	This question was added based on questionnaire strategy.	
Q: Was anyone in the household taking TB medicine during the past 12 months? *[system displays list of all household members]* *A: Yes, No, DK, R* [no immediate action – assess within 1 week]	This questions was added based on questionnaire strategy	
Q: Has anyone in the household been diagnosed with TB but is not yet taking TB medicine? *[system displays list of all household members]* *A: Yes, No, DK, R* [immediate referral or immediate assessment]	This question was added based on questionnaire strategy	
Q: Does anyone in the household have any of the following:	NDOH question.	

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Reference</th></tr>
<tr><td>[system displays only those household members who are not answered Yes to above question]

<table>
<tr><td>Name</td><td>...</td><td>Cough</td><td>N'sweat</td><td>LOW</td><td>LOA</td><td>Fever</td></tr>
<tr><td>M N</td><td></td><td>o</td><td>o</td><td>O</td><td>O</td><td>o</td></tr>
<tr><td>A B</td><td></td><td>o</td><td>o</td><td>O</td><td>O</td><td>o</td></tr>
<tr><td>M T</td><td></td><td>o</td><td>o</td><td>O</td><td>O</td><td>o</td></tr>
<tr><td>M G</td><td></td><td>o</td><td>o</td><td>O</td><td>O</td><td>o</td></tr>
<tr><td>...</td><td></td><td>o</td><td>o</td><td>O</td><td>O</td><td>o</td></tr>
</table>

If any Yes:
Refer for/take sputum test for TB [immediate referral or immediate assessment]</td><td></td><td></td></tr>
<tr><td>~~Q: It is very important to know your HIV status. Would anyone in the HH like to have an HIV test?~~
~~[system displays list of all household members]~~
~~A: Yes, No, DK, R~~

~~If Yes: Refer for HCT [immediate referral or immediate assessment]~~</td><td>This NDOH question is not going to be addressed here. The knowledge about the HIV status is a health priority but not an emergency. HCT is addressed within the individual HSA (HIV questions)</td><td></td></tr>
<tr><td>~~Family planning screening~~
~~Q: Is there anyone who does not use a family planning method but wants to?~~
~~[system displays list of all household members]~~
~~A: Yes, No, DK, R~~</td><td>This NDOH question is not going to be addressed here. Family planning is a health priority but not an emergency. Family Planning is addressed within the individual HSA (Reproductive health questions)</td><td></td></tr>
</table>

Item	Comment/Rational	Reference
~~If Yes: Refer for family planning [immediate referral or immediate assessment]~~		
Q: Is there anyone in the HH who cannot get out of bed or needs help with daily living activities? *[system displays list of all household members]* *A: Yes, No, DK, R*	NDOH question	
If Yes: ***Q: Does the person get home based care support?*** *[system displays list of household members that answered with Yes]* *A: Yes, No, DK, R* If No: Refer for HBC [immediate referral or immediate assessment]	NDOH question	
~~**Need for social grant screening**~~ ~~***Q: Do any household members need help applying for social grants?***~~ ~~*[system displays list of all household members]*~~ ~~*A: Yes, No, DK, R*~~ ~~If Yes: Refer for social services~~	This NDOH question is not going to be addressed here. The promotion of social grants is a health priority but not an emergency. Grants are addressed within the individual HSA (General health)	

Item	Comment/Rational	Reference
~~[immediate referral or immediate assessment]~~		
Q: Is there anyone in the HH who is currently pregnant? *[system displays list of all female only! household members]* *A: Yes, No, DK, R* [prioritise for immediate assessment]	NDOH question [applies to female HH members only]	
If Yes: ***Q: Has she been to the ANC clinic?*** *A: Yes, No, DK, R*	This question was added based on questionnaire strategy	
Q: Is there anyone in the HH who may be pregnant? *[system displays list of all female only! household members]* *A: Yes, No, DK, R* [prioritise for immediate assessment]	NDOH question (slightly modified) [applies to female HH members only]	
Q: Has anyone had a baby in the last 6 week in this household? *A: Yes, No, DK, R* [prioritise for immediate assessment]	NDOH question – addressing women in post-natal care	
Q: Are there any children under the age of 5 in the HH? *A: Yes, No, DK, R)* [system generated] [prioritise for immediate assessment]	NDOH question – can distinguish between Neonate and post-Neonate	
Q: Is anyone in the HH taking daily medication (like ART, TB medication,	NDOH question (slightly modified)	

