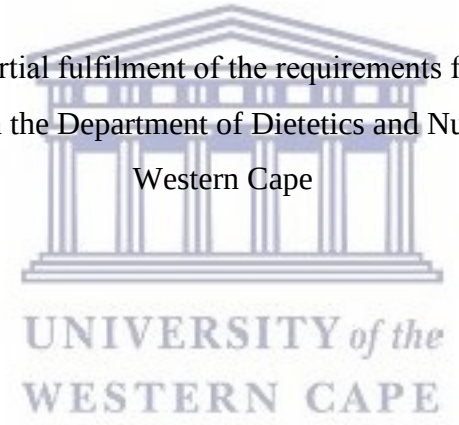
THE DIETARY INTAKE, FOOD (IN)SECURITY AND NUTRITIONAL STATUS OF WASTE PICKERS IN SOUTH AFRICA

JOY DESIRÉ WILLIAMS

A minithesis submitted in partial fulfilment of the requirements for the degree of Master's in Public Health Nutrition in the Department of Dietetics and Nutrition, University of the Western Cape



Supervisor: Prof E.C. Swart

March 2019

THE DIETARY INTAKE, FOOD (IN)SECURITY AND NUTRITIONAL STATUS OF WASTE PICKERS IN SOUTH AFRICA

JOY DESIRÉ WILLIAMS

KEYWORDS

Waste pickers

Homeless people

Street people

Destitute

Vulnerable

Food security

Hunger

Nutritional status

Anthropometry

Dietary intake

ABSTRACT

J.D. Williams

M Public Health Nutrition minithesis, Department of Dietetics and Nutrition,
University of the Western Cape

Background: Waste picking is not a new phenomenon in South Africa and is becoming increasingly prevalent, with rising numbers of waste pickers operating on landfills and on the streets. Although waste pickers are recognised as making an important contribution to waste management systems in South Africa, they remain at the lowest level of the waste collection and disposal hierarchy. Operating on the fringes of the formal economy with low and generally erratic income, they have limited access to safe and nutritious food. Many waste pickers are therefore prone to micronutrient malnutrition and macronutrient malnutrition. Food insecurity is a constant threat. Few studies have been conducted on this vulnerable group of people, with relatively little known about their eating habits and the impact thereof on their health. The aim of this study was to assess the dietary intake, food (in)security and nutritional status of waste pickers in South Africa, with a specific focus on landfill waste pickers.

Study population and design: This constitutes a secondary study which builds on an earlier (primary) study conducted among 409 landfill waste pickers on nine landfill sites in four provinces in South Africa. Data was obtained from a cross-sectional quantitative survey conducted during the primary study which assessed the food (in)security, anthropometric status and dietary intake of waste pickers. In this study, group discussions were also conducted with waste pickers to gain more insight into activities and conditions on the landfill sites.

Methods: An anonymised data set in Microsoft Excel 2016 was used, which was exported and analysed in IBM SPSS Statistics version 25, 2017. Several variables in the data set were recoded prior to the analysis. Waste pickers' dietary intake was assessed using a 24-hour recall questionnaire to determine the anthropometrical/nutritional status of the waste pickers, and their weight (in kilograms) and height (in metres) were measured to determine their body mass index (BMI). Food security/insecurity was measured using the household hunger scale (HHS). Results were then expressed as means, standard deviations, median, frequencies and percentages. The average nutrient intakes were compared to the Dietary Reference Intakes (DRIs). To determine the proportion of the sample with inadequate dietary intake, the waste

pickers' nutrient intake was compared to the DRIs and the macronutrient intake was compared to the DRIs for Acceptable Macronutrient Distribution Range (AMDR).

Results: In this study, 55.96% of waste pickers had a normal BMI. Women (28.05%) were four times more likely to be overweight than men (7.66%), while underweight was more prevalent among waste pickers who described themselves as Coloured.

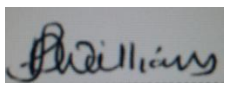
Waste pickers' diets were very nutrient-poor and energy-dense, with carbohydrates accounting for more than 65% of the total energy intake of the study sample. One in five of the waste pickers consumed protein below 10% of their total energy intake, while more than 50% had an inadequate intake of most of the given micronutrients, putting them at risk of multiple micronutrient deficiencies. Food insecurity and hunger were common, with 20% of the study sample reporting that they went to sleep at night hungry and 18.34% going for a whole day and night without eating anything because there was not enough food.

Conclusion: A double burden of malnutrition, including both underweight and obesity, was seen among the waste pickers, with hunger and food insecurity being very prevalent. It is recommended that the Department of Health and municipalities take active steps to integrate waste pickers into formal waste value chains and provide them with the necessary support to enhance their health status and quality of life.

DECLARATION

I, Joy Williams, declare that "*The dietary intake, food (in)security and nutritional status of waste pickers in South Africa"* is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full name: Joy Desiré Williams Date: March 2019

Signed: 

ACKNOWLEDGEMENTS

I would like to extend my appreciation to the following people and organisations for the important contribution they have made towards the success of this work:

To my Lord and Saviour, Jesus Christ. Thank you for carrying me on this long journey. Thank you for always reminding me that I can do all things through Christ who gives me strength (Proverbs 3:5–6).

To my supervisor, Prof Rina Swart. Thank you for your words of encouragement and walking the journey with me. Thank you for your patience, support and understanding. You are one of a kind, a woman of strength. I salute you!

To my husband, Gary Williams. Thank you for your love, prayers, understanding and support.

To my son, Micah Williams, and my daughter, Grace Williams. Every time it got tough, you gave me every reason to smile and push through. This one is for the two of you!

To my parents, Lilburne Cyster and Patricia Cyster. Thank you for always keeping me in your prayers. Thank you for your guidance, believing in me and always encouraging me when times got tough. Thank you for motivating me and encouraging me to never give up hope.

A special thanks, too, to all the waste pickers who participated in this study. Thank you for your patience and offering your time to contribute towards this study.

ACRONYMS AND ABBREVIATIONS

AI:	Adequate Intake
AMDR:	Acceptable Macronutrient Distribution Range
BMI:	Body Mass Index
DRI:	Dietary Reference Intake
EAR:	Estimated Average Requirement
FAO:	Food and Agriculture Organization
FCS:	Food Consumption Score
HDDS:	Household Dietary Diversity Scale
HFIAS:	Household Food Insecurity Access Scale
HHS:	Household Hunger Scale
IFAD:	International Fund for Agricultural Development
LWP:	Landfill waste picker
MRC:	Medical Research Council
MUAC:	Mid-Upper Arm Circumference
NCDs:	Non-Communicable Diseases
NFCS:	National Food Consumption Survey
NHANES:	National Health and Nutrition Examination Survey
PURE:	Prospective Urban Rural Epidemiology
RDA:	Recommended Daily/Dietary Allowance
IBM SPSS Statistics:	IBM Statistical Package for the Social Sciences
SD:	Standard Deviation
STATSSA:	Statistics South Africa
SANHANES:	South African National Health and Nutrition Examination Survey
SWP:	Street waste picker
UL:	Tolerable Upper Level
UNICEF:	United Nations International Children's Emergency Fund
USAID:	United States Agency for International Development
WFP:	World Food Programme

DEFINITIONS

Adequate intake (AI): "is a nutrient recommendation based on observed or experimentally determined approximation of nutrient intake by a group (or groups) of healthy people when sufficient scientific evidence is not available to calculate RDA or EAR." (Escott-Stump & Earl, 2008:338)

Anthropometry: "involves obtaining physical measurements of an individual and relating them to standards that reflect the growth and development of the individual. These physical measurements are useful for evaluating over-nutrition or under-nutrition." (Hammond, 2008:398)

Dietary intake data: "data about food consumption, including information on appetite, eating patterns, and estimations of typical nutrient intakes." (Hammond, 2008:383)

Dietary reference intake (DRI): "DRIs encompass four types of nutrient recommendations for healthy individuals: adequate intake (AI), estimated average intake (EAR), RDA, and tolerable upper level (UL)." (Escott-Stump & Earl, 2008:338)

Estimated average requirement (EAR): "is the average requirement of a nutrient for healthy individuals; a functional or clinical assessment has been conducted, and measure of adequacy has been made at a specified level of dietary intake. An EAR is the amount of a nutrient with which approximately one half of individuals would have their needs met and one half would not. The EAR should be used for assessing the nutrient adequacy of populations, not individuals." (Escott-Stump & Earl, 2008: 338)

Food security: "The 2009 Declaration of the World Summit on Food Security states that "food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food, which meets their dietary needs and food preferences for an active and healthy life." (FAO, 2009)

Nutrition assessment: "the science of determining nutrition status by analysing an individual's medical, dietary, and social history, anthropometric data; biochemical data and clinical data; and drug-nutrient interactions." (Hammond, 2008:390)

Nutrition status: “a measurement of the extent to which an individual’s physiologic need for nutrients is being met.” (Hammond, 2008:383)

Recommended dietary allowance (RDA): “the amount of a nutrient needed to meet the requirements of almost all (97% to 98%) of the healthy population.” (Escott-Stump & Earl, 2008:338)

Tolerable upper level (UL): “the highest daily intake amount of a nutrient that is likely to pose no risk of adverse health effects for almost all individuals in the general population.” (Escott-Stump & Earl, 2008:338)

TABLE OF CONTENTS **Page number**

TABLE OF CONTENTS **Page number**

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Waste picking in South Africa has a long history and remains a common activity in the urban informal economy (Benson & Vanqa-Mgijima, 2010). Even though waste pickers are often seen in towns and cities in South Africa, both on the streets and on landfill sites, little is known about this distinct group of people.

The literature refers to waste pickers as garbage pickers, recyclers, hunters and waste salvagers (Medina, 1997). More broadly, waste pickers are self-employed individuals who work in very challenging environments and form part of the urban informal economy (Schenck & Blaauw, 2011). Most people are not aware of the significant contribution that they make to waste management and the economy as a whole. For example, waste pickers play an important role in conserving the environment by decreasing the amount of waste on landfills and aiding in the disposal and recycling of waste (Medina, 1997).

Waste picking, however, does not constitute skilled labour and can be performed by anyone who is physically capable of collecting waste for recycling. Waste pickers operate at the lowest level in the hierarchy of entities that collect and dispose of waste. The number of waste pickers in South Africa increased from 37,000 in 2004/5 to approximately 51,500 in 2016 (Mehay, 2017).

Most studies on waste pickers have focused on determining their socio-economic status and the health hazards to which they are exposed. Not many studies have been conducted on the dietary intake, food security/insecurity and nutritional status of waste pickers. More attention needs to be given to these aspects so that appropriate policies can be implemented that will enable waste pickers to benefit from health, welfare and municipal waste management systems. Protection of this vulnerable group of small-scale, self-employed entrepreneurs will go a long way towards ensuring that they will be able to generate sufficient income to meet their (and their dependents') basic survival needs.

The aim of this study, therefore, was to determine the dietary intake, food (in)security and nutritional status of waste pickers in South Africa with a view to expanding the knowledge base on this important segment of the economy.

CHAPTER 2: LITERATURE REVIEW

2. Waste pickers

2.1.1 Who are waste pickers?

Waste pickers are a vulnerable group of people. They lack the ability to secure decent work and are unable to invoke their socio-economic rights and obtain social protection. The literature refers to waste pickers as garbage pickers, recyclers, hunters and waste salvagers (Medina, 1997). They spend their days collecting recyclable waste materials in dangerous environments that pose many physical risks. Waste pickers are not necessarily homeless or street people, but their food-seeking behaviour can be compared to that of homeless or street people.

2.1.2 Where do waste pickers work?

Waste pickers work and collect waste in different places, either on landfill sites or on the streets. Those who collect waste from a landfill are referred to as landfill waste pickers (LWPs) while those who collect waste from the streets are called street waste pickers (SWPs). Waste pickers either collect materials for sale to buy-back centres in return for money or they collect waste and other materials for their own use (Medina, 1997). This is often the sole source of income for a growing number of disadvantaged people and helps to ward off food insecurity for these people.

Waste pickers work in very dirty and unhygienic environments, are often mistreated, ignored by society and are often associated with filth, a lack of personal hygiene, illnesses and criminal activity because of the work they do (Medina, 1997). There are different reasons why people decide to be waste pickers. Unemployment, a low level of education, the loss of family members, mental illness, and drug or physical abuse are some of the factors that may drive people to work for themselves. The work provides an income that allows them to survive at a basic level or make a modest living (Coppenrath, 2001).

2.1.3 The contribution of waste pickers to the economy

Waste is a naturally occurring by-product of human activity. The non-disposal and build-up of waste pollutes the environment and can pose health risks to others (Mote et al., 2016).

Waste generation differs between high- and low- or middle-income countries. There is far more waste generated in high-income countries, and better survival opportunities for waste pickers, than in low- or middle-income countries (Schenck & Blaauw, 2011).

Waste pickers play an important role in the process of recycling, saving other entities time and money by collecting waste so that it can be turned into economic goods that can be used again (Medina, 1997; Schenck & Blaauw, 2011). Landfill and street waste pickers also help the environment by ensuring lower air pollution from garbage trucks and less energy and water usage in the more formal collection process. They also help to extend the life of dumps and landfills (Medina, 1997). Yet they are far from being accepted as part of the formal recycling sector by the municipal waste management systems in South Africa (Schenck & Blaauw, 2011). In fact, waste pickers fall into the bottom tier of the urban informal sector for recycling and are commonly recognised as having the lowest occupational status in society (Schenck & Blaauw, 2011; Medina, 1997).

According to Faber (2016), municipalities would be able to save up to an estimated R 750 million per year and protect landfill space if waste pickers could be better accommodated in the formal economy in South Africa. If South Africa's municipal waste management systems made provision for waste pickers, it would reduce the cost to the economy of disposing of waste, assist with environmental sustainability and serve as a more viable opportunity for income generation among vulnerable people (Schenck & Blaauw, 2011).

2.2 Food and nutrition security

2.2.1 Definition of food and nutrition security

At the 2009 Declaration of the World Summit on Food Security it was stated that "food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food, which meets their dietary needs and food preferences for an active and healthy life" (FAO, 2009). Food security and nutrition have four dimensions: availability of food, access to food, utilisation of food, and stability of both availability and access to food. A household is considered food insecure if it is deficient in one or all of these dimensions (FAO, 2009).

Food availability refers to the production and continuous supply of sufficient amounts of quality and nutritious food at national and household level, whether it is imported into or exported from a country (Zewdie, 2014; Burchi & De Muro, 2016). Food availability is seen

as the starting point in achieving food security. However, food availability on its own is not sufficient for food security because even though food is available it is not necessarily accessible to the majority of vulnerable people (FAO, 2009). Food availability is influenced by many factors, including climate change which will have an effect on agricultural productivity (Zewdie, 2014).

Food accessibility refers to the ability (through access and affordability) of individuals, households and communities to purchase safe and nutritious foods in adequate amounts to meet their nutritional needs and satisfy their hunger (Zewdie, 2014; Burchi & De Muro, 2016). Therefore, income level, employment status, education, access to resources and food prices are some of the factors that could hinder an individual's or household's ability to access food (Renzaho & Mellor, 2010).

Food availability and accessibility do not necessarily mean that the food will be sufficient to meet the nutritional needs of an individual or household (Connolly-Boutin & Smit, 2015). Food utilisation refers to the bioavailability of the food that an individual or household consumes. Food utilisation can also be affected by other factors such as climate change and changes in methods of food production which may alter the nutritional quality of foods (Zewdie, 2014).

2.2.2 The nutrition and food (in)security situation in South Africa

Food insecurity is seen as an extreme form of poverty. Approximately 821 million people globally experience food insecurity, of which 236.5 million live in Sub-Saharan Africa (FAO, 2018). The number of undernourished people globally increased from 804 million in 2016 to 821 million in 2017 (FAO, 2018). In 2017 in Sub-Saharan Africa, the prevalence of undernourishment stood at 21% of the population (250 million people), with approximately 23.2% of the population in the region suffering from chronic food deprivation (FAO, 2018).