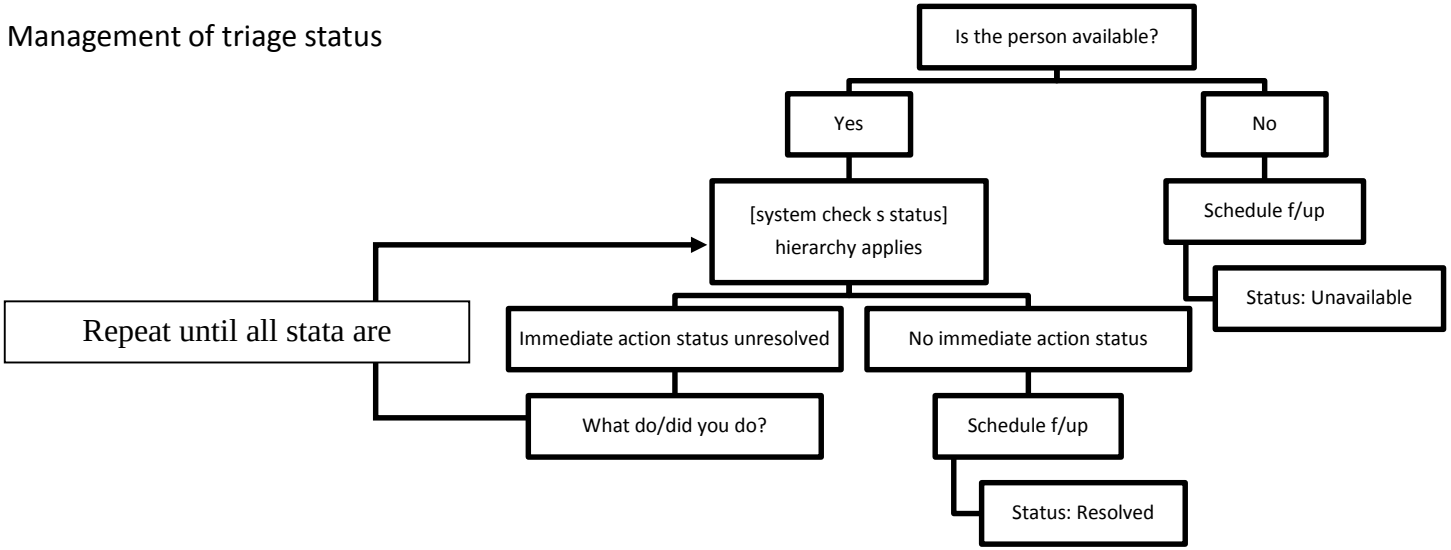
Item	Comment/Rational	Reference
diabetes medication, high blood pressure medication)? *[system displays list of all household members]* *A: Yes, No, DK, R* [prioritise for immediate assessment]		

Managing the outcome of triage:

After the triage each registered person is "tagged" according to his/her status. There are seven stata that require *immediate action* (see table below). E.g. PRG (triage) unresolved, or TBSx (triage) sputum taken, or TBSx (triage) logged emergency call. *Immediate action status* should be prompted for referral. In any case a triage status was found (any of the 11 possibilities) and irrespective of the person being present or not, a follow-up should be scheduled. The triage status, however, has to be formally resolved on the day of the triage ("To do" stays < 24 hours), otherwise it does not make sense to triage at all. Possible resolution of stata are: Unavailable, unresolved or resolved. Unavailable applies to all persons who are not available at the time. Unresolved applies to all persons in whom the questions to resolve the status have not been completed and/or no follow-up scheduled. Resolved means that the tasks to resolve that status have been completed and a follow-up scheduled.

	TB				HBC	ANC		PNC	Child		CC
Possible status	TB Rx (E)	TB 12mHx (F)	TB Dx (D)	TB Sx (B)	may need HBC	PRG not in ANC	Maybe pregnant	PNC	Neonate	U5	
Wording for system			be diagnosed with TB but not yet on TB treatment	have symptoms of TB	maybe needing HBC	be pregnant not attending ANC	maybe being pregnant	have delivered a baby in the past 6 weeks	be a newborn (less than 6 weeks old)		
Options			Log EC Consult TL Refer to clinic Advise No action	Log EC Consult TL Refer to clinic Advise No action Collect sputum	Log EC Consult TL Refer to HBC Advise No action	Log EC Consult TL Refer to ANC Advise No action	Log EC Consult TL Refer for PT Advise No action	Log EC Consult TL Refer for PNC Advise No action	Log EC Consult TL Refer to NBC Advise No action		
Immediate action to be taken	-	-	Referral	Collect sputum or referral	Referral	Referral	Referral	Referral	Referral	-	-
In any case	Schedule f/up										

Management of triage status



Summary example:

Name	...	Gender	Relation to HoHH	Vulnerability	TB Rx	TB 12mHx	TB Dx	TB Sx	HBC	PRG no ANC	PRGmb	PNC	Neonate	U5	CC
M... N...	...	female	Head	Single parent						YES					
A... B...	...	...	Immediate	Child										YES	
M... B...	...	...	Immediate	Single				YES							
M... T...	...	...	Immediate	Pensioner				YES	YES						
M... G...	...	...	Extended	Pensioner				YES							YES

Based on the example above the CHW needs to attend to 4 people immediately. They should all be referred for one or two reasons.