Recent statistics from the South African General Household Survey 2017, show that the number of South African households that have access to food has improved since 2002, but things have remained stagnant since 2011 (StatsSA, 2018a). The proportion of South African households with inadequate or severely inadequate access to food was 21.3% in 2017 (StatsSA, 2018a), while in the same year the proportion of individuals in the country who were at risk of going hungry was 24.7%. Also in 2017, the proportion of individuals who experienced hunger was 12.1% while the proportion of households experiencing hunger was 10.4% (StatsSA, 2018a).

According to Oxfam (2014), South Africa is apparently a food-secure nation, producing enough food to nourish all 53 million inhabitants. However, 25% of the population experience hunger on a regular basis and more than half the population is at risk of experiencing hunger. This is consistent with various reports that describe South Africa as having high rates of household food insecurity.

Even though there has been a decline in the number of people experiencing food insecurity or going hungry, South Africans are still faced with various forms of malnutrition

2.2.3 Measuring food (in/)security

The Household Food Insecurity Access Scale (HFIAS) includes a collection of indicators that were developed by the United States Agency for International Development (USAID) and are used to estimate the prevalence of food insecurity or food poverty in a household (Ballard et al., 2011). The indicators are used as a continuous measure of household food insecurity in previous months. The HFIAS consists of a set of nine questions that represent increasing severity of food insecurity and nine follow-up questions that determine the frequency of the condition. The indicators are used to determine which households across all cultures are food secure or food insecure (Ballard et al., 2011). The questions are aimed at all the members in the household and not just the respondent. The questions address different elements of food insecurity, including: anxiety and uncertainty about the household food supply, insufficient quality of foods and insufficient food intake and the physical consequences thereof (Ballard et al., 2011). Those households with a higher score were more food insecure and had poor access to food (Ballard et al., 2011).

The Household Hunger Scale (HHS) is an indicator derived from the HFIAS that is used to determine the degree of hunger in households that live in areas that are more prone to food insecurity (Ballard et al., 2011). The HHS is the most appropriate indicator to use in the case of significant food insecurity as it can determine the occurrence of hunger and the changes in hunger among households over time. The results of the HHS can be used to motivate for the formulation and implementation of policies and programmes to combat food insecurity and hunger in areas that are particularly vulnerable to these phenomena (Ballard et al., 2011). Another objective of this indicator is to monitor and evaluate policies and programmes that specifically address food insecurity and hunger and to provide information that will inform early cautionary measures or nutrition and food security surveillance (Ballard et al., 2011).

The HHS indicator consists of three questions, with one subset question per question. The full set of six questions is used as a valid method of determining the degree of household food inadequacy. Therefore, all six questions must be used when interviewing an individual (Ballard et al., 2011). A score from 0–1 indicates "little to no household hunger", 2–3 indicates "moderate household hunger" and 4–6 indicates "severe household hunger" (Ballard et al., 2011).

The HHS indicator focuses on food quantity and food access, not dietary quality. However, the HHS indicator should not be used on its own to measure food insecurity.

A household food insecurity assessment can include other data as well. For example, the nutritional status of the individuals in the household can be assessed by collecting and analysing anthropometric data. Household income and expenditure can be useful in determining the proportion of total household income that is spent on food. The production of food within a household and the consumption thereof also influence the food intake and food security of a household. Food production and consumption can be assessed to determine whether households are consuming the food they produce or whether they are harvesting and selling food to generate an income. In addition, household coping strategies can be assessed, which might include borrowing food or money for food, limiting portion sizes, reducing the number of meals per day, and so on. Also subject to scrutiny might be the dietary diversity within the household or at an individual level aimed at determining the degree of variety of foods eaten and the nutrient adequacy of people's diets (Ballard et al., 2011).

After the data from the HHS survey has been collected it can be analysed as a categorical HHS, which is easier to interpret. The options could be rarely hungry, sometimes hungry or often hungry.

Other indicators that can be used to measure food (in)security are dietary diversity and frequency of food groups, which will determine the kinds of foods consumed and the frequency thereof. The indicators used to measure dietary diversity are the Food Consumption Score (FCS), the Household Dietary Diversity Scale (HDDS), and Spending on Food and Undernourishment (Vhurumuku, 2014). Consumption behaviour can also be used as an indicator of food (in)security. It measures behaviours relating to food consumption and determines the frequency and severity of behavioural change when people do not have access to food and money for food (Vhurumuku, 2014). The household dietary diversity scale is usually compiled over a 24-hour recall period and represents the number of different foods or

food groups consumed over that period. It is also used as a proxy measure of household food access and nutrient adequacy of individuals' diets (Vhurumuku, 2014).

2.3 Anthropometrical/nutritional status

2.3.1 Definition of nutritional status

Nutritional status is the extent to which an individual's nutritional needs are being met. It can be assessed by interpreting anthropometric measurements, and by assessing biochemical markers, clinical assessments and dietary intake (Hammond, 2008). The aim of assessing nutritional status is to collect sufficient information to make a professional nutritional diagnosis and provide the necessary management, rehabilitation and support (Hammond, 2008).

The most common anthropometric measurements are weight and height. These two measurements can be used to calculate BMI (Body Mass Index). Biochemical markers refer to blood test results and how they compare to the minimum and maximum values; these will indicate whether an individual has any micronutrient or other deficiencies. A clinical assessment involves the head-to-toe physical examination of an individual to determine whether the individual presents with any physical signs of nutritional deficiency. A dietary assessment is a summary of the individual's dietary intake over a specific time period or the frequency with which foods are consumed. Anthropometry is one component of a nutritional assessment that is useful to classify whether an individual is underweight or overweight (Escott-Stump & Earl, 2008).

2.3.2 How to measure anthropometrical status

According to Escott-Stump and Earl (2008:398), "anthropometry involves obtaining physical measurements of an individual and relating them to standards that reflect the growth and development of the individual. These physical measurements are useful for evaluating over-nutrition or under-nutrition".

Anthropometry and dietary intake will be the two main components used to assess nutritional status in this study. The most commonly used anthropometric measurement is Quetelet's index (W/H^2), referred to as Body Mass Index (BMI) (Hammond, 2008). The BMI calculation uses the weight (in kilograms) and height (in metres) of an individual to indicate whether the individual is underweight or overweight (Hammond, 2008).

Other anthropometric measurements include: waist circumference and waist–hip ratio which assesses abdominal obesity or abdominal fat (Hammond, 2008). The three indicators (BMI, waist circumference and waist–hip ratio) have different cut points for men and women. The Mid-Upper Arm Circumference (MUAC) can be measured to determine whether the individual is malnourished or not. The MUAC is a useful measurement when a scale or height meter is not available. The individual's age, weight, height and gender are not necessary when the MUAC is classified according to cut points.

2.3.3 Anthropometric/nutritional status of South Africans adults

According to the FAO (2018), approximately 672 million adults are overweight or obese in the world (FAO, 2018). The prevalence of overweight and obesity in South Africa in 2016 was 68% and 31% respectively in women and men (NDoH et al., 2019). Non-communicable diseases (NCDs) relating to over-nutrition is a growing problem, despite the prevalence of under-nutrition and infectious diseases (Vorster, 2010).

2.3.4 Anthropometric/nutritional status of waste pickers

Not many studies have been conducted to determine the anthropometrical/nutritional status of waste pickers in South Africa. There are some international studies among waste pickers, homeless, vulnerable adults and food secure or insecure adults and families. Anthropometry data which included body weight, height and waist circumference, according to the international standards for males and females (Alberti et al., 2005) was measured among 268 waste pickers in Brazil. More of the women (58.9%) were overweight, 28.9% were obese and 66.5% had abdominal obesity compared to approximately one-third (29.6%) of the men being overweight, 16.9% being obese and 33.8% presenting with abdominal obesity (Auler et al., 2013). The IOM and NRC (2013) investigated the adequacy of the Supplemental Nutrition Assistance Program (SNAP) among adults in the United States. The IOM and NRC (2013) reported that those adults who were more food insecure were twice as likely to develop diabetes mellitus as those adults who consumed a healthy diet and were more food secure. According to the IOM and NRC (2013), there is an association between low household food security and some measure of decreased nutritional status, especially among women and the elderly.

2.4 Factors affecting nutritional status

The UNICEF Conceptual Framework (UNICEF, 1990) will be used as a theme to describe the various factors contributing to food security and the nutritional status of the sample population

in this study (see Figure 1). The UNICEF Conceptual Framework has been used in many studies to explore and explain the factors that influence an individual's and a population's nutritional status. The framework is mainly used to explain the causes of under-nutrition in developing countries, but it is also applicable to over-nutrition in an urban context (Gross et al., 2000).

The UNICEF Conceptual Framework illustrates the different factors influencing nutritional status. These factors are categorised as direct and indirect factors. Direct factors include factors of immediate impact to the individual. Indirect factors are underlying factors that relate to families, the environment, health systems, and broad community or economic issues (Gross et al., 2000).

The nutritional status of a population will be more severely affected when the indirect factors constitute inadequacies among the population (Gross et al., 2000). Nutritional status is an outcome of food intake and health status; these two immediate causes are therefore directly linked to nutritional status. The underlying factors influencing nutritional status include inadequate access to food, insufficient health services, an unhealthy environment and inadequate care for children and women. These underlying factors are further affected or aggravated by basic causes such as educational level, household income, and changes in the economic, political and environmental arenas.

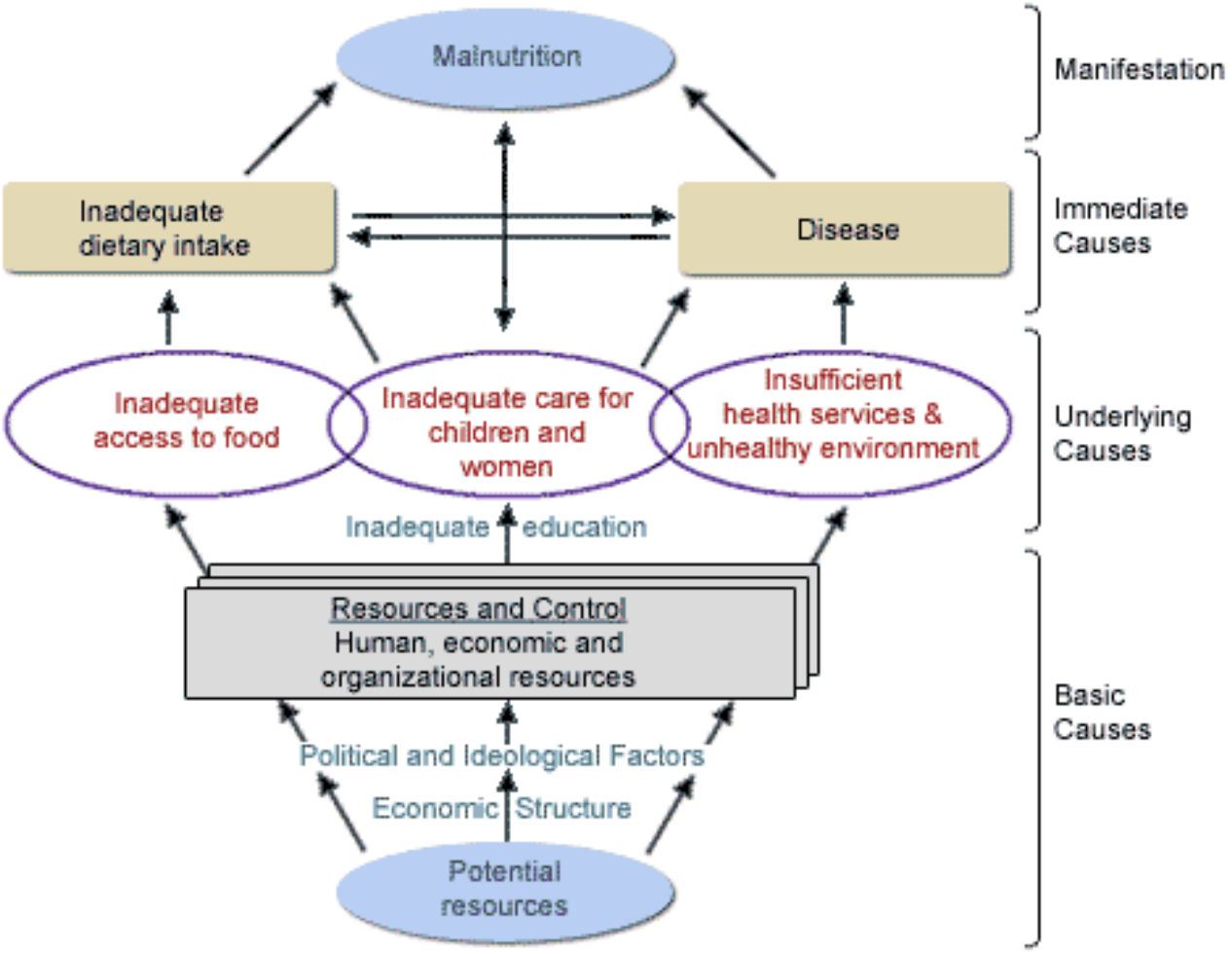


Figure 1: UNICEF Conceptual Framework

Source: UNICEF (1990)

2.4.1 The basic causes of malnutrition within the UNICEF Conceptual Framework

With constant change taking place in the political and economic environments of South Africa, the population is faced with challenges such as rising food prices and a recent increase in Value Added Tax (VAT) (SARS, 2018). Many families cannot cope with the growing economic pressures and struggle to feed their families safe and nutritious meals every day. The changing political and economic climate in the country has a direct influence on the availability of, and access to, nutritious food.

Climatic changes, like droughts or floods, can impact food production which in turn causes food prices to rise and influences the availability of and access to food. Sub-Saharan Africa is extremely susceptible to climate change (Zewdie, 2014). As a result, climate change is seen as

a major factor affecting the three components of food security, namely food availability, food accessibility and food utilisation (Zewdie, 2014).

Socio-demographic characteristics like school education, household income, age and living conditions influence the underlying causes of malnutrition. An individual's school education plays an important role in the quest for food security. According to Lee and Greif (2008), the homeless or more vulnerable people are limited in terms of their education and are often not aware of the value of nutritional health and well-being. Homeless people also face a number of personal problems like drug abuse and mental illness, which can adversely affect the decisions and choices that they make. Their lack of knowledge actually hinders their ability to satisfy their hunger (Lee & Greif, 2008).

2.4.2 The underlying causes of malnutrition within the UNICEF Conceptual Framework

Inadequate access to safe, nutritious food is the main underlying cause of inadequate food intake. Inadequate access to nutritious food can either cause under- or over-nutrition; therefore, the quality and quantity of food are important when considering access to food. Poor and vulnerable people are often faced with challenges that affect their access to nutritious food. Some vulnerable people live in rural areas where supermarkets are situated far from their homes. As a result, they are forced to purchase food from street vendors (Pereira, 2014). Food sold by street vendors often includes fresh fruit and vegetables but also a wide variety of fast foods like deep-fried *vetkoek[1], chicken feet, braaied meats and other cultural delicacies (Pereira, 2014).

Vulnerable people living far from regular shops, having limited access to nutritious food, often purchase food that is energy-dense like vetkoek or fatty meat to feed the whole family (Pereira, 2014). Often these foods lack micronutrients to support the growth and immunity of individuals and contain large amounts of saturated fats and poor-quality proteins (Pereira, 2014). The poor nutritional quality of such foods and the quantity thereof negatively influence the health of the individuals concerned and can cause chronic lifestyle diseases, obesity and micronutrient deficiencies. This directly affects their health status and also their nutritional outcomes.

*vetkoek: (noun) a South African cake or pastry (Collins, 2019a)

Household income is another underlying contributor to nutritional status. A lack of education, for example, often gives rise to a lack of income in a household and directly affects an individual's ability to purchase nutritious food.