The CHW have the mandate to refer people (statement written on the NDOH referral form)

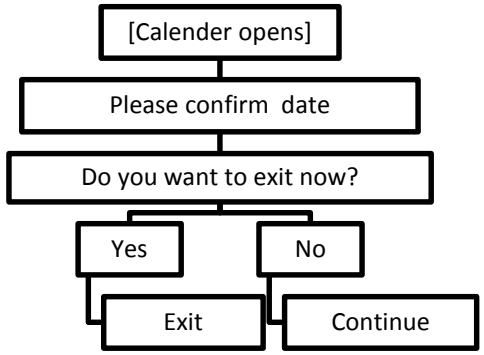
Name	Triage	Triage Status	Outcome	To do	Follow-up	HAS	HSA status	To do
M... N...	●	PRG	unresolved	*Resolve*	[no]	*Not assessed*		
A... B...	●	TBSx, CC	unresolved	*Resolve*	[no]	*Not assessed*		
M... B...	●	TBSx, HBC	collect sputum, referred for HBC	Resolved	13 Oct 2013	*Not assessed*		
M... T...	●	TBSx	unavailable	Resolved	20 Oct 2013	*Not assessed*		
M... G...	●	U5	unresolved	*Resolve*	[no]	*Not assessed*		

Now the CHW has to resolve the issue on an individual level by clicking on the link “Resolve” and link the status to an action according to the algorithm above. Questions below addressed to CHW.

Item	**Comment/Rational**	**Reference**
C: Is the person available? *A: Yes, No, DK, R* If No: [change *outcome* to *“unavailable”* and the *To do* to *“Resolved”*] If Yes: *[system checks immediate action status]*		
If immediate action status: ***C: The person has been found to [****system generated wording see above table:* ***be pregnant not attending ANC]. What did you do or want to do about it?*** *A: Logged emergency call, Consulted team leader, Refer person for ANC, Provided advise/health education, No specific action* [system checks further unresolved status]		

Item	**Comment/Rational**	**Reference**
If further unresolved stata: [Repeat question above]		
C: The person has been found to [system generated: ...]. What did you do or want to do about it? *A: Logged emergency call, Consulted team leader, Refer person for ..., Schedule follow-up visit, Provided advise/health education, No specific action*		
C: Please schedule follow-up visit A: [calendar opens to select date] [confirm date]		

Schedule f/up visit prompt



Household profile

For each household the system should generate a profile summary sheet that characterises the household and from which information can be drawn and linked to other information and/or the generation of questions.

To illustrate by characteristic and possible information or questions:

Address ...

Head of HH ….GENDER, AGE

Child-headed? NO

Household members: NUMBER

Household Relationships: FAMILY STRUCTURE and vulnerability (table)

Vulnerability status: SINGLE PARENT, PENSIONER

Environmental status: AIR POLLUTION

Water: PIPED WATER IN THE STREET

[other?]

Poverty status: POVERTY (Total income R 340/week)

Business/Enterprise: NO

Food security status: FOOD INSECURE NO HUNGER

Indigent status: INDIGENT POSSIBLE

Indigent number:

Household assessment - Demographic data

Comment:

The value of this set of questions is to obtain demographic information in order to characterise and measure population dynamics in communities. It can be used to inform planning, to support service prioritisation and to provide insight and understanding about the relationship between basic demographics and particular health conditions

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Resource</th></tr>
<tr><td>Births
Q: Have there been any births in this household during the past 12 months
[no, yes: enter date, surname, name, gender and outcome {drop down}]</td><td>The question may require back-capture of children born in the previous 12 months to a household who no longer not live tin the household or who is deceased. The information obtained should allow us to estimate birth rate:
[Number of live births in the past 12 months in the HH assessed] / [Number of people living {or lived?} in the HH assessed]

Definition Live birth (WHO): “Refers to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born.“

The assessment of the birth rate at ward level is also meaningful as it is not possible to draw such information from official statistics.

Example
<table>
<tr><td>M... N...</td><td>...</td><td>female</td><td>12 Apr 2013</td><td>alive</td></tr>
<tr><td>M... P...</td><td>...</td><td>male</td><td>08 May 2013</td><td>alive</td></tr>
<tr><td>M... B...</td><td>...</td><td>female</td><td>12 Nov 2012</td><td>dead</td></tr>
<tr><td>[name]</td><td>...</td><td>[drop down]</td><td>dd/mm/yyyy</td><td>[drop down]</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td></tr>
</table>
</td><td>http://www.who.int/healthinfo/statistics/indmaternalmortality/en/</td></tr>
</table>

Item	**Comment/Rational**	**Resource**
Deaths ***Q: Have there been any deaths in this household during the past 12 months?*** *[no, yes: enter death date, surname, name, gender, DOB and reason {autopsy}]*	Rationale: Death data allows for the estimation of crude and age specific mortality rates. The death rate may be of a special value as official statistics do not register early neonatal deaths or deaths of babies born at a young gestational age. WBOTs can contribute to getting all deaths registered. The information would also allow for verbal autopsies at a later stage. Definitions: *Maternal death* (WHO) is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. To facilitate the identification of maternal deaths in circumstances in which cause of death attribution is inadequate, a new category has been introduced: Pregnancy-related death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death. *Perinatal mortality (WHO):* The "number of stillbirths [gestational age ≥24 weeks or 500g birth weight] and deaths in the first week of life per 1,000 live births, after 24 weeks gestation", *Neonatal mortality.* Early neonatal mortality refers to a death of a live-born baby within the first seven days of life, while late neonatal mortality covers the time after 7 days until before 28 days. The sum of these two represents the neonatal mortality. *Infant mortality.* Neonatal mortality and post-neonatal mortality (covering the remaining 11 months of the first year of life) are reflected in the Infant Mortality Rate. *Still birth* is a synonym for *Foetal death.* Definitions are not uniform across countries. It refers to intrauterine death of an child	WHO: http://www.who.int/healthinfo/statistics/indmaternalmortality/en/

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Resource</th></tr>
<tr><td></td><td>at a gestational age of ≥20-24weeks and/or 350-500g birth weight. For international comparison the following cut-offs are used: gestational age of ≥28 completed weeks or ≥1000g birth weight.
Miscarriage. Refers to intrauterine death before foetal viability (which is defined differently in different countries ,with cut-offs from 16 to 26 weeks)

<table>
<tr><td>Name</td><td>…</td><td>Gender</td><td>Date of death</td></tr>
<tr><td>M… F…</td><td>…</td><td>female</td><td>19 Apr 2013</td></tr>
<tr><td>M… Y…</td><td>…</td><td>male</td><td>08 jun 2013</td></tr>
<tr><td>M… U…</td><td>…</td><td>female</td><td>19 Dec 2012</td></tr>
<tr><td>[name]</td><td>…</td><td>[drop down]</td><td>dd/mm/yyyy</td></tr>
<tr><td>…</td><td>…</td><td>…</td><td>…</td></tr>
</table></td><td></td></tr>
<tr><td>In-migration
Q: Has any person living in this household presently, joined this household in the past 12 months?
[system lists all HH members, drop down menu to choose from: lived here 12 months ago, moved in during past 12 months, DK, R]</td><td>Very easy to capture information!</td><td></td></tr>
<tr><td>Out-migration
Q: Has any member of this household moved out (not living here anymore) during the past 12 months?
[Yes, No, DK, R; If Yes: enter surname, name, gender, DOB, move out date and relation to head of HH]
[Capture relation to head of HH]</td><td>In and out migration is an important characteristic of family and community life. It provides an understanding of population movement. It also is important for the management of infectious diseases like TB. The information may have to be back captured....</td><td></td></tr>
</table>

HH assessment – Household characteristics

Item	**Comment/Rational**	**Reference**
Type of dwelling ***Q: What kind of living quarter is the household in?*** *A: House, Flat, Room, Hut, Shack, Collective living quarters, Other* If collective living quarter: [please specify: Workers hostel, School hostel, Student residence, Shared dwelling, Home for the aged, Home for disabled, Orphanage, Shelter for homeless, Refugee camp, Other]	The assessment of the type of dwelling informs understanding of vulnerability and ill health. CHW observation Categories drawn from the census with small changes	
Number of rooms ***Q: How many rooms has this household?***[11] *A: [enter number]*	Requirement from NDOH (valuable question) Definition "room": Bedrooms, living rooms, kitchen(sic!), studies, but not bathrooms, garages, sheds, stables unless people living in those rooms	
Windows/Cross-ventilation ***Q: Is there a window that can be opened in every room***[12]***?*** *A: Yes, No, DK, R*	CoT requirement (MHS); Infection control Definition: A room is considered as having cross-ventilation if there is at least a door (obvious as the room cannot be entered otherwise...) and at least one window that can be opened in the room (count: bedrooms, living rooms, kitchen, bath rooms, studies etc.)	
Condition of dwelling	Guidelines needed to define status.	