According to a study done by Dubihlela and Dubihlela (2014), which illustrated the impact of social grants on female-headed households, there was evidence that social grants contribute to household income and help combat poverty. Social grants also help households move further away from the poverty gap and poverty index and bring very poor households closer to the poverty line. However, the impact on poverty reduction differs according to the type of grant received (Dubihlela & Dubihlela, 2014). Even though very few individuals receive old-age pension grants compared with child support grants, the old-age pension grant is more effective in reducing the incidence of poverty and the intensity thereof. The old-age pension is currently R 1700 per month, four times more than the child support grant of R 410 per child per month (SASSA, 2018). Households can therefore meet more of their living expenses and purchase more food for the family with the money received from social grants. Unfortunately, these grants are not sufficient to cover all living expenses and feed the whole family nutritious food. There is therefore always a risk of food insecurity (Dubihlela & Dubihlela, 2014).

Access to health services and an unhealthy working and living environment have a significant influence on health status. Poor, vulnerable people or homeless people often live in unhygienic environments which make them more susceptible to communicable diseases such as tuberculosis, diarrheal diseases, pneumonia and other infectious diseases (Singh & Singh, 2008). These diseases affect their health negatively and therefore their nutritional outcomes.

2.4.3 The immediate causes of malnutrition within the UNICEF Conceptual Framework

Immediate causes of malnutrition include inadequate dietary intake and disease. These two factors go hand in hand and have a direct influence on an individual (Gross et al., 2000). Physically, an individual is at risk of contracting diseases when the body lacks nutritious, safe food to meet its nutritional requirements. If the basic and underlying causes of malnutrition are dealt with, then an individual's dietary intake will improve and the risk of contracting diseases will decline.

2.5 Dietary intake

2.5.1 What is dietary intake?

A diet history is the most common method for collecting dietary intake information. It refers to an individual's usual patterns of food consumption (Escott-Stump & Earl, 2008:383).

2.5.2 How is dietary intake assessed?

A dietary assessment is a component of nutritional assessment. A dietary assessment is a summary of an individual's dietary intake over a specific time period or the frequency with which particular foods are consumed (Escott-Stump & Earl, 2008). Dietary intake is most commonly recorded by collecting retrospective intake data and completing a 24-hour dietary recall or food frequency questionnaire which can also be used to determine the number of times a week or month certain food groups are consumed. In addition, a food diary can be kept by a client or a patient to determine exactly how much (i.e. the amount of) food is eaten (Escott-Stump & Earl, 2008).

2.5.3 Dietary intake of South African adults

Currently there is limited national data on the dietary intake of South African adults. The only relevant study that was conducted by the National Food Consumption Survey (NFCS) was in 1999 to assess the dietary intake of children aged one to nine years (Mchiza et al., 2015).

However, a systematic review performed by Mchiza et al. (2015) summarises 13 studies that were conducted to determine the dietary intake of South African adults and describe possible nutritional deficiencies in the period 2005–2015. The studies included in the review covered both urban and rural areas. The systematic review provides a summary of probable micronutrient deficiencies that South African adults experience and gives an idea of the most commonly eaten foods (Mchiza et al., 2015). In the studies the dietary intakes were compared to the dietary reference intakes (DRIs), usually the estimated average requirements (EARs), adequate intakes (AIs), recommended dietary allowances (RDAs) and acceptable macronutrient distribution ranges (AMDRs), and were expressed as means and standard deviations (Mchiza et al., 2015).

2.5.4 Macronutrient intake of South African adults

The systematic review indicates that there are big differences in energy and macronutrient intakes in the 13 studies that were conducted (Mchiza et al., 2015). Mean energy intakes varies from 6973 to 15,485 kJ and 6107 to 12,302 in men and women respectively (Mchiza et al., 2015). Overall, the mean intake of total energy among South African adults appears to be less than the DRIs for men and women, with a lower mean energy intake among rural South Africans compared to that of their urban counterparts who had adequate to high energy intakes (Mchiza et al., 2015).

The majority of the mean percentage values of carbohydrates, proteins and fats were within the AMDR of the DRIs. The range for percentage energy from carbohydrates was 47%–69%, from protein was 10.9%–18.3% and from fat was 17% –37.1% (Mchiza et al., 2015). Studies that were done among participants in urban areas had higher mean percentage intakes of macronutrients, such as fat and protein, than studies in the rural areas (Mchiza et al., 2015).

Mean fibre intakes in most of the studies were less than the RDA for men and women while mean added sugar intakes in all 13 reviewed studies were more than the recommended minimum requirement of <25 g/day or <10% of total energy (Mchiza et al., 2015).

2.5.5 Micronutrient intake of South African adults

The systematic review included seven studies to summarise the micronutrient intake of South African adults. Calcium, folate, B vitamins, and Vitamins C and D were below the DRIs for certain studies (Mchiza et al., 2015). The mean calcium and Vitamin D intakes for men and women were much lower than the DRIs. The lower mean intakes for micronutrients were more prevalent in black racial groups as well as in the one study conducted among Indian participants (Mchiza et al., 2015).

The systematic review performed by Mchiza et al. (2015) therefore reveals that most South African adults' energy intakes are below the DRIs, especially those residing in rural areas. Most adults in South Africa meet the AMDR for macronutrients but adults in urban areas have a higher fat and protein intake than their counterparts in rural areas. South African adults have a very limited variety of foods in their diets, with a large consumption of carbohydrates such as maize and breads, a very large consumption of added sugar and a low consumption of fruit and vegetables.

2.5.6 Dietary intake of waste pickers

Dietary intake is a big concern among waste pickers. Waste pickers do not normally live on the streets, but they do have similar characteristics to street people, which could influence their food-seeking behaviours and decision-making with regard to food intake. They both walk the streets and scratch in dustbins or garbage for food and they often do not see the nutrient value as the most import aspect of the food that they collect. They collect food to satisfy their hunger and not to look for nutritional value. They often collect and eat contaminated food from unhygienic sites, while collecting other recyclable materials.

A study done by Talukder et al. (2015) revealed that even though street children received some food from waste, it was of a poor nutrient value. The study indicated that the nutrient value of the food that was collected and eaten was not important to the street children, as they ate food from waste to satisfy their hunger.

Poor eating habits and poor quality of food (below nutritional requirements) are factors that place these people at a high risk of becoming malnourished, which will also make them more susceptible to other illnesses. It is often expected that homeless people are undernourished and have a poor nutritional status. On the contrary, similar studies that assessed malnutrition in vulnerable groups found that binge-type eating was a common habit among vulnerable people (Coppenrath, 2001). Poor or vulnerable people merely eat what they get, whether it is a bowl of chicken fat or a loaf of bread. They have inadequate access to food and do not always have the facilities to cook meals. The eating habits of homeless people can therefore alternate between food shortages and or binge eating (Coppenrath, 2001). A study amongst waste pickers in Santos, Brazil showed that most participants had a normal BMI with only 29.5% being overweight or obese, but those women with a lower BMI were more likely to present with anaemia (Rozman et al., 2010). Therefore, the risk of micronutrient deficiencies increases if nutritional status deteriorates (Rozman et al., 2010).

Malmauret et al. (2002) conducted a study on homeless people in Paris. They concluded that more than 50% of the study sample reported that they were not getting enough food to eat due to a lack of finance. This corresponds with more than 50% of the study sample consuming less than two-thirds of the Recommended Dietary Allowance (RDA) of all micronutrients for French adults, except for iron for men (Malmauret et al., 2002). The majority of the study sample ate only two meals per day. Mean total energy intakes for men and women were below the RDA for French adults, but were moderate with a wide range – mostly accounted for by

the addition of alcohol (Malmauret et al., 2002). Alcohol constituted from 30–40% and 17–19% of total energy for men and women respectively, while 84% of the sample population of French homeless adults reported that they drank regularly (Malmauret et al., 2002). Although the energy from alcohol is very efficient, alcohol consumption can interfere with the body's ability to metabolise other sources of energy such as carbohydrates (Coppenrath, 2001). The limited available research among waste pickers indicates that the dietary intake, nutritional status and food in/security is usually sub-optimal and therefore further research in this area will be beneficial to the health and well-being of waste pickers.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

This chapter will describe the methodology of the primary study and the secondary study.

There is limited information available on the anthropometrical/nutritional status of waste pickers in South Africa or on their dietary intake.

Given this background, the following research questions were formulated:

1. What is the socio-demographic status of the landfill waste pickers (LWPs)?
2. What is the food (in)security status of the LWPs?
3. What is the anthropometrical/nutritional status of LWPs?
4. What is the dietary intake of the LWPs?

3.1 Project aim and objectives

3.1.1 Aim of the primary study

The aim of the primary study was to investigate the dietary intake, food (in)security, anthropometrical/nutritional status and socio-demographic status of the waste pickers on nine landfill sites in South Africa

3.1.2 Objectives of the primary study

1. To assess the dietary intake of people who make a living from landfill sites.
2. To assess the anthropometrical/nutritional status of people who make a living from landfill sites.
3. To assess the socio-demographic status of people who make a living from landfill sites.
4. To explore the daily survival strategies and functioning of people who make a living from landfill sites.

3.2 Methodology of the primary study

3.2.1 Study design and sample size of primary study

The primary study by Schenck et al. (2018) used a cross-sectional study design with a triangulation mixed-method design (Creswell, 2007; Schenck et al., 2018). The triangulation mixed-method design is characterised by two or more methods used to confirm, cross-validate and support findings within a study (Creswell, 2007; Schenck et al., 2018). The data collection

is concurrent, which strengthens the results. The researcher uses both qualitative and quantitative data in order to best understand the phenomenon of interest (Creswell, 2003).

The primary study was conducted on nine landfill sites in four of the nine provinces of South Africa among a total of 373 adult waste pickers older than 18 years of age (Schenck et al., 2018). Six landfill sites were in rural areas and three were in urban areas. The landfill sites comprised Bloemfontein North (BN), Bloemfontein South (BS), Botshabelo (BO), Bronkhorstspruit (BR), Mamelodi (MA), Oudtshoorn (OU), Potchefstroom (PO), Stellenbosch (ST) and Vryburg (VR). The landfill sites were in Free State province (BN, BS and BO), Gauteng province (BR and MA), Western Cape province (ST and OU) and North West province (VR and PO).

The nine landfill sites were sampled in consultation with the Centre of Excellence (CoE) in Food Security so as to coincide with other CoE studies being performed in the same areas (Schenck et al., 2018). The study was funded by the CoE in Food Security with the funds being used to cover research costs such as transport, accommodation and compensation for waste pickers (Schenck et al., 2018).

According to Schenck et al. (2018), four provinces in South Africa were selected because the CoE had other projects in these areas which provided health information on the Prospective Urban Rural Epidemiology (PURE) Sites (Potchefstroom, Vryburg, Langa and Mount Frere). During reconnaissance, no waste pickers were allowed on the dumpsites in Langa and Mount Frere; therefore, these sites were replaced by sites in the Western Cape province (Stellenbosch and Oudsthoorn). The urban site in Gauteng province was selected because there was another CoE project on that site, while another rural site from Gauteng (Bronkhorstspruit) was included. The Bloemfontein North and Bloemfontein South sites were included because previous studies among waste pickers on these sites had been conducted by the same researchers in 2012. Botshabelo was added as a rural counterpart to Bloemfontein North and Bloemfontein South.

The members of the research team visited the sites before they started with the fieldwork and collection of data (Schenck et al., 2018). This was necessary to determine whether they would be able to gain access to the sites, to get permission from the municipalities and to identify the primary language spoken by the waste pickers in order to prepare data collection instruments and select the most suitable fieldworkers (Schenck et al., 2018).

A pilot study was done on the Stellenbosch landfill site, which had 50 waste pickers. Using the cross-sectional study design, the team completed the pilot study within one day. A total of 20 fourth-year Social Work and 20 Dietetics students were trained as fieldworkers. The fieldworkers' and team leaders' reflections on the data collection process, observations and results were used to make changes to the instruments as well as the approach to data collection.

3.2.2 Sampling and collection of data

On each landfill site, the following sampling procedure was followed:

On arrival at the landfill site the fieldworkers counted the waste pickers to serve as the sampling frame. On small landfill sites (<50 waste pickers), the whole research population of waste pickers who were willing and available was interviewed. On larger landfill sites, the team ensured that at least 10% of the population of waste pickers were invited (minimum of 50) to participate. All available waste pickers were interviewed on the day the researchers visited the sites (Schenck et al., 2018). Three sets of data were collected simultaneously by the trained fieldworkers (Schenck et al., 2018). Proportionate gender and age representation was also ensured.

Process A: The socio-economic data was collected using a questionnaire with quantitative and open-ended explanatory, qualitative questions where more information was required. This information was used to determine the socio-demographic status of waste pickers and the food (in)security and prevalence of hunger among waste pickers (Schenck et al., 2018).

Process B: (i) The dietary intake of landfill waste pickers was assessed by means of a 24-hour recall by a trained fieldworker using a standardised form and a dietary intake toolkit to assist with quantification (Schenck et al., 2018). Where possible, interview days were selected to ensure that 24-hour recalls represented weekend days and week days proportionately. (ii) Anthropometrical measurements were performed by a trained fieldworker. Measurements (taken without shoes and heavy clothing) included body weight to the nearest 0.1 kg (A&D Personal Precision Scale, Tokyo, Japan) and height on a portable stadiometer to the nearest 1 mm (Lee & Nieman, 2003).

Process C: Semi-structured individual and group interviews were conducted by the researchers in the primary study (Schenck et al., 2018). In addition, general observations were made and photographs were taken during the data collection process (Schenck et al., 2018).

The fieldwork straddled the period April 2015–April 2016 (Schenck et al., 2018).

3.3 Validity and reliability of information

Creswell (2007) uses the term "validity" to denote the trustworthiness of both quantitative and qualitative data sets, although different validation strategies are used for the data sets. In terms of the quantitative data, the selection process was as representative as possible with at least a 10% (with a minimum of 50 waste pickers) representation from each site (landfill site). For smaller sites (<50 waste pickers), all waste pickers who were willing to be interviewed were included.

The reliability of an instrument refers to the extent to which the instrument is repeatable and consistent. The questionnaire used to determine the socio-demographic status of the waste pickers was previously used in studies with waste pickers (Schenck & Blaauw, 2011). It was adapted after the completion of the pilot study. Maree (2007) refers to this process as test-retest reliability. Dietary intake and anthropometric assessments were performed using standard operating procedures and validated data collection forms (Mahan & Escott-Stump, 2008).

In terms of the qualitative data, trustworthiness was ensured through various measures: multiple data sources were used with triangulation of data with the literature and other studies; internal and independent coding was done to compare the qualitative analysis and findings; rich and thick descriptions of the findings were provided along with the fieldworkers' reflections, and checking was done with the fieldworkers, team members and stakeholders (Schenck et al., 2018).

3.4 Ethics

Ethical approval for the primary study was provided by the Senate Research Ethics Committee at the University of the Western Cape, reference number 15/4/24. The thesis title for the secondary study was approved on 2017/11/29 by the Senate Higher Degrees Committee, reference number SHD/2017/7.

Participants were treated with respect and dignity, with the principles outlined in 3.5, 3.6 and 3.7 being upheld so as to protect their rights.

3.5 Informed consent

The participants were informed of the process and the purpose of the research, and completed a written consent form to confirm their voluntary participation. In the case of an illiterate participant, consent was obtained in the presence of a third person as witness. The consent form was removed from the questionnaire before the questionnaire was completed.

The contact details of the researcher and the supervisor were clearly stipulated on the consent form and on the information sheet. All fieldworkers and researchers were clearly identified as being part of the project by a name tag with a photo and a UWC-labelled glow jacket.

3.6 Voluntary information

Participation in the research was voluntary. Participants were informed of their right to refuse to participate and their freedom to withdraw from the research at any point. Participants were assured that such withdrawal would not in any way affect their access to benefits for which they would otherwise qualify.