[11] Counting: bedrooms, living rooms, kitchen(sic!), studies, but not bathrooms, garages, sheds, stables unless people living in those rooms
[12] Definition: Every room (bedrooms, living rooms, kitchen, bath rooms, studies etc.) in the house to have a door/ window that can be opened at least in two walls

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Reference</th></tr>
<tr><td>C: Please assess (observation) the condition of the dwelling
A: Well maintained, somewhat maintained, poorly maintained</td><td>Definition: Window: intact (0), cracked (1), broken (2); Wall: intact (0), cracks (1), holes (2); Roof: intact (0), single leakage (bucket when rain)(1), multiple/huge leakage (unusable when rain)(2), Yard: totally cared of (0), partially cared of (1), not cared of at all (2). Suggestion: If total count ≥6: poorly maintained, if ≥3: somewhat maintained, if ≤2 well maintained.</td><td></td></tr>
<tr><td>Energy
Q: Which of the following energy sources do you usually use (for heating, lighting and/or cooking)?

<table><tr><th></th><th>Yes</th><th>No</th><th>DK</th><th>R</th></tr><tr><td>Electricity</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Gas</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Paraffin</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Wood</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Candles</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Coal</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Solar</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Open fire</td><td>O</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Other</td><td>O</td><td>o</td><td>o</td><td>o</td></tr></table></td><td>The question on energy sources provides crucial information on environmental and public health and safety. WBOTs can promote the safe use of energy according to the risks associated with different sources and relevant energy related morbidity and mortality.
A secondary use value of energy source data relates to measuring the degree of electrification and the extent of mono-energy dependence.</td><td></td></tr>
<tr><td>Water
Q: Where does the household get water?

<table><tr><th></th><th>Yes</th><th>No</th><th>DK</th><th>R</th></tr><tr><td>Piped water in the house</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Piped water in the yard</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Piped water outside yard</td><td>o</td><td>o</td><td>o</td><td>o</td></tr></table></td><td>The question will provide information about HH access to safe water as well as the time use associated with obtaining safe water. The NDOH-Q: Is there piped water in the house or in the yard? is insufficient. The census asks about piped water in the dwelling/yard, piped water outside yard, no access to piped water. It reflects the national objective of providing every HH with safe piped water. However, this is less than useful where unsafe water sources influence the health status of individuals and households.</td><td></td></tr>
</table>

Item					**Comment/Rational**	**Reference**
Borehole / well	*o*	*o*	*o*	*o*		
Spring/ Stream / River / Dam	*o*	*o*	*o*	*o*		
Rainwater tank	*o*	*o*	*o*	*o*		
Water tanker	*o*	*o*	*o*	*o*		
Other	*o*	*o*	*o*	*o*		
~~***Q: Is the water used for cooking and drinking clean and safe?***~~ ~~*A: Yes, No, DK, R*~~					The Q comes from the CoT. It is unlikely to generate meaningful or accurate information. It requires a common understanding of what is meant by "clean", and what is meant by "safe" (criteria? -). In fact, water safety is best assessed bacteriologically through chemical analysis. We therefore have omitted the question.	
Toilet ***Q: What type of toilet do you use?*** *A: Flush toilet connected to a sewage system, Flush toilet with septic tank, Pit toilet ventilated improved (VIP), Pit toilet without ventilation, Chemical toilet, Bucket toilet system, None, DK, R*					This questions assesses the type of toilet the members of this household (= "you") use *mainly*.	
[Continue if above Q was not answered with "none"]: ***Q: Where is this household's toilet?*** *A: Inside the house, In the yard, In the street,* ~~*None,*~~ *Elsewhere*						
Q: Is this household's toilet shared with another/other household/s? *A: Yes, No, DK, R*						

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Reference</th></tr>
<tr><td>Q: Is there a hand washing facility (water and soap) next to the toilet?
A: Yes, No, DK, R</td><td>NDOH-Q: Is there a toilet in the house? An inadequate question as it does not discriminate sufficiently regarding human waste disposal and the system risks to individual health. According to Census 2011, the government has responsibility for and is committed to improving sanitation as a matter of individual and environmental safety. Hence we propose that toilet related questions are asked as above in keeping the National Census options.
The question about hand-washing facility is a CoT (MHS). The former version in the HH assessment has been reformulated.</td><td></td></tr>
<tr><td>Refuse
Q: How does this household usually dispose refuse (rubbish)?