As some of the respondents were illiterate or not proficient in English, the consent forms and information sheet were translated into the most commonly spoken languages (English and Afrikaans) and explained to them in the language they understood best. Fieldworkers were selected on the basis of their proficiency in the languages spoken on the landfill sites so that they could communicate with the participants.

Compensation for participants' involvement and contribution was in the form of food, which was distributed after all the interviews and measurements had been completed. This was to prevent people participating merely to gain access to food.

3.7 Privacy, anonymity and confidentiality

Information acquired was stored securely with each questionnaire/data collection form coded using a number instead of a name, for identification purposes, during the process of data analysis. The identities of the participants were protected by removing the consent form from the completed questionnaire/data collection form. Research data is generally stored for at least five years. Hard copies of documents were stored in a sealed box in a locked cabinet and electronic data was stored on a password-protected computer.

Interviews were conducted between the researcher and one participant at a time. The interviews were all conducted in the open at the landfill sites.

3.8 Methodology of the secondary study

3.8.1 Project aims and objectives of the secondary study

The aim of the secondary study was to investigate the dietary intake, food (in)security and anthropometrical/nutritional status of the waste pickers on nine landfill sites in South Africa. This was part of the primary study conducted by Schenck et al. (2018) (**Project Title**: Food security, nutrition and socio-economic status of landfill waste pickers).

3.8.2 Objectives of the secondary study

1. To assess the dietary intake of people making a living from landfill sites in South Africa by administering a 24-hour recall.
2. To assess the anthropometrical/nutritional status of people making a living from landfill sites in South Africa by determining the BMI.
3. To determine the food (in)security of people making a living from landfill sites in South Africa.
4. To determine the socio-demographic factors influencing the nutritional status of waste pickers in South Africa.

3.8.3 Study design and sample size of the secondary study

The secondary study was conducted on nine landfill sites in four of South Africa's nine provinces among 409 adult waste pickers who were older than 18 years of age. Six landfill sites were in rural areas and three were in urban areas. The nine landfill sites were sampled in consultation with the Centre of Excellence (CoE) in Food Security so as to coincide with other CoE studies being performed in the same areas (Schenck et al., 2018). The study was funded by the CoE in Food Security (Schenck et al., 2018).

The reason for the extra 36 waste pickers in the secondary study is that whereas 409 waste pickers in the primary study all completed the anthropometry and dietary questionnaires, they might have missed other components of the survey such as socio-demographic information which was the main aim of the primary study. Therefore, all 409 gave their consent and completed some components of the study, but due to interruptions some participants only started completing the questionnaires halfway through. Waste pickers may have produced

incomplete questionnaires because they first had to attend to their business when the trucks arrived. Participation was voluntary; therefore, the researchers had no control over the waste pickers if they chose to stop participating in the study.

The landfill sites comprised Bloemfontein North (BN), Bloemfontein South (BS), Botshabelo (BO), Bronkhorstspruit (BR), Mamelodi (MA), Oudtshoorn (OU), Potchefstroom (PO), Stellenbosch (ST) and Vryburg (VR). The landfill sites were in Free State province (BN, BS and BO), Gauteng province (BR and MA), Western Cape province (ST and OU) and North West province (VR and PO).

The secondary study was conducted using the collected data from the primary study. Random group discussions were arranged to gain some insight into the activities on the landfill sites. Although these group discussions were not thematically analysed as part of this dissertation, the researcher made written notes on the key points during the group discussions with the waste pickers. Where relevant, some of these key points have been included in the discussion to support the findings.

3.8.4 Data analysis in the secondary study

The researcher received an anonymised data set in Microsoft Excel 2016 which was exported and analysed in IBM SPSS Statistics 25 2017. Anonymised data was stored on a password-protected personal computer and storage device.

Pairwise exclusion was done (i.e. cases were excluded if the variables that were investigated were missing) and various variables in the data set were recoded. Results were expressed as means, standard deviations, median, frequencies and percentages. Hunger and food (in)security were assessed using the Household Hunger Scale (HHS). The HHS was adjusted and only two categories ("yes" and "no") were used to determine which participants and households experienced hunger. Participants either answered "yes" or "no" to the questions. Average nutrient intakes were compared to the DRIs (Institute of Medicine of the National Academies, 2005) to determine the proportion of the sample group who were below or met the DRIs.

Anthropometric data was recoded in IBM SPSS Statistics 25 2017 and analysed according to BMI categories. BMI cut points were used to classify men and women in separate categories. BMI cut points for women were: underweight ($\leq$ 17.99 kg/m^2), normal weight (18–23.99 kg/m^2), overweight (24–29.99 kg/m^2) and obese ($\geq$30 kg/m^2). BMI cut points for men were: ($\leq$18.99 kg/m^2), normal weight (19–24.99 kg/m^2), overweight (25–29.99 kg/m^2) and obese

(≥30 kg/m^2) (Lee & Nieman, 2007) The 24-hour dietary recalls were coded and converted to nutrient intakes using a computerised program, Food Finder, which is based on the MRC food composition database (SAFOODS, 2016).

The macronutrient and micronutrient intakes of the study sample were compared with the appropriate Dietary Reference Intakes (DRIs) for men and women aged ≥19 years (Institute of Medicine of the National Academies, 2005).

Dietary adequacy was calculated using dietary reference intakes (DRIs), usually the estimated average requirements (EARs) according to gender/age groups when available, and adequate intakes (AIs) which were used when EARs were not available. An AI is usually developed and used if there is not enough evidence to establish an EAR and therefore the RDA cannot be established as well (Institute of Medicine of the National Academies, 2005).

Daily Recommended Intakes (DRIs) for the Acceptable Macronutrient Distribution Range (AMDR) were used to determine the percentage of the study sample who met the AMDR for macronutrient intakes.

The results of the macronutrient and micronutrient intakes of the study sample were expressed as means, standard deviations, median, and minimum and maximum values.

The following categories were re-coded in IBM SPSS Statistics 25 according to each micronutrient: inadequate intake (below the EAR or AI when EAR was not available), adequate intake (intake between EAR/AI and below Tolerable Upper Level (UL)) and excessive intake (above UL). Macronutrients were compared to the AMDR and the following categories were re-coded in IBM SPSS Statistics 25 according to each macronutrient: inadequate intake (below AMDR), adequate intake (between the AMDR) and excessive intake (above the AMDR) (Table 16).

Socio-economic data, the nutrient intake and the anthropometric status of participants were analysed using SPSS data analysis instruments.

CHAPTER 4: RESULTS

This chapter will provide descriptive analyses of the study population in terms of socio-demographic characteristics, self-reported food insecurity and hunger, anthropometric status and dietary intake. Data will be disaggregated by the data collection sites using anonymised pseudonyms, gender and occasionally population group, but information on the statistical significance of differences between groups will not be reported on as the purpose of the study was a descriptive exploration of the population. Furthermore (and because of the descriptive nature of the project), no attempt was made to achieve representativeness of landfill waste pickers in the study sample.

4.1 Socio-demographic characteristics

Among the 409 respondents who agreed to participate in the study, 408 of them reported their gender (Table 1) of whom 54% were men. Six of the nine sites were male-dominated: BN (59.0%), BS (69.5%), OU (70.6%), ST (74.6%) and VR (75.0%). In PO all waste pickers were men due to a management decision. Waste pickers on two sites were predominantly women, i.e. BR (91.7%) and BO (70%).

Table 1: Proportion of men and women in the study sample

	Gender					
Name of the landfill site	**Male %**	**n**	**Female %**	**n**	**Total %**	**n**
BN	59.0	23	41.0	16	9.56	39
BS	69.5	41	30.5	18	14.46	59
BO	30.0	9	70.0	21	7.35	30
BR	8.3	3	91.7	33	8.82	36
MA	49.1	53	50.9	55	26.47	108
OU	70.6	24	29.4	10	8.34	34
PO	100.0	19	0	0	4.66	19
ST	74.6	44	25.4	15	14.46	59
VR	75.0	18	25.0	6	5.88	24
Total	57.4	234	42.6	174	100	408

Source: Survey data

Of the 409 respondents, only 361 (88.3%) reported their age. The reasons for waste pickers not reporting their age were simply that they were not sure how old they were or what year they were born or they did not own an Identity Document (ID) book. The mean and median for the

age of the study sample were fairly close together; therefore; age was normally distributed: [2]39.32 years (38) ± 12.41 [18 – 71] (Table 2A).

There was a difference in the mean age of women ranging from five to nine years that was much higher than the mean age of men in BS, BO, OU and VR. Therefore, the majority of women in the study sample were approximately five years older than the men.

The age of the study sample was divided into age categories with increments of five years (Table 2B). Approximately 14.4% of the study sample were in the age category of 26–30 years with a mean age of [1]28.02 years (28) ± 1.34 [26 – 30], followed by 12% of the study sample in the age category of 36–40 years with a mean age of [1]38.22 years (38) ± 1.37 [36 – 40] and 11.2% of the study sample in the age category of 31–35 years with a mean age of [1]32.70 years (32) ± 1.51 [31 – 35] (Table 2B). Therefore, 37.6% of the study sample were in the age category of 26–40 years.

[2] Mean (Median) ± SD [Min – Max]

Table 2A: Age of the study sample

Name of the landfill site	Gender	n	Mean	Std deviation	Median	Minimum	Maximum
BN	Male	21	38.86	11.72	38.00	23	65
	Female	16	39.75	9.68	37.00	26	59
	Total	37	39.24	10.75	38.00	23	65
BS	Male	34	35.91	13.39	33.00	20	71
	Female	15	41.27	9.94	43.00	20	59
	Total	49	37.55	12.58	35.00	20	71
BO	Male	9	43.00	13.65	47.00	23	65
	Female	21	51.62	9.87	53.00	28	70
	Total	30	49.03	11.61	52.50	23	70
BR	Male	3	35.67	13.01	35.00	23	49
	Female	28	37.25	11.85	34.00	20	58
	Total	31	37.10	11.74	35.00	20	58
MA	Male	47	42.83	11.91	40.00	20	68
	Female	52	43.98	11.08	44.50	18	63
	Total	99	43.43	11.44	44.00	18	68
OU	Male	23	31.35	13.27	28.00	18	65
	Female	8	40.00	12.90	41.00	23	57
	Total	31	33.58	13.52	29.00	18	65
PO	Male	17	31.06	6.69	29.00	23	48
	Total	17	31.06	6.69	29.00	23	48
ST	Male	33	36.00	12.14	35.00	19	68
	Female	9	36.44	11.17	32.00	24	61
	Total	42	36.10	11.81	34.50	19	68
VR	Male	18	34.06	10.05	34.50	18	56
	Female	6	40.83	14.13	44.00	22	57
	Total	24	35.75	11.27	36.50	18	57
Total	Male	205	37.04	12.45	35.00	18	71
	Female	155	42.34	11.71	43.00	18	70
	Total	360	39.32	12.40	38.00	18	71

Source: Survey data

Table 2B: Mean age of the study sample per age category

Age category	n	Proportion of the total population (%)	Mean	Std deviation	Median	Minimum	Maximum
=<20	14	3.4	19.29	.825	19.50	18	20
21–25	36	8.8	23.08	1.31	23.00	21	25
26–30	59	14.4	28.02	1.34	28.00	26	30
31–35	46	11.2	32.70	1.51	32.00	31	35
36–40	49	12.0	38.22	1.37	38.00	36	40
41–45	39	9.5	42.95	1.45	43.00	41	45
46–50	38	9.3	47.58	1.22	47.00	46	50
51–55	34	8.3	52.59	1.10	53.00	51	55
56–60	29	7.1	57.83	1.03	58.00	56	60
61–65	12	2.9	63.17	1.46	63.00	61	65
66–70	4	1.0	68.00	1.63	68.00	66	70
>71	1	0.2	71.00	0.00	71.00	71	71
Total	361	88.3	39.28	12.41	38.00	18	71

Source: Survey data

Almost half the study sample were single (46.6%), 27.1% were co-habiting and only 15.7% were married (Table 3A).

Table 3A: Marital status of the study sample

Marital status	Percentage (%)
Single	46.6
Separated/Divorced	2.2
Married	15.7
Widowed	7.6
Co-habiting	27.1
Other	0.8
Total	100.0

Source: Survey data

The majority of the study sample were African/Black (82.1%). All respondents in BN, BS, BO and MA were African and the majority of respondents in ST were Coloured (Table 3). The majority of respondents on all other landfill sites were African (Table 3B). None of the waste pickers was classified as White/Caucasian.

Table 3B: Cultural group of the study sample

Landfill site		Cultural group		Total
		African/Black	Coloured	
BN	n	39	0	39
	% of total	10.6%	0.0%	10.6%
BS	n	50	0	50
	% of total	13.6%	0.0%	13.6%
BO	n	30	0	30
	% of total	8.1%	0.0%	8.1%
BR	n	31	1	32
	% of total	8.4%	0.3%	8.7%
MA	n	99	0	99
	% of total	26.8%	0.0%	26.8%
OU	n	0	33	33
	% of total	0.0%	8.9%	8.9%
PO	n	16	1	17
	% of total	4.3%	0.3%	4.6%
ST	n	15	30	45
	% of total	4.1%	8.1%	12.2%
VR	n	23	1	24
	% of total	6.2%	0.3%	6.5%
	N	303	66	369
	% of total	82.1%	17.9%	100.0%

Source: Survey data

Of the 409 participants, only 366 responded to the question about the highest grade of education attained. In the study sample, 61.8% of the landfill waste pickers had completed primary school (Table 4) but only a small percentage (7.9%) had completed Grade 12 and none of the participants completed tertiary education. As many as 13.9% of the sample had had no schooling (Table 4).

Table 4: Education levels of the study sample

Grade category	Gender		Total (%)
	Male (%)	Female (%)	
No schooling	9.5	20.0	13.9
Grade 3	11.8	6.5	9.6
Grade 5	13.3	16.8	14.8
Grade 7	22.7	22.6	22.7
Grade 9	25.1	19.4	22.7
Grade 11	9.5	7.1	8.5
Grade 12	8.1	7.7	7.9

Source: Survey data

The majority of the study sample collected a wide variety of recyclable waste, including cardboard, paper, plastic, cans, glass, tetrapak, metals, batteries and globes (Table 5).

Table 5: Types of recyclable waste collected by the study sample

	Percentage of the population (%)
Cardboard	100.0
Paper	100.0
Plastic	99.7
Cans	99.7
Glass	100.0
Tetrapak	100.0
Metals	99.6
Batteries	100.0
Globes	100.0
Other	99.3

Source: Survey data

Of the 409 participants, 364 responded to the question about income earned as follows: income earned from waste picking during the last week: [3]R 451.90 (R 350) ± R 369.54 [0 – R 2000]; income earned from waste picking during a good week: [1]R 768.51 (R 500) ± R 715.71 [0 – R 5000]; income earned from waste picking during a bad week: [1]R 288.69 (R 200) ± R 243.10 [0 – R 1500 (Table 6). Of the 409 participants, 65 (15.89%) reported that they received an income from child support grants of [1]R 680.23 (R 660) ± R 345.56 [R 165 – R 1420] (Table 6). For three (0.73%) of the respondents, income received from disability grants was [1]R 1460 (R 1320) ± R553.44 [R 990 – R 2070]. For six (1.47%) of the respondents, income received from old-age grants was [1]R 1393.33 (R 1410) ± R 40.70 [R 1350 – R 1450]), while only one (0.24%) respondent earned an income from a pension of R 1400 (Table 6).

In addition, 54 of the participants (13.2%) earned an income from other household members of [2]R 648.52 (R 660) ± R 366.19 [R 300 – R 1980]. Three respondents (0.73%) earned an income from disability grants of [2]R 1016.67 (R 1320) ± R 605.00 [R 320 – R 1410]. Nine respondents (2.20%) earned an income from old-age grants of [2]R 1508.89 (R 1420) ± R 506.64 [R 1200 – R 2840], while two respondents (0.49%) earned a mean income of [2]R 1200 (R 1200) ± R 282.84 [R 1000 – R 1400] from the pension of other household members (Table 6). For 22

[3] Mean (Median) ± SD [Min – Max]

of the respondents (5.38%), income received from the jobs of other people in the household was [4]R 1003.41 (R 700) ± R 823.15 [R 20 – R 3200].

Of the 4.1% of the study population (Table 2B) who reported that they were eligible to receive pension grants (in the age categories of 61–65, 66–70 and >71), only one respondent (0.24%) actually received an income from a pension grant (Table 6).

[4] Mean (Median) ± SD [Min – Max]

Table 6: Income earned by the study sample

Question	n	Proportion of study sample (%)	Mean (R)	Std deviation (R)	Median (R)	Minimum (R)	Maximum (R)
How much income from waste picking did you earn last week?	359	87.78	451.89	369.542	350.00	0.00	2000.00
How much income from waste picking do you earn in a good week?	364	89.00	768.51	715.71	500.00	0.00	5000.00
How much income from waste picking do you earn in a bad week?	363	88.75	288.69	243.10	200.00	0.00	1500.00
How much do you earn (Rand) from the other sources of income available to you?							
• Another job/source of income (you)	6	1.47	325.00	251.61	240.00	80.00	660.00
• Another job/source of income (other)	22	5.38	1003.41	823.15	700.00	20.00	3200.00
• Child support grant (you)	65	15.89	680.23	345.55	660.00	165.00	1420.00
• Child support grant (other)	54	13.20	648.52	366.19	660.00	300.00	1980.00
• Disability grant (you)	3	0.73	1460.00	553.44	1320.00	990.00	2070.00
• Disability grant (other)	3	0.73	1016.67	605.00	1320.00	320.00	1410.00
• Old-age grant (you)	6	1.47	1398.33	40.702	1410.00	1350.00	1450.00
• Old-age grant (other)	9	2.20	1508.89	506.64	1420.00	1200.00	2840.00
• Pension (you)	1	0.24	1400.00		1400.00	1400.00	1400.00
• Pension (other)	2	0.49	1200.00	282.84	1200.00	1000.00	1400.00

Source: Survey data

The number of people dependent on the respondent's income was [5]3.56 (3) ± 2.22 [0 – 15]. The mean income was R768.51 and mean number of people dependent on the respondent's income was 3.56; therefore, the income earned from waste picking in a good week was approximately R 215.87 per person in a household. The number of children that the respondents had was [3]2.73 (2) ± 1.67 [0 – 12], and the number of children under the age of 18 was [3]2.17 (2) ± 1.30 [0 – 9]. The majority of the respondents' children were under the age of 18 and therefore financially dependent on their income. Therefore, the majority of the other members of the household were dependent on the respondent's income and other social grants.

Table 7: Mean number of people in the household

	N	Mean	Std deviation	Median	Minimum	Maximum
Number of people dependent on your income	331	3.56	2.221	3.00	0	15
Number of children	275	2.73	1.668	2.00	0	12
Number of children under 18 years	240	2.171	1.3001	2.000	.0	9.0

[5] Mean (Median) ± SD [Min – Max]

4.2 Food (in)security and hunger

The high level of food insecurity in the study sample was expected as many of the waste pickers lived in impoverished areas and collected food from the landfill sites. Approximately 20% (n=82) of the study sample said that they went to sleep hungry at night while 18.34% (n=75) said that they went for a whole day and night without eating anything because there was not enough food (Table 8). Approximately 17% of the study sample (n=70) said that at least one person in their household went to sleep at night hungry and 16.62% said that there were people in their household who went for a whole day and night without eating anything because there was not enough food during the past month (Table 8). All the others who were interviewed who did not answer these questions, did not experience hunger.

Table 8: Proportion of the study sample who experienced hunger

Amended household hunger survey	**Yes**		**No**	
	n	**%**	**n**	**%**
Did you go to sleep hungry at night in the last month because there was not enough food?	82	20.00	327	80.00
Did any of your household members go to sleep at night hungry in the last month because there was not enough food?	70	17.11	339	82.89
Did you go for a whole day and night without eating anything at all because there was not enough food during the last month?	75	18.34	334	81.66
Did any of your household members go for a whole day and night during the last month without eating anything at all because there was not enough food?	68	16.62	341	83.38

Source: Survey data

More than 90% of the study sample got food: that had been prepared at home, that they had bought as ready-made meals, on the landfill site, from other waste pickers and from some other source (such as the church, restaurants, individuals) (Table 9).

Table 9: Proportion of the study sample who got their food from various sources

Sources of food for waste pickers	Proportion of study sample (%)
Prepares food at home	97.8
Buys ready-made meals	99.4
On the landfill site	95.9
From other waste pickers	90.9
Some other source	93.9

Source: Survey data

4.3 Anthropometry

The weight and height of the study sample were used to calculate the BMI. BMI cut points were used to classify men and women in separate categories. BMI cut points for women were: underweight (≤17.99 kg/m^2), normal weight (18–23.99 kg/m^2), overweight (24–29.99 kg/m^2) and obese (≥30 kg/m^2). BMI cut points for men were: (< 18.99 kg/m^2), normal weight (19–24.99 kg/m^2), overweight (25–29.99 kg/m^2) and obese (≥30 kg/m^2) (Lee & Nieman, 2007). Of the 409 respondents, only 386 were measured.

The mean BMI of the study sample was [6]23.22 kg/m^2 (21.56 kg/m^2) ± 5.42 kg/m^2 [13.67 kg/m^2 – 48.01 kg/m^2] (Table 10). More than half (55.99%) the study sample had a normal BMI (Table 11). The mean BMIs of men and women were: [5]20.87 kg/m^2 (20.36 kg/m^2) ± 6.32 kg/m^2 [13.67 kg/m^2 – 32.92 kg/m^2] and [5]26.42 kg/m^2 (25.28 kg/m^2) ± 2.92kg/m2 [15.21 kg/m^2 – 48.01 kg/m^2] respectively (Table 10).

Of the 409 respondents, only 386 were measured and classified in their gender categories. More than 50% of the study sample (55.96%) had a normal BMI (Table 11). The majority of men (68.47%) had a normal BMI, but 28.05% of the women in the study sample were overweight compared to only 1.35% of men being overweight (Table 11).

Underweight was more prevalent in men (22.52%) than women (4.88%) (Table 11). The proportion of obesity in women (28.35%) was much higher than that in men (1.35%) (Table 11).

The proportion of the study sample's BMI category per landfill site was measured to determine who was overweight or underweight. The majority of the participants on the landfill sites had a normal BMI (Table 12). More than half the participants on six of the nine landfill sites – MA (51.96%), BS (55.17%), OU (63.64%), ST (73.47%), VR (75%) and PO (77.78%) – had a normal BMI (Table 12). Obesity among the study sample was most prevalent in BO (33.33%), followed by BN (21.05%). Overweight was most prevalent in BR (35.29%), followed by BN (23.68%) and MA (22.55%). Approximately one-third (33.33%) of the participants in OU were underweight, followed by ST (24.48%) and BS (24.14%) (Table 12).

Table 10: BMI of men and women in the study sample

[6] Mean (Median) ± SD [Min – Max]

Landfill site	Gender	n	Mean	Std deviation	Median	Minimum	Maximum
BN	Male	22	22.42	3.76	21.42	17.57	32.92
	Female	16	28.66	6.02	28.79	16.26	39.45
	Total	38	25.04	5.70	23.99	16.26	39.45
BS	Men	41	20.33	2.42	19.60	16.23	26.09
	Women	17	26.28	7.41	24.00	17.04	48.01
	Total	58	22.08	5.19	21.26	16.23	48.01
BO	Male	9	20.96	3.67	20.19	16.87	29.07
	Female	21	28.56	7.01	28.62	17.83	39.76
	Total	30	26.28	7.08	24.52	16.87	39.76
BR	Male	3	20.55	2.04	20.46	18.56	22.63
	Female	31	25.87	5.99	25.76	15.22	38.45
	Total	34	25.40	5.93	25.00	15.22	38.45
MA	Male	49	21.90	2.99	21.52	17.57	31.47
	Female	53	27.64	5.96	27.22	18.71	39.95
	Total	102	24.89	5.55	23.16	17.57	39.95
OU	Male	24	19.23	2.57	19.48	13.67	24.71
	Female	9	21.45	4.68	19.73	17.85	32.77
	Total	33	19.84	3.35	19.53	13.67	32.77
PO	Male	18	21.25	2.17	20.56	17.66	25.57
	Total	18	21.25	2.17	20.56	17.66	25.57
ST	Male	38	20.22	2.71	19.76	15.83	32.23
	Female	11	20.61	2.61	20.99	15.21	23.55
	Total	49	20.31	2.67	20.04	15.21	32.23
VR	Male	18	20.48	2.45	20.37	16.47	25.64
	Female	6	23.24	2.48	23.21	20.11	27.31
	Total	24	21.17	2.70	20.56	16.47	27.31
Total	Male	222	20.86	2.92	20.36	13.67	32.92
	Female	164	26.41	6.32	25.28	15.21	48.01
	Total	386	23.22	5.42	21.56	13.67	48.01

Source: Survey data

Table 11: BMI category of men and women in the study sample

Gender	Underweight		Normal weight		Overweight		Obese		Total	
	n	% of total	n	% of total	n	% of total	n	% of total	N	% of total
Male	50	22.52	152	68.47	17	7.66	3	1.35	222	100.00
Female	8	4.88	64	39.02	46	28.05	46	28.05	164	100.00
Total	58	15.03	216	55.96	63	16.32	49	12.69	386	100.00

Source: Survey data

Table 12: Proportion of the study sample per landfill who fell within a specific BMI category

Landfill site		Underweight	Normal weight	Overweight	Obese	Total
BN	n	4	17	9	8	38
	%	10.53%	44.74%	23.68%	21.05%	100%
BS	n	14	32	9	3	58
	%	24.14%	55.17%	15.52%	5.17%	100%
BO	n	3	12	5	10	30
	%	10%	40%	16.67%	33.33%	100%
BR	n	2	13	12	7	34
	%	5.88%	38.24%	35.29%	20.59%	100%
MA	n	7	53	23	19	102
	%	6.86%	51.96%	22.55%	18.63%	100%
OU	n	11	21	0	1	33
	%	33.33%	63.64%	0%	3.03%	100%
PO	n	2	14	2	0	18
	%	11.11%	77.78%	11.11%	0%	100%
ST	n	12	36	0	1	49
	%	24.48%	73.47%	0.0%	2.04%	100%
VR	n	3	18	3	0	24
	%	12.5%	75%	12.5%	0.0%	100%
Total	**N**	58	216	63	49	386
	%	15.03%	55.96%	16.32%	12.69%	100.0%

Source: Survey data

The BMIs of the African/Black and Coloured cultural or racial groups were also compared. The BMI was 4 points more in the African/Black group at [7]23.84 kg/m^2 (22.3 kg/m^2) ± 5.41 kg/m^2 [15.22 kg/m^2 – 39.95 kg/m^2] than the Coloured group at [6]19.70 kg/m^2 (19.48 kg/m^2) ± 3.15 kg/m^2 [13.67 kg/m^2 – 32.77 kg/m^2] (Table 13). Overweight and obesity were mostly prevalent in BN, BS, BR, BO and MA where the majority of respondents were from an African/Black culture or race (Table 3).

Table 13: Mean BMI per cultural group

Cultural group	n	Mean	Std deviation	Median	Minimum	Maximum
African/Black	288	23.84	5.41	22.30	15.22	39.95
Coloured	58	19.70	3.15	19.48	13.67	32.77
Total	346	23.15	5.33	21.43	13.67	39.95

Source: Survey data

The mean height of the study sample was [6]163.83cm (163.75cm) ± 8.26cm [144.60cm – 192.20 cm]. The mean and median were relatively close together; therefore, the height was normally distributed (Table 14).

Table 14: Mean height per landfill site

Landfill site	Mean (cm)	Std deviation (cm)	Median (cm)	Minimum (cm)	Maximum (cm)
BN	164.03	8.02	162.60	149.20	184.40
BS	164.59	7.79	164.45	144.60	178.80
BO	158.99	8.317	158.00	147.00	174.00
BR	160.63	5.920	161.05	147.60	176.80
MA	164.29	8.73	164.30	145.50	192.20
OU	164.85	8.55	165.10	146.40	184.30
PO	167.85	6.92	168.80	150.00	177.40
ST	165.59	8.83	165.80	147.45	183.75
VR	162.23	6.69	162.85	147.60	173.80
Total	163.83	8.26	163.75	144.60	192.20

Source: Survey data

[7] Mean (Median) ± SD [Min – Max]

4.4 Dietary intake

Energy intake was compared to the Dietary Reference Intake (DRI) for the mean energy requirement for men and women, and total protein, carbohydrates and fibre were compared to the RDAs and AIs (Institute of Medicine of the National Academies, 2005). There is no RDA for total fat in this age group , therefore only the AMDR was used to compare total fat intake (Institute of Medicine of the National Academies, 2005).

Mean energy intake of the study sample (Table 15)

The recommended mean energy intake according to the DRI is 7560 kJ (1800 kcal) – 9240 kJ (2200 kcal) for women and men respectively (Institute of Medicine of the National Academies, 2005). The mean daily energy and macronutrient intake of the sample population was described in Table 15. The mean intake for energy among female participants, i.e. [8]5664.12 kJ (4917.21 kJ) ± 3583.76 kJ [213.60 – 23 637 kJ], was below the mean energy requirement of 7560 kJ (1800 kcal) and met 75% of the mean energy requirement. The mean intake for energy among male participants, i.e. [7]7408.26 kJ (6809.16 kJ) ± 4651.83 kJ [110.40 – 26147 kJ] was below the mean energy requirement of 9240 kJ (2200 kcal) and met 80% of the mean energy requirement (Table 15).

Mean carbohydrate intake of the study sample according to the DRIs

The mean carbohydrate intake for men, i.e. [7]248.55 g/day (233.86 g/day) ± 155.53 g/day [5.98 – 961.88 g/day], and that for women, i.e. [7]210.59 g/day (184.03 g/day) ± 132.39 g/day [10.40 – 707.14 g/day], in the age range 19>70 years, were almost double the minimum RDA of 130 g/day for men (191%) and women (162%) (Table 15).

Mean protein intake of the study sample according to DRIs

The mean total protein intake for women, i.e. [7]43 g/day (39.23 g/day) ± 28.82 g/day [0 – 153.99 g/day], met 93% of the total protein requirement of 46 g/day for women in the age range 19>70 years (Table 15). The mean total protein intake for men, i.e. [7]61.5 g/day (54.56 g/day) ± 39.75 g/day [0.18 – 203.75 g/day], met 109% of the total protein requirement of 56 g/day for men in the age range 19>70 years (Table 15). Therefore, male waste pickers had a mean protein intake

[8] Mean (Median) ± SD [Min – Max]

above the DRI, while female waste pickers' mean protein intake was just below the DRI, but relatively close to meeting their protein needs.

Mean added sugar intake of the study sample according to the UL

The mean intake of added sugar for men, i.e. [7]44.12 g/day (23.97 g/day) ± 63.87 g/day [0 – 445.75 g/day], and for women, i.e. 36 g/day [7](17.98 g/day) ± 52.33 g/day [0 – 329.94 g/day], were 176%–144% over the recommended added sugar level of 25 g/day, respectively (WHO, 2015) (Table 15). Therefore, the added sugar intake was very high in the study sample.