<table><tr><th></th><th>Y</th><th>N</th><th>D</th><th>R</th></tr><tr><td>Collected by local authority once a week</td><td>o</td><td>O</td><td>o</td><td>o</td></tr><tr><td>Collected occasionally</td><td>o</td><td>O</td><td>o</td><td>o</td></tr><tr><td>Bury in yard</td><td>o</td><td>O</td><td>o</td><td>o</td></tr><tr><td>Dumped in the yard</td><td>o</td><td>O</td><td>o</td><td>o</td></tr><tr><td>Dumped on street/dump,</td><td>o</td><td>O</td><td>o</td><td>o</td></tr><tr><td>Dumped inside your house/building</td><td>o</td><td>O</td><td>o</td><td>o</td></tr><tr><td>Other</td><td>o</td><td>O</td><td>o</td><td>o</td></tr></table></td><td>The question about refuse disposal provides information on environmental health and safety. The CoT (MHS) asks: Is the garbage in the house properly disposed off? This question is poorly formulated as “properly” can be interpreted in different ways. Also multiple choice question as above, allows for a deeper understanding of the multiple ways households dispose of refuse, especially where public services are irregular.
The CoT question about completely unsafe refuse handling (pest, smell, hygiene etc) is adequately covered by the proposed formulation and should be omitted.</td><td></td></tr>
<tr><td><s>Q: Is there any heap or pile of refuse kept inside the building or house</s>
<s>A: Yes, No, DK, R</s></td><td>The Q of the CoT (MHS) targets unsafe refuse disposal inside the house/dwelling (e.g. as it attracts pestulence). The Q is answered in the Q above and has been omitted.</td><td></td></tr>
<tr><td>Environmental
C: CHW to assess: Is the household currently exposed to</td><td>The question addresses the environment as a risk factor for holistic health. It is a requirement of the CoT and is directly linked to action at a local and CoT level– namely to prevent vector,air, and water borne diseases.</td><td>Municipal Health Services. 2013. www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/Social.</td></tr>
</table>

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Reference</th></tr>
<tr><td>
<table>
<tr><th></th><th>Y</th><th>N</th><th>D</th><th>R</th></tr>
<tr><td>Air pollution</td><td>o</td><td>o</td><td>o</td><td>o</td></tr>
<tr><td>Land pollution</td><td>o</td><td>o</td><td>o</td><td>o</td></tr>
<tr><td>Water pollution</td><td>o</td><td>o</td><td>o</td><td>o</td></tr>
<tr><td>Noise pollution</td><td>o</td><td>o</td><td>o</td><td>o</td></tr>
<tr><td>Pest pollution</td><td>o</td><td>o</td><td>o</td><td>o</td></tr>
<tr><td>Other</td><td>o</td><td>o</td><td>o</td><td>o</td></tr>
</table>

If any Yes:
Refer to EHS of the CoT</td><td>Definitions
Air pollution: HH exposure to smoke, exhaust fume, dust, stench etc.
Land pollution: HH on or bordering polluted land (rubble, garbage, waste, scrap, chemical spillages etc.)
Water pollution: HH neighbouring surface water (streams, rivers, dams, springs, boreholes etc.) that shows signs of pollution (staining, turbidity, foam, waste, stench etc.) or are known or suggested to cause waterborne diseases (diarrhoea, dysentery, jaundice, etc.)
Noise: HH exposed to noise nuisance (“sounds that impair or disturb the peace of any reasonable person”) and noise disturbance (“noise that causes ambient noise levels to rise above a designated zone level” – suggest: affecting normal [indoor or outdoor] conversation)
Pest: HH exposed to nuisance by rodents, insects etc</td><td></td></tr>
<tr><td>Household safety
Q: Are all dangerous substances stored out of the reach of children?[13]
A: Yes, No, DK, R
[prompt: Please check storage of alcohol, paraffin, washing powder, medicines, nail polish remover, cleaning materials, insecticides, benzene, fertilizer, cement etc...]</td><td>Very valid question. It requires CHW education and training.

Definition “dangerous substance”: A pretty comprehensive list can be found in the internet (see reference)

Definition of “out of reach”: in a cupboard with a door on shelves out of the reach of children (e.g. above 1.50m from the floor), or locked in a cupboard that is at or below 1.50m from the floor. While no place is absolutely “out of reach” of children taking precautions to prevent domestic accidents is part of health promotion and prevention.</td><td>http://environmentalchemistry.com

http://kidshealth.org/parent/firstaid_safe/home/household_checklist.html</td></tr>
</table>

[13] TRAINING!! Definition of what is “safe”!

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Reference</th></tr>
<tr><td></td><td>Reminder: household safety also applies to electric appliances, pools, walls, floors, stairways, doors, windows etc.</td><td></td></tr>
<tr><td>Household goods
Q: Does the household have any of the following functioning household goods ?