Mean total fibre intake of the study sample according to the DRIs

The mean total fibre intake for men, i.e. [9]17.72 g/day (15.76 g/day) ± 12.57 g/day [0 – 92.25 g/day]), and for women, i.e. [8]16.41 g/day (13 g/day) ± 12.01 g/day [0 – 67 g/day] ,were much lower than the recommended fibre intake of 25–21 g/day for women in the age range 19>70 years and the recommended fibre intake of 38–30 g/day for men in the age range 19>70 years (Table 15). The mean total fibre intake met the recommended fibre intake of only 46%–59% for men and 66%–78% for women (Table 15). Therefore, fibre intake was very low in the study sample.

Proportion of the study sample who had an excessive intake of macronutrients above the AMDR

The majority (51.6%) of the study sample showed an excessive intake of carbohydrates which was above 65% of the total energy (Table 16). Approximately 13% (Table 16) of the study sample had an excessive fat intake. The 24-hour recalls of the participants who had an excessive sugar intake (42.2%) (Table 16) above the UL for added sugar of ≤25 g/day were checked to distinguish which food items were commonly eaten. Added sugar was mainly due to consumption of excessive amounts of sugary drinks, ranging from 7 litres–2 litres in the case of some participants.

Proportion of the study sample who had an adequate intake between AMDR for macronutrients

Almost half the study sample (47.5%) met the AMDR for adequate intake of carbohydrates and three-quarters (76%) of the study sample had an adequate intake of protein of 10%–35%

[9] Mean (Median) ± SD [Min – Max]

of total energy. The majority (57.79%) of the study sample had an added sugar intake of ≤25 g/day.

Proportion of the study sample who had an inadequate intake of macronutrients below the AMDR

Half the study sample (50%) had an inadequate intake of fat below the AMDR, while 23.5% of the study sample had an inadequate intake of protein below the AMDR (Table 16). The reason for the majority of the sample having an inadequate fat intake is probably that they only ate what they collected for that day. The consumption of animal food sources was low in the study sample which could also be a contributing factor to their inadequate fat and protein intake. The whole study sample had an inadequate intake of fibre in their diet (Table 16).

There were no significant differences between the percentages of men and women respectively who met the AMDR for fat (Table 17) and protein (Table 18). However, a higher percentage of women (63.24%) had an excessive intake of carbohydrates above the AMDR compared to men (42.70%) (Table 19). More men (26.91%) had an excessive intake of added sugar compared to women (15.3%) (Table 20).

Table 15: Mean intakes of macronutrients in the study sample

Gender		Energy (kJ)	Total protein (g)	Plant protein (g)	Animal protein (g)	Total fat (g)	Sat fat (g)	Mono fat (g)	Poly fat (g)	Carbo-hydrate (g)	Choles-terol (mg)	Added sugar (g)	Total fibre (g)
Male	**N**	205	205	205	205	205	205	205	205	205	205	205	205
	Mean	7408.26	61.57	29.13	32.10	44.53	12.44	14.50	10.31	248.54	179.32	44.12	17.72
	Std deviation	4651.83	39.75	19.98	30.18	38.77	12.78	14.21	11.87	155.53	275.70	63.87	12.57
	Median	6809.16	54.56	25.74	25.48	34.19	8.46	9.58	5.99	233.86	106.80	23.97	15.76
	Minimum	110.40	0.18	0.18	.00	.00	.00	.00	.00	5.98	.00	.00	.00
	Maximum	26147.00	203.75	133.20	147.39	225.58	77.55	99.77	82.71	961.88	2720.40	445.75	92.25
Female	**N**	153	153	153	153	153	153	153	153	153	153	153	153
	Mean	5664.12	43.47	22.57	20.07	33.84	8.68	9.91	8.50	210.59	99.30	36.00	16.41
	Std deviation	3583.76	28.82	14.576	21.78	29.67	9.44	10.27	11.10	132.39	133.78	52.33	12.01
	Median	4917.21	39.23	19.50	12.75	27.24	5.89	6.93	4.60	184.03	50.00	17.98	13.00
	Minimum	213.60	.00	.00	.00	.00	.00	.00	.00	10.40	.00	.00	.00
	Maximum	23637.11	153.99	80.97	112.11	164.95	53.23	52.65	75.75	707.14	798.05	329.94	67.00
Total	**N**	358	358	358	358	358	358	358	358	358	358	358	358
	Mean	6662.86	53.83	26.32	26.96	39.96	10.83	12.54	9.5402	232.32	145.12	40.65	17.16
	Std deviation	4310.48	36.56	18.14	27.53	35.52	11.61	12.86	11.57	147.10	229.41	59.27	12.33
	Median	6017.1950	46.46	22.21	18.84	29.18	7.44	8.16	5.46	208.85	80.15	20.38	14.74
	Minimum	110.40	.00	.00	.00	.00	.00	.00	.00	5.98	.00	.00	.00
	Maximum	26147.00	203.75	133.20	147.39	225.58	77.55	99.77	82.71	961.88	2720.40	445.75	92.25

Source: Survey data

Table 16: Proportion of the study sample's intake according to the distribution of macronutrient intake

	Carbohydrates	Protein	Fat	Added sugar intake	Fibre
Inadequate	1.0	23.5	50.0	0	100
Adequate	47.5	76.0	36.6	57.79	0
Excessive	51.6	0.6	13.4	42.21	0

Acceptable Macronutrient Distribution Ranges (AMDRs) for adults:

Fat: 20–35%
Carbohydrate: 45–65%
Protein: 10–35%
Source: Institute of Medicine of the National Academies (2005)

Added sugars: ≤25g/day (WHO guideline, 2015)

Total fibre:

Men 19–50 years: 38 g/day
Men ≥51 years: 30 g/day
Women 19–50 years: 25g/day
Women ≥51 years: 21g/day

Source: Institute of Medicine of the National Academies (2005)

Table 17: Proportion of men and women in the study sample who met the AMDR for fat intake distribution (20%–35% of total energy)

			Inadequate (<20%)	Adequate (20–35%)	Excessive (>30%)	Total
Gender	**Male**	n	102	73	30	205
		%	49.76%	35.61%	14.63%	57.3%
	Female	n	77	58	18	153
		%	50.33%	37.91%	11.76%	42.7%
Total		N	179	131	48	358
		%	50%	36.59%	13.41%	100.0%

Source: Survey data

Table 18: Proportion of men and women in the study sample who met the AMDR for protein intake distribution (10%–35% of total energy)

			Inadequate (10%)	Adequate (10–35%)	Excessive (>35%)	Total
Gender	**Male**	n	43	161	1	205
		%	20.98%	78.54%	0.49%	57.3%
	Female	n	41	111	1	153
		%	26.80%	72.55%	0.65%	42.7%
Total		N	84	272	2	358
		%	23.46%	75.98%	0.56%	100.0%

Source: Survey data

Table 19: Proportion of men and women in the study sample who met the AMDR for carbohydrate intake distribution (45%–65% of total energy)

			Inadequate (<45%)	Adequate (45–65%)	Excessive (>65%)	Total
Gender	**Male**	n	3	99	76	178
		%	1.69%	55.62%	42.70%	56.7%
	Female	n	0	50	86	136
		%	0%	36.76%	63.24%	43.3%
Total		N	3	149	162	314
		%	0.96%	47.45%	51.59%	100.0%

Source: Survey data

Table 20: Proportion of men and women in the study sample who met the highest level of recommended added sugar intake (<25 g/day)

			Adequate (<25 g)	Excessive (>25 g)	Total
Gender	**Male**	n	107	95	202
		%	30.31%	26.91%	57.22%
	Female	n	97	54	151
		%	27.48%	15.30%	42.78%
Total		N	204	149	353
		%	57.79%	42.21%	100%

Source: Survey data

Tables 21 and 22 illustrate the mean intake of micronutrients and the proportion of the study sample who had an adequate intake of the various micronutrients. These were compared to the EARs for micronutrients.

More than 50% of the study sample had an inadequate intake of calcium (95%), magnesium (77.2%), potassium (98.1%), sodium (69.2%), copper (100%), manganese (57%), riboflavin (65.5%), folate (53.6%), Vitamin B12 (73.2%), panthothenate (73.2%), biotin (73.2), Vitamin A (78.2%), Vitamin C (93.8%), Vitamin D (95.3%) and Vitamin E (82.9%) (Table 29A and Table 29B). Therefore, the dietary intake of most vitamins and minerals was below the DRI recommendations.

There were no significant differences in micronutrient intake between men and women, except more women had an inadequate intake of iron (27.7%), phosphorous (60.6%), Vitamin B6 (29.2%) and sodium (81%) when compared to men. More men had an inadequate intake of manganese (65.8%) and Vitamin A (84.8%) when compared to women.

Table 21: Mean intakes of micronutrients in the study sample

	Male						Female						Total					
	n	Mean	Std deviation	Median	Minimum	Maximum	n	Mean	Std deviation	Median	Minimum	Maximum	N	Mean	Std deviation	Median	Minimum	Maximum
Ca (mg)	205	286.88	437.10	140.80	3.62	4070.00	153	257.52	372.53	123.36	.36	2910.00	358	274.33	410.46	128.63	.36	4070.00
Fe (mg)	205	14.35	9.38	12.71	.16	66.11	153	11.85	7.76	9.73	.04	41.71	358	13.28	8.80	11.72	.04	66.11
Mg (mg)	205	272.52	303.12	213.48	.00	2882.50	153	210.51	153.55	183.64	2.40	1180.71	358	246.02	251.96	195.67	.00	2882.50
P (mg)	205	842.39	694.13	743.54	.00	5279.00	153	598.21	442.72	487.30	4.32	3002.48	358	738.03	611.07	629.06	.00	5279.00
K (g)	205	1547.17	1062.79	1380.40	.00	7049.20	153	1227.84	832.02	1062.30	79.20	4960.79	358	1410.70	982.45	1230.28	.00	7049.20
Na (g)	205	1463.90	1295.49	1213.40	3.62	7304.27	153	883.40	822.32	634.47	3.20	4402.12	358	1215.81	1153.10	892.65	3.20	7304.27
Zn (mg)	205	11.88	7.33	10.55	.04	38.40	153	8.66	5.55	7.54	.07	28.20	358	10.50	6.81	9.03	.04	38.40
Cu (µg)	205	1.01	1.150	0.8672	.00	14.55	153	0.77	0.48	0.67	.05	2.73	358	0.91	0.93	0.75	.00	14.55
Mn (mg)	205	2426.99	3415.80	1714.66	.00	32120.00	153	2280.24	1860.62	1873.60	2.52	9882.00	358	2364.27	2854.21	1818.00	.00	32120.00
Vitamin_A_RE(µg)	205	527.17	1013.36	312.55	.00	11324.04	153	503.58	633.16	349.98	.00	4382.40	358	517.09	870.42	338.57	.00	11324.04
Thiamin (mg)	205	1.62	1.144	1.38	.00	7.44	153	1.43	1.04	1.17	.00	4.55	358	1.54	1.105	1.30	.00	7.44
Riboflavin (mg)	205	1.12	1.22	0.88	.00	8.38	153	0.90	1.14	0.66	.02	11.25	358	1.02	1.19	0.77	.00	11.25
Niacin (mg)	205	20.69	14.68	17.69	.30	81.50	153	12.52	9.02	10.81	.00	52.65	358	17.20	13.20	14.19	.00	81.50
Vitamin B6 (mg)	205	3.52	2.61	3.18	.00	14.58	153	2.27	1.68	1.81	.00	8.49	358	2.99	2.34	2.43	.00	14.58
Folate total (µg)	205	365.67	262.50	313.36	.00	1591.60	153	333.62	262.78	275.50	.80	1964.32	358	351.98	262.73	299.08	.00	1964.32
Vitamin B12 (µg)	205	4.19	13.73	1.00	.00	123.41	153	2.83	7.55	0.60	.00	66.75	358	3.61	11.51	0.86	.00	123.41
Pantothenate (mg)	205	3.40	3.67	2.46	.00	23.58	153	2.24	1.85	1.83	.00	15.03	358	2.90	3.08	2.14	.00	23.58
Biotin (µg)	205	28.26	24.43	22.42	.00	195.30	153	25.92	22.28	21.23	.00	184.99	358	27.26	23.53	21.88	.00	195.30
Vitamin_C (mg)	205	17.77	31.99	5.45	.00	257.50	153	20.18	26.44	10.65	.00	158.00	358	18.80	29.73	8.45	.00	257.50
Vitamin_D (µg)	205	2.47	6.09	0.39	.00	48.74	153	1.49	3.39	0.18	.00	27.71	358	2.0	5.13	0.30	.00	48.74
Vitamin_E (mg)	205	6.39	9.04	2.85	.12	56.39	153	6.43	8.21	2.94	.00	48.33	358	6.41	8.68	2.92	.00	56.39
Vitamin K (µg)	Not available in anonymised data set.																	

Source: Survey data

Table 22: Proportion of men and women in the study sample who met DRIs for micronutrient intake

		Gender		Total
		Male	Female	
Calcium	Inadequate	95.1%	94.9%	95.0%
	Adequate	4.3%	4.4%	4.4%
	Excessive	0.5%	0.7%	0.6%
Iron	Inadequate	16.6%	27.7%	21.1%
	Adequate	82.0%	72.3%	78.1%
	Excessive	1.5%		0.9%
Magnesium	Inadequate	79.3%	71.4%	77.2%
	Adequate		14.3%	3.9%
	Excessive	20.7%	14.3%	18.9%
Phosphorus	Inadequate	35.3%	60.6%	46.1%
	Adequate	63.0%	39.4%	53.0%
	Excessive	1.6%		0.9%
Potassium	Inadequate	97.3%	99.3%	98.1%
	Excessive	2.7%	0.7%	1.9%
Sodium	Inadequate	60.3%	81.0%	69.2%
	Adequate	17.4%	11.7%	15.0%
	Excessive	22.3%	7.3%	15.9%
Zinc	Inadequate	42.4%	40.1%	41.4%
	Adequate	57.6%	59.9%	58.6%
Copper	Inadequate	100.0%	100.0%	100.0%
Manganese	Inadequate	65.8%	45.3%	57.0%
	Adequate	32.6%	54.7%	42.1%
	Excessive	1.6%		0.9%
Vitamin A	Inadequate	84.8%	69.3%	78.2%
	Adequate	13.0%	29.2%	19.9%
	Excessive	2.2%	1.5%	1.9%
Thiamin	Inadequate	31.5%	41.6%	35.8%
	Adequate	0.5%		0.3%
	Excessive	67.9%	58.4%	63.9%
Riboflavin	Inadequate	62.8%	69.1%	65.5%
	Excessive	37.2%	30.9%	34.5%
Niacin	Inadequate	28.3%	52.6%	38.6%
	Adequate	57.1%	43.8%	51.4%
	Excessive	14.7%	3.6%	10.0%
Vitamin B6	Inadequate	16.8%	29.2%	22.1%
	Adequate	83.2%	70.8%	77.9%
Folate	Inadequate	51.1%	56.9%	53.6%
	Adequate	46.2%	42.3%	44.5%
	Excessive	2.7%	0.7%	1.9%
Vitamin B12	Inadequate	71.2%	75.9%	73.2%
	Adequate	0.5%	0.7%	0.6%
	Excessive	28.3%	23.4%	26.2%
Panthothenate	Inadequate	82.6%	91.2%	86.3%
	Excessive	17.4%	8.8%	13.7%
Biotin	Inadequate	63.0%	69.3%	65.7%
	Excessive	37.0%	30.7%	34.3%
Vitamin C	Inadequate	95.1%	92.0%	93.8%
	Adequate	4.9%	8.0%	6.2%
Vitamin D	Inadequate	94.6%	96.4%	95.3%
	Adequate	5.4%	3.6%	4.7%
Vitamin E	Inadequate	83.7%	81.8%	82.9%
	Adequate	16.3%	18.2%	17.1%

CHAPTER 5: DISCUSSION

5.1 Socio-demographic status of waste pickers

The socio-demographics of this study sample were compared to those of other studies that were conducted among waste pickers. Makhasana et al. (2018) conducted a study in 2014 among approximately 62,147 waste pickers (36,680 operating on landfills and 25,467 operating on the streets) in the nine provinces of South Africa. Other studies were conducted by Viljoen (2014) among 914 street waste pickers and by Mothiba (2016) among 176 waste pickers on landfill sites. These other studies showed similar findings with regard to the socio-demographic status of waste pickers when compared to this study sample.