<table><tr><th>HH good</th><th>Yes</th><th>No</th><th>DK</th><th>R</th></tr><tr><td>All beds with mattresses</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Sofa set</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Dining table or desk</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Refrigerator</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Stove (gas, electric, aga etc.)</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Washing machine</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Computer</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>TV/DVD/Sound system</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Motorcar</td><td>o</td><td>o</td><td>o</td><td>o</td></tr></table></td><td>Household goods (movable assets) are a proxy for household wealth. They are used by StatsSA in income and expenditure surveys. Functioning refers to “in working order”</td><td></td></tr>
<tr><td>Household communication and information
Q: Does the household have any of the following telephone, radio or postal communication services?

<table><tr><th>Communication</th><th>Yes</th><th>No</th><th>DK</th><th>R</th></tr><tr><td>Cell phone</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Land line phone</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Radio</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Satellite TV</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Internet access</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Mail – post box</td><td>o</td><td>o</td><td>o</td><td>o</td></tr><tr><td>Mail – home delivery</td><td>o</td><td>o</td><td>o</td><td>o</td></tr></table></td><td>This question provides relevant information to support communication for health from responsiveness to emergencies to treatment support and health promotion. While primary health care is built on interpersonal relations, ICT and media supported communication are an invaluable adjunct to efficient and effective service delivery.</td><td></td></tr>
<tr><td>Household income (”spending/purchase power”)</td><td>This question assesses HH disposable income. Questions about income yield notoriously imprecise Information. This is because</td><td></td></tr>
</table>

<table>
<tr><th>Item</th><th>Comment/Rational</th><th>Reference</th></tr>
<tr><td>Q: How much money did the household have to live on in the past month or the past week? (count any income from work, trade, rent, interest, grants, pensions, allowances, subsidies etc.)
A: last month: [type in the amount in ZAR]
A: last week: [type in the amount in ZAR]</td><td>people are both reluctant to answer such questions precisely and because they often do not know global household income. It has become standard practice to solicit categorical information , as in the National Census and periodic household income and expenditure surveys
The question does not provide information on non-monetised income (food, shelter etc) .
Also the question is unable to provide information on how the income is used and the way its uses are distributed between members within the HH.
Where more exact information about HH income matters is in connection with grants. Grant information is more easily assessed on an individual level.</td><td></td></tr>
<tr><td>Business/enterprise
Q: Do you run a business or enterprise from home (this property)?
A: Yes, No, DK, R</td><td>There is a need identify businesses that may pose a health risk to individuals, the household or the community e.g. crèche/daycare services that are crowded, poorly organised or exposed to hazards/communicable diseases; use of dangerous chemicals/gas (e.g. garage) etc.</td><td></td></tr>
<tr><td>If yes:
Q: What kind of business/ enterprise do you run?

<table><tr><th></th><th>Business/enterprise</th></tr><tr><td>o</td><td>Office</td></tr><tr><td>o</td><td>Shop</td></tr><tr><td>o</td><td>Handicraft</td></tr><tr><td>o</td><td>Crèche /Day care</td></tr><tr><td>o</td><td>Workshop</td></tr><tr><td>o</td><td>Other</td></tr></table></td><td>Suggested categories:
Office: using just office equipment/stationary (e.g. broker, agent)
Handicraft e.g. hair dresser, artisan, craftsman, electrician, plumber etc. where light and portable machinery is used
Shop: predominantly selling goods (e.g. spaza, appliances etc.)
Workshop: using stationary machinery for production or repair of goods (e.g. garage, carpenter)</td><td></td></tr>
</table>

Item	**Comment/Rational**	**Reference**
Grants	Not addressed in this section, but in the individual health status assessments (HSA) Grants are attributed to individuals (although the individual may not be the intended beneficiary e.g. child grant, foster care grant) The assessment regarding grant income is therefore part of the Individual registration section of the HSA. The NDOH form requires the total number of grants received in the household. This question can best be system generated automatically, once everybody in the HH has been assessed.	
People working	Addressed in the individual health status assessments The NDOH HH form enquires about the number of people working in the household. Assessing employment status is part of the individual HSA. As such the NDOH requirements will be generated automatically by the system once everybody in the HH has been assessed.	
School name	Addressed in the individual HSA As with the two preceding question, a requirement of the NDOH HH assessment form. The information is relevant but will be assessed once occupation/employment status of the individual is assessed in the individual assessments.	
Fruit & Vegetable Garden ***Q: Do you grow fruit or vegetables for your household?*** *A: Yes, No, DK, R*		
Animals ***Q: Do you have livestock (cattle, goat, sheep, chickens, donkey, horses, etc.)*** *A: Yes, No, DK, R*	The question aims to identify households that have livestock. Through the WBOT it will be possible to make such households identifiable to veterinarian services.	