Overall fewer women (42.6%) than men (57.4%) were included in this study sample when compared to the gender split of South Africa's population, which is 51% women and 49% men (StatsSA, 2018a). Other studies on street waste pickers (also called trolley pushers) also found a slight predominance of male waste pickers (50.7%) compared with female waste pickers (49.3%), with the mean age of 38.7 years calculated from an age range of 16–83 years (Makhasana et al., 2018).

Among the large group of 62,147 waste pickers in the study conducted by Makhasana et al. (2018), male waste pickers were significantly 10 years younger than female waste pickers, with mean ages of 35.8 years and 41.7 years, respectively (Makhasana et al., 2018). The mean age for the study sample was [9]39.32 years (38) ± 12.41 [18 – 71] (Table 2B). Men were also significantly five years younger than women in this study sample.

There was also a slight predominance of African/Black (82.11%) waste pickers in the study sample when compared to the racial split found in the waste-picking population in general; the vast majority (94.5%) of waste pickers in the study by Makhasana et al. (2018) were African/Black, 5.1% Coloured, 0.2% white and 0.1% Indian (Makhasana et al., 2018).

Another smaller study on three landfill sites found more women (66%) than men (34%), with a mean age of 44 years (Mothiba, 2016), while Viljoen (2014) found that the majority of waste pickers (91%) were men. According to Viljoen (2014), there were more men (91.1%) than women (8.9%) working as street waste pickers in contrast to studies of waste pickers working on landfill sites. When comparing the gender differences between landfill waste pickers and street waste pickers, Viljoen (2014) argued that the strenuous nature of street waste picking, i.e. having to travel long distances and carry heavy loads of collected recyclable waste, and the safety aspect on the streets may account for the low prevalence of female street waste pickers

(Viljoen, 2014). However, the majority of the street waste pickers were also Africans (79.4%) with a mean age of 39 years, which is similar to the larger population of waste pickers in the study by Makhasana et al. (2018) and this study sample.

5.2 Food insecurity and hunger among waste pickers

Food security has four dimensions: availability of food, access to food, utilisation of food, and stability of both availability and access to food (FAO, 2018). A household is considered food insecure if it fails to meet one or all of these dimensions (FAO, 2009). Waste pickers meet all of these dimensions for food insecurity and are therefore a group of people who are very vulnerable to experiencing hunger.

The degree of food insecurity and hunger in this study sample was expected, as many of the waste pickers lived in impoverished areas and collected food from the landfill sites. The proportion of participants who experienced hunger in this study sample (20%) was more than that of individuals experiencing hunger (12.1%) in South Africa in 2018 (StatsSA, 2018a). All other individuals who were interviewed who did not answer these questions did not experience hunger. This prevalence of hunger (20%) in the sample population in this study is close to the percentage of South African households with inadequate or severely inadequate access to food (21.3%), the percentage of individuals in South Africa at risk of going hungry (24.7%) and the percentage of households experiencing hunger (10.4%) (StatsSA, 2018a).

Individuals' nutrient needs differ. Food is a source of energy that is needed by the body to function. Energy requirements differ between individuals according to age, physical activity and body composition. The energy we expend daily or the degree of physical activity has a huge impact on the amount of food our body needs. Waste pickers engage in very strenuous work and therefore food is very important for them to perform their daily activities. Unfortunately, these vulnerable people often do not have access to the food that their bodies need and go without food for the day or collect food from the dustbins or landfill sites. In the primary study conducted by Schenck et al. (2018), waste pickers reported that they received food almost every day, but some waste pickers (18.34%) reported that they went hungry for a whole day and night without eating anything at all because there was not enough food during the last month (Schenck et al., 2018).

According to Viljoen (2014), the majority (59.3%) of street waste pickers ate food from home or sometimes bought food (54.1%). However, a very large proportion of street waste pickers

(32.78%) reported that they collected and ate food from dustbins (Viljoen, 2014). The fact that healthy, adequate and nutritious food is not easily accessible to waste pickers worsens their food intake. Similar findings in this study showed that waste pickers collected food from the landfills, either from shops or restaurants that delivered food to the landfill sites or from household waste. During random group discussions with waste pickers from the nine landfill sites, they reported that they collected food from the site but they also got some food from restaurants in the surrounding areas that dropped off leftovers at the site.

Waste pickers also reported that during Christmas and Easter holidays more food was dropped off at sites and more leftover food could be found among the waste that they collected. Sometimes people also brought soup to them during the winter. One can therefore assume that waste pickers' access to food varies depending on the seasons, the weather, holidays and organisations in the surrounding area. Food availability and accessibility also depend on the area where waste is collected, with more food being available on landfill sites if garbage trucks collect waste from more affluent areas rather than from poorer areas in the city or town concerned (Schenck et al., 2018). These factors are ever changing and therefore these groups of vulnerable people are always at risk of being food insecure.

5.3 Anthropometrical/Nutritional status of waste pickers

5.3.1 BMI status of the waste pickers

Middle-income countries like South Africa often have a double burden of disease, which includes under- and over-nutrition. According to the FAO (2018), approximately 672 million adults are overweight or obese in the world (FAO, 2018). The prevalence of overweight and obesity in South Africa in 2016 was 68% and 31% for women and men, respectively (NDoH et al., 2019). A similar pattern of under- and over-nutrition was seen in this study sample where under-nutrition (15.03%), overweight (16.32%) and obesity (12.69%) were prevalent. Non-communicable diseases (NCDs), which are related to over-nutrition, are an emerging problem despite the prevalence of under-nutrition and infectious diseases (Vorster, 2010).

In a study conducted among 268 waste pickers in Brazil with a mean age of 40.8 years, it was reported that the mean BMI was 26.3 kg/m^2 and the mean waist circumference was 86 cm, which indicates that this sample population of waste pickers was overweight and had abdominal obesity (Auler et al., 2013). This is in contrast to the results of this study where the mean BMI of the study sample was 23.22 kg/m^2 (Table 10) and 56% of the study sample had

a normal BMI. The mean BMI of men was slightly lower than that of women who had a mean BMI kg/m^2 just above 25 kg/m^2 (Table 10).

Auler et al. (2013) stated that there was also a higher frequency of hypertension and dyslipidaemia among male respondents in the Brazil study sample. More female respondents were diabetic and overweight and had abdominal obesity compared to their male counterparts. In this regard 58.9% of women were overweight, 28.9% were obese and 66.5% had abdominal obesity compared to approximately one-third (29.6%) of men being overweight, 16.9% being obese and 33.8% presenting with abdominal obesity (Auler et al., 2013). These are similar to the results seen in this study where more women (28.05%) were overweight and obese (28.05%) compared to men (7.66%). According to the IOM and NRC (2013), there is an association between low household food security and some measure of decreased nutritional status, especially among woman and the elderly. Overweight and obesity are therefore associated with a higher prevalence of NCDs, especially among women in the study sample compared to men.

Therefore, it is possible to assume that the anthropometric status of waste pickers varies where under- and over-nutrition is seen. One can, however, predict that overweight and obesity are seen in more women than in men in the study sample and therefore women are more at risk of presenting with other chronic lifestyle diseases.

5.4 Factors affecting food security and nutritional outcomes

The following factors will be discussed in line with the UNICEF Conceptual Framework (UNICEF, 1990) to illustrate how they affect nutritional outcomes: changes within the political, economic and environmental spheres; education; household income; insufficient health services and an unhealthy environment.

5.4.1 Changes within the political, economic and environmental spheres

Waste picking and recycling are normally pursued as a preferred manner of living in the face of poor economic circumstances and changes in the environment and economy of the country. Makhasana et al. (2018) reported that the majority (68%) of the waste pickers in South Africa, including street waste pickers and LWPs, see waste picking as a form of employment and a way of making a living (Makhasana et al., 2018). Therefore, it is possible to assume that waste picking is not simply a matter of choice but is rather a source of employment for those desperate to make a living. The waste pickers in this study sample were therefore more vulnerable to

external forces and more at risk of struggling economically. Food security and compromised nutrition are expected to be exacerbated from the climate changes that South Africa is experiencing and the political changes and uncertainty gripping the country.

The cost of living among waste pickers who earn a mean income of between R 768.51 (R 500) ± R 715.71 [0 – R5000] on a good week and [1]R 288.69 (R 200) ± R 243.10 [0 – R 1500] (Table 6) on a bad week, directly influences the availability of and access to nutritious food as they do not have enough money to buy safe, nutritious food in adequate quantities. The income of waste pickers is not fixed, it changes daily, with waste pickers in rural areas (BO and OU) more vulnerable than their counterparts in urban areas such as BN (Schenck et al., 2018).

The working environment of waste pickers poses many health risks, such as communicable diseases like diarrhoea, food-borne illnesses and tuberculosis. However, it appears that many of the restaurants and organisations that deliver food to landfill sites are very aware of the need for safe storage of leftover foods (Schenck et al., 2018).

Environmental changes like droughts or flooding may cause changes in food production which then increases food prices and influences the availability of food. The unhealthy environment in which waste pickers work impacts their health and puts them at risk of contracting many other communicable diseases. Clearly, then, changes in the political and economic arenas, climate change, and working and living environments are all factors that are potentially detrimental to the availability of food.

5.4.2 Education

The study sample displayed a low level of education, with only a small proportion of the sample having completed Grade 12 (7.9%). The levels of education of the participants in this study sample were similar to those in the larger study of 62,147 waste pickers in South Africa, where majority (80%) had not completed secondary education (Makhasana et al., 2018). Similarities can be drawn with the study conducted by Viljoen (2014) where only 11.1% of street waste pickers had completed primary school and only 7% had completed secondary school or Grade 12 (Viljoen, 2014). The levels of education were also similar to the study by Mothiba (2016) who reported that 94% of waste pickers had not completed secondary education. Therefore, the level of education among waste pickers in South Africa is very low, with approximately 8% of waste pickers having completed secondary education/Grade 12.

With only 7.9% of the participants in this sample study indicating that Grade 12 was their highest level of education, one can therefore assume that the participants did not have a broad knowledge of health and nutrition. As backed up by findings in the literature, waste pickers' knowledge of health and nutrition in this study sample was limited, which could influence their food-seeking behaviour and food choices. Other problems identified in this study sample, such as substance abuse (glue sniffing and a high alcohol intake) and mental illnesses, could also hinder their efforts to get adequate food to eat (Lee & Greif, 2008). According to Schenck et al. (2018), poverty and the lack of family support were the most common reasons given for the waste pickers inability to complete their schooling. Other contributing factors included the death or illness of parents, a lack of money to pay school fees, or the need to leave school to find work to help support the family financially (Schenck et al., 2018).

A waste picker's low level of education is probably a key factor in their resorting to waste picking as a source of income as it is unlikely that unskilled individuals will find formal employment. Poverty as a whole is therefore the underlying cause of low levels of education, and vice versa (StatsSA, 2018b). Poverty creates a vicious cycle of deprivation and lack of opportunity limits people's ability to complete formal schooling (Viljoen, 2014). Poverty can also lead to many other problems, such as ill health of the individual or family members, the loss of parents or caregivers, and malnutrition. These in turn affect people's ability to focus and learn, thus affecting their educational achievement. Overall, children under the age of 17 years, black Africans, women, people residing in rural areas and people with a low level of education are most affected by poverty "(StatsSA, 2018b).

Because of poor food choices – those that are energy-dense and nutrient-poor – the mortality and morbidity rates for non-communicable lifestyle diseases are much higher in people from socio-economically disadvantaged groups (Moreira & Padrão, 2004). The level of education compared to income, has a bigger influence on food choices. In a study done by Moreira and Padrão (2004), it was found that more fresh fruit, vegetables and milk and less alcohol beverages were consumed by people that had a higher level of education compared to their less-educated counterparts (Moreira & Padrão, 2004). The IOM and NRC (2013) also reported that low-income households purchase more discounted food items and no-name brands than high-income households. This does not imply that discounted food items are less nutritious, but the fact that they are cheaper helps a consumer's food budget. Low-income households purchase less fruit and vegetables and spend less on fresh produce than higher-income households (IOM & NRC, 2013). This spending pattern is similar to that revealed in the random

group discussions among waste pickers in this study sample, where vegetables and fruit are seldom eaten and beer and wine are consumed in large quantities, which contributed to their excessive carbohydrate intake.

5.4.3 Household income

In 2009, in Gauteng alone, it was estimated that more than 32,000 households make an income through waste-picking activities (Viljoen, 2014). According to Viljoen (2014), landfill waste pickers earn more money than street waste pickers. In this study, one can clearly see that waste pickers on landfill sites earned more than street waste pickers where the mean income collected during a good week was [10]R 768.51 (R 500) ± R 715.71 [0 – R 5000] and during a bad week was R 288.69 (R 200) ± R 243.10 [0 – R 1500] (Table 6). This can be compared with a study by Viljoen (2014) among street waste pickers where the mean income collected during a good week was R 658.41 with a median of R 500 and during a bad week was R 214.24 with a median of R 150. A difference in reported income can be expected due to inflation over time as the Viljoen study was conducted more than five years ago. Therefore, in this study sample among waste pickers working on landfill sites, one can clearly see that they earn more than street waste pickers.

During group discussions with waste pickers in the sample population on landfill sites, it was reported that there were different factors influencing their waste collection efforts. The availability of waste, the seasons and the busy holiday periods during the year all contributed to the income they earned. Municipalities have a schedule and a route that they follow every week to collect waste from different areas, which affects the quality and amount of waste that waste pickers collect. According to Viljoen (2014), waste is more accessible and plentiful during the drier seasons. During random group discussions among the study sample it was reported that during the summer people consume more soft drinks, which generates more plastic waste. Waste generation is also higher during the December, Easter and July school holidays as well as public holidays and long weekends. During these periods, earnings from waste collection are higher. Nevertheless, the general uncertainty surrounding income places this vulnerable group at risk of food insecurity during much of the year.

[10] Mean (Median) ± SD [Min – Max]

5.4.4 Insufficient health services and an unhealthy environment

The environment one lives and works in plays a big role in one's health. One can assume that most of the waste pickers live under less fortunate circumstances where poor housing and overcrowding are very common. They also work in a very dangerous and unhygienic environment. Therefore, they are more at risk of physical injury and contracting a communicable disease like tuberculosis. The collection of waste from any landfill site subjects waste pickers to the risk of physical injuries, such as cuts and wounds to their hands and feet; untreated wounds can then lead to infection. In collecting food from landfills, waste pickers are at a higher risk of diarrhoea and food-borne illnesses. In addition, hand washing is not a common practice among waste pickers, which exposes them to different kinds of germs (Schenck et al., 2018).

One of the landfill sites in this study was close to a factory where shoes were manufactured. Unfortunately, many of the dangerous chemicals (including glue) were dumped on the landfill site. Waste pickers, especially the younger generation, flooded to the landfill not necessarily to collect waste but rather to sniff the glue (see Figure 3). During the random group discussions, the participants shared with the researchers that some of these "glue sniffers" became violent and aggressive and scared off some of the other waste pickers. They also stole waste from each other. There were far fewer women working on this particular site because they were fearful of the aggressive attitude of the "glue sniffers".

5.5 Dietary intake of waste pickers

5.5.1 Macronutrient intake of the study sample

There is limited data on the dietary intake of waste pickers in South Africa. Consequently, other studies that included the dietary intake of vulnerable adults living in rural or urban-rural areas were used to compare results with this study sample.