Item	**Comment/Rational**	**Reference**
Q: How many dogs do you have?? *A: None, [enter number], DK, R*	Count all dogs in the HH. Gating question for the following question	
If Not "None": ***Q: Have all your dogs been vaccinated in the last 3 years?*** *A: Yes, No, DK, R)*	There are two essential vaccines for dogs in SA: Canine parvo/adeno/distemper and rabies. They have to be repeated every three years. The question aims to ensure domestic pet inoculation, sterilisation and the humane care of pets.	http://www.pawsforpeople.co.za/Health/Vaccination.htm
Q: How many cats do you have? *A: None, [enter number], DK, R*	Count all cats that belong to the HH.	
If Not "None": ***Q: Have all your cats been vaccinated in the last 3 years?*** *A: Yes, No, DK, R)*		
Food security ***Q: Does any member of this household ever cut the size of his/her meal (or skip a meal) because there is not enough food/not enough money to buy food?*** *A: Yes [1], No [0], DK, R*	TRAINING: Consider the most vulnerable foremost, namely children, elderly, chronically ill etc. Do people have the resources to get enough food? (secure, insecure without hunger, insecure with hunger). The assessment is based on the 6-item questionnaire suggested by the U.S. Department of Agriculture, Guide to measure food security (2000) and the South African 4-item General household Survey, 2012 The original questions were modified as they overstated the monetary aspect of buying food. Also the period to be considered was been shortened Number of affirmatives (modified): 0-1 Food secure 2-3 Food insecure without hunger	

Item	**Comment/Rational**	**Reference**
	4-5 Food insecure with hunger	
If Yes: - ***Q: How often does this happen in a month?*** *- A: Almost every week [1], Some weeks but not every [1], Only 1 or 2 days [0], DK, R, X (if not asked)*		
Q: Does any member of this household ever eat less than he/she feels he/she should because there is not enough food/not enough money to buy food? *A: Yes [1], No [0], DK, R*		
Q: Does any member of this household ever say he/she is hungry because there was not enough food in the house? *A: Yes [1], No [0], DK, R*		
Q: Does any member of this household ever go to bed at night without food because there is not enough food/not enough money to buy food? *A: Yes [1], No [0], DK, R*		
Q: Does any member of this household receive food parcels~~ or utilise other food support services~~?	A HH is food insecure with hunger if responses to the above score If: (1) score ≥4 *and* (2) HH income <5300 (?? - taxable income) *and*	

Item	**Comment/Rational**	**Reference**
A: Yes ~~– all HH members, Yes – some HH members~~, No, DK, R If: (1) score ≥4 *and* (2) HH income <5300 (?? - taxable income) *and* (3) not: "Yes" [refer to social services for food support]	(3) not: "Yes" [refer to social services for food support] The household should be flagged to be referred to social services for support. Action to follow: Individuals with food insecurity and hunger may be linked to public kitchen/charity food supply/social services etc. The Gauteng Department of ARD suggests targeted food parcels and meals for immediate support	

Indigent household - NEEDS STILL TO BE VERIFIED!!

Identify the household as indigent (resulting in either of the following stata: registered indigent, possible indigent, not qualifying, unknown][14]. If the household is identified as indigent it may qualify for certain benefits. However certain rules apply to be recognised as a indigent household.

Item	Comment/Rational	Reference
Indigent household registration [System checks whether household may qualifies as indigent: If: HH not collective living quarter *AND* If: Head of household owner of the property AND If: Household has Tshwane account number and/or electricity meter number AND If: Head of household SA (or PR?) ID (or PR number AND IF: Household income <R 2520 p.m. (2 old age state pensions, R 1260 * 2) or < 630 p.w. ***Q: I would also like to assess your household for the CoT indigent programme. Is the household already registered as "indigent"?*** *A: Yes, No, DK, R*	TO BE VERIFIED!!	http://www.services.gov.za/services/content/Home/ServicesForPeople/Socialbenefits/oldagegrant/
If Yes:	(Is there anything like this?)	

[14] Criteria: registered if answered "Yes" to *Q: Is the HH already registered.* Possible if HH is not registered but fulfils all minimum criteria. Not qualifying if HH does not fulfil the minimum criteria ("No" answer), given the minimum criteria are all available. Unknown if any of the minimum criteria are lacking or "R" answer.

Q: Please provide indigent registration number [system labels household as "registered indigent", household stays "indigent" for 24 months, than status expires...)		
If No: ***Q: Does the household head own any fixed property other than this?*** *A: Yes, No, DK, R* If No/DK the household may qualifies: [label household as " possible indigent"]	The CHW can assist in identifying HHs as possible indigent. However, a detailed assessment for the indigent programme should to be done by the programme itself, according to its needs.	