Energy intake:

The Kolahdooz et al. (2013) study that was conducted among 136 adults from a small town in rural KwaZulu-Natal was used to compare the dietary intake of vulnerable adults residing in a rural area. This study population's dietary intake was used as a comparison because the waste pickers in this study sample were also seen as vulnerable adults from rural and urban areas in South Africa.

According to Kolahdooz et al. (2013), mean energy intake for men and women exceeded the DRI for energy (Kolahdooz et al, 2013). Kolahdooz et al. (2013) found that the mean energy intake among men met 70.5% of the energy recommendation of 10500 kJ/day. Therefore, majority of the adults in rural KwaZulu-Natal met the DRI for energy intake (Kolahdooz et al, 2013).

This was in contrast to this study where results showed that the mean intake of energy among female participants at 5664.12 kJ (4917.21 kJ) ± 3583.76 kJ [213.60 – 23637 kJ] was below the mean energy requirement of 7560 kJ (1800 kcal) and met 75% of the mean energy requirement. The mean intake of energy among male participants at 7408.26 kJ (6809.16 kJ) ± 4651.83 kJ [110.40 – 26147 kJ] was below the mean energy requirement of 9240 kJ (2200 kcal) and met 80% of the mean energy requirement (Table 15). Therefore, the waste pickers in this study sample's energy intake was deficient.

Carbohydrate intake:

According to the IOM and NRC (2013), the American NHANES analysed total carbohydrate consumption over time, with the poverty/income ratio and level of education as indicators to determine socio-economic position. Positive associations were seen among the poverty/income ratio and level of education, with intake of more nutritious foods (mostly fruit and vegetables) and a greater consumption of Vitamin A, C and calcium (IOM & NRC, 2013). A decrease in micronutrient intake is seen when more nutrient-dense foods are replaced by energy-dense,

nutrient-poor, less expensive foods; these dietary habits can increase the risk of overweight or obesity and chronic diseases of lifestyle (IOM & NRC, 2013).

Similarly, the study among 136 adults in KwaZulu-Natal indicated that the majority of the total energy consumed was from carbohydrates (67%), and even though the majority of the population had adequate protein intake, most protein was plant-based and lacked animal protein (Kalahdooz et al., 2013).

A study of 67 residents of Boston in the USA, involving both food insecure and food secure participants, revealed that the food insecure participants chose more energy-dense foods than food secure participants and the prevalence of obesity was higher in this group of participants (Walker & Kawachi, 2012). Due to the lack of food availability and food accessibility, it is possible to say that the majority of the food that was consumed from different sources by the food insecure participants were more energy-dense food; this therefore impacted their caloric intake (Walker & Kawachi, 2012).

Similarly, in this study sample, diets high in refined carbohydrates and fat were associated with obesity and were risk factors for chronic lifestyle diseases. More than 50% of the waste pickers consumed a diet very high in carbohydrates with an AMDR for carbohydrates of more than 65% of total energy. The participants who had excessive carbohydrate 24-hour recalls were checked for the food items typically associated with a high consumption of carbohydrates among waste pickers. Food items commonly (and excessively) eaten by waste pickers that were very high in carbohydrates included beer (ranging from 20 litres–6 litres among some participants), sugary drinks, maize meal and vetkoek (see Figure 6).

Protein intake:

Three-quarters (76%) of the study sample had an adequate intake of protein of 10%–35% of total energy. Meat and chicken were commonly collected from landfill sites, especially BO which is in the vicinity of a meat-processing factory and other sites that received food from restaurants and the nearby military base. Food items that were commonly collected by waste pickers on the landfill sites included meat/chicken (59.8%), bread/buns (43%), fruit and vegetables (15.1%), tinned food (15.1%) and maize (14%) (Schenck et al., 2018).

Fat intake:

The 24-hour recalls of the participants who had had an excessive fat intake were checked to distinguish which food items were commonly eaten. Approximately 13% (Table 16) of the study sample had an excessive fat intake, which was due to the consumption of very fatty foods, including: fried chicken, vetkoek, chicken feet, Russian sausages, *[11]maas, peanut butter, beef with fat, and fries. According to Schenck et al. (2018), waste pickers from BO reported that they regularly ate Russian sausages because they received it from the meat-processing factory in the area.

According to Darmon and Drewnowski (2008), the energy intake of people from a lower socio-economic background, and with low income and education levels, are not necessarily below the minimum DRI for energy, but the quality of nutrient intake is affected because of the food choices that they make. Therefore, socio-economic status can influence the quality of the diet but not necessarily the total energy intake or macronutrient composition of the diet (Darmon & Drewnowski, 2008). Similarly, in this study sample where waste pickers were classified as vulnerable people, the quality of their diet was poor where they opted for more energy-dense, high-in-carbohydrate but nutrient-poor, foods (see Figure 5 and Figure 6).

5.5.2 Micronutrient intake of the study sample

The majority of the study sample had an inadequate intake of most of the micronutrients, and therefore were at risk of micronutrient deficiencies. It was also revealed that the quality of the average diet in disadvantaged areas or among people with a low socio-economic status is very nutrient-poor. This finding is evident in other studies as well. Adequate iron intake would have been 78.1% for the population. However, only 21.1% of participants had an inadequate intake. This is seen as a moderate public health problem. A study conducted among adults in rural and urban areas determined that calcium, iron, folate and Vitamin B6 were low in the diets of South African adults (Steyn et al., 2008). The study also found that people from rural areas were most affected by all these micronutrient deficiencies compared to their counterparts from urban areas (Steyn et al., 2008).

There is not much formal evidence of micronutrient deficiencies in South African adults (Steyn, 2006; Vorster et al., 1997). Overall, though, the micronutrient content or quality of an

[11] *maas: (noun) thick soured milk (Collins, 2019b)

adult diet in South Africa is poor. Respective studies done by Steyn (2006) and Vorster et al. (1997) showed that a lot of South Africans did not meet their requirements for iron and calcium (commonly black women and girls) and folate (Indian and black women), while most Indian, Coloured and black groups did not meet their Vitamin C requirements. Most South Africans also had a low intake of zinc, riboflavin and Vitamin B6, and Vitamin A intake was especially low in children (Vorster, 2010).

Steyn et al. (2008) assessed the micronutrient intake among adults in rural and urban areas and showed that there was also an inadequate intake of Vitamin A in women of child-bearing age, which was a huge concern. A study that was conducted among premenopausal black women showed a large percentage of micronutrient deficiencies in calcium, Vitamin D, iron, selenium, folate, and Vitamins C, A, E and B6 (Hattingh et al., 2008).

Kolahdooz et al. (2013) found that among the 136 adults living in rural areas in KwaZulu-Natal were deficient in iron, zinc, Vitamin B12, riboflavin, calcium and Vitamin A. Zinc and Vitamin A remained below the adequate intake level, despite the fortification of foods with these micronutrients. Zinc's adequate intake was much lower in men (41%) than in women (72%) and the majority of the participants Vitamin A and B12 intake was <70% of the DRI's (Kolahdooz et al., 2013). This could be attributed to the low intake of animal source foods. These nutrients are more bioavailable in animal source foods than in plant foods; therefore, such foods are consumed less in those communities that cannot afford to consume animal proteins, such as eggs, dairy or meat products. This could also explain why so many of the micronutrient intakes were inadequate in this study sample (Table 22).

Dietary calcium and Vitamin D intakes of more than 90% in the KwaZulu-Natal population were less than 70% of the DRIs (Kolahdooz et al., 2013). The reason for this would also be low consumption of dairy products and diets that are high in phytates, oxalates and tannins which decreases the absorption of calcium (Kolahdooz et al., 2013). In this study, more than 95% of the population had an inadequate intake of calcium and Vitamin D because of an inadequate intake of dairy products (Table 22). In this study, micronutrients that were below the adequate intake were mainly due to the low consumption of animal food sources and fruit and vegetables. The majority of this study sample's intakes of fat-soluble vitamins were inadequate because of the low consumption of animal source foods (Table 22).

Socio-economic status also has an effect on the quality of diets. Darmon and Drewnowski (2008) investigated the relationship between socio-economic status and diet quality. Darmon

and Drewnowski (2008) indicated that socio-economic status does have an effect on diet quality; people from a lower socio-economic group had a lower consumption of Vitamin C, Beta-carotene and folate, Vitamin E, plant-based poly phenols, iron, calcium, potassium and Vitamin D. The reason for these inadequate intakes of nutrients in this study was the low consumption of fruit and vegetables and the lower consumption of animal protein food sources by lower socio-economic groups compared to higher socio-economic groups (Darmon & Drewnowski, 2008).

The IOM and NRC (2013) also reported that the dietary intake of food insecure adults was less than 50% of the RDA and they had lower serum levels for selected nutrients compared to food secure families in the American National Centre for Health Statistics (NHANES) III. The NHANES collect data annually from 5000 persons from 15 counties in the United States to evaluate the nutritional status of children and adults in the United States in order to determine the nutritional status of the country and the prevalence of disease (IOM & NRC, 2013). Data from the 24-hour recalls of adults in the age range 20–59 years showed intakes less than 50% of the RDA of Vitamin E and calcium and lower serum concentration of total carotene and Vitamin C, while adults older than 60 years showed intakes of zinc and iron below 50% of the RDA (IOM & NRC, 2013).

On the other hand, this study showed that approximately 70% of the study sample's sodium intake was below the WHO recommendation of 5 g/day compared to the study done by Kolhahdooz et al. (2013) in KwaZulu-Natal, which showed excessive sodium intakes exceeding the DRIs by 300 mg–700 mg across all ages and both genders. The reason for the high sodium intake was that the composite dishes in rural Kwa-Zulu Natal indicated that large amounts of salt were added during the preparation of meals (Kolhahdooz et al., 2013). However, the participants in this study sample merely ate what they collected or had, and so it can be assumed that they perhaps did not cook as much.

According to the Heart and Stroke Foundation of South Africa (HSFSA) (2017), salt intake in South African adults is approximately 40% more (6–11 g/day) than the WHO-recommended salt intake of 5 g/day. The addition of salt to food and hidden salt in processed foods is responsible for the prevalence of high blood pressure in one in three people over the age of 15 years (HSFSA, 2017). The 16% of this study sample of waste pickers who reported excessive intakes of sodium in the 24-hour recalls were checked against the list of the most commonly eaten foods that are high in sodium. The foods that were high in sodium included: farm-style

and Russian sausages, maas and sugary drinks. No added sodium was indicated in the 24-hour recalls; therefore, sodium intake was only measured in terms of the foods that were consumed. If added sodium had been indicated in 24-hour recalls, it is possible that a higher percentage of the population would have had an excessive intake of sodium.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

The double burden of disease could be seen among this study sample of waste pickers in South Africa. Dietary intake and nutritional status among waste pickers varied between men and women and according to the areas in which the waste pickers lived. In this study sample, women (28.5%) were four times more likely to be overweight than men (7.3%). The proportion of women that were overweight and obese on all landfill sites was much higher than that of men. Overweight and obesity were mostly prevalent in BN, BS, BR, BO and MA, and the majority of these respondents were from an African/Black culture or race. The mean BMI was four points more in the African/Black group (23.8431 kg/m^2) than the Coloured group (19.7081 kg/m^2) and therefore one can state that race had a direct influence on dietary intake and nutritional status among waste pickers. Underweight was more prevalent among the Coloured communities, OU (33.33%), BS (24.14%) and ST (24.49%) – the latter situated in a less affluent area.

The majority (51.6%) of the study sample's carbohydrate intake exceeded the AMDR of >65% of the total energy intake. Carbohydrate intake was high because of the high consumption of beer (ranging from 20 litres–6 litres of beer among some participants), and the high consumption of sugary drinks, maize meal and vetkoek. Diets high in refined carbohydrates and fat are associated with obesity and could be a reason for the high prevalence of overweight and obesity in this study sample; such conditions are risk factors for chronic lifestyle diseases. One-quarter of the sample population had an inadequate intake of protein below the AMDR of 10% of the total energy intake. Most participants that had inadequate protein intake were from OU. The majority (65.6%) of waste pickers in OU had an inadequate protein and inadequate fat intake (71.9%), which could be associated with the higher prevalence of underweight in the OU area.

More than 50% of the study sample had an inadequate intake of most of the micronutrients which put them at risk of multiple micronutrient deficiencies. This also indicated that diets in rural areas or among people with a low socio-economic status are very nutrient-poor and energy-dense. The level of education, income earnings and occupation has direct effects on nutrition and quality of the diet and is not only affected by age and gender of a person Diet quality and food intake are not only affected by age and gender; occupation, education and earnings appear to have direct effects on nutrition and quality of the diet (Darmon &

Drewnowski, 2008). Consequently, education and income have clear associations with the selection food and therefore nutrient intake (Moreira & Padrão, 2004).

One-fifth (20%) of the study sample went to sleep at night hungry and 18.34% went for a whole day and night without eating anything because there was not enough food (Table 8). Approximately 17% of the household went to sleep at night hungry and 16.62% went for a whole day and night without eating anything because there was not enough food during the past month (Table 8). Food insecurity and hunger were rife in this study sample.

In conclusion, a double burden of disease, including under- and over-nutrition, was observed among waste pickers in South Africa. Food insecurity and hunger were experienced among the waste pickers in this sample population. Dietary intake was poor, characterised by energy-deficient diets and a high consumption of energy-dense and nutrient-poor foods.

The municipalities and Department of Health should note the following recommendations when engaging in future programme planning for waste disposal and recycling:

- The municipalities in South Africa should give priority to educating all households on the safe and correct approach to waste disposal. All households could be issued with two bins, one for garbage (dry waste and glass) and one that can be used to store leftover food that is safe for waste pickers to eat.
- The population should be educated on the correct storage of leftover foods which will ensure food safety and help to satisfy the hunger of waste pickers. In this way, waste pickers will be able to collect frozen leftover foods in the separate food bins put out on garbage collection days.
- The municipalities should make provision for a hand-washing basin and tap at each landfill site.
- Health professionals such as dietitians, food microbiologists and environmental health practitioners and social workers could assist in educating people in rural and urban communities on the safe disposal of waste, the environmental hazards associated with waste and illegal dumping, the importance of handwashing and hygienic food handling as well as the safe storage of leftover foods so that they can be consumed again.
- Dietitians could educate waste pickers about healthy diets so that they can make healthier food choices and purchase more nutritious but still affordable food items.

- Health professionals could also educate waste pickers in the safe handling of waste and exercising of caution when collecting food from the landfill sites or garbage bins.
- Environmental health practitioners and social workers could advocate to municipalities to help make the waste pickers' job safer and more pleasant by issuing gloves and masks to supervisors at landfill sites. These materials could be given to waste pickers before they started collecting their waste for the day.

As far as future studies are concerned, more research could be done on the dietary intake, food (in)security and anthropometrical/nutritional status of waste pickers. Limitations of this study included a very limited dietary intake and limited anthropometric measurements. A larger study sample – including landfill and street waste pickers, a 24-hour dietary intake assessment covering a three-day period and a food frequency questionnaire – would give a stronger indication of dietary intake, food security and dietary diversity among waste pickers. To determine the nutritional status of waster pickers, anthropometric measurements might include Mid-Upper Arm Circumference (MUAC) and waist circumference to support BMI findings. The results from this secondary study could then be shared to lend further weight to efforts to determine the dietary intake, nutritional status and food (in)security of waste pickers.

APPENDIX: Photos of waste pickers at work

Figure 2: Waste pickers collecting waste from a landfill site
Photo: Joy Williams
Date: 22/09/2016

Figure 3: Male waste picker sniffing glue from a discarded container on a landfill site
Photo: Joy Williams
Date: 23/09/2016

Figure 4: Waste pickers hurrying to an army truck that has dumped a new load of waste at a landfill site
Photo: Joy Williams
Date: 23/09/2016

Figure 5: Food collected from a landfill site
Photo: Joy Williams
Date: 22/09/2016 and 23/09/2016

Figure 6: Bread and cooked stew collected from a landfill site
Photo: Joy Williams
Date: 22/09/2016 and 23/09/2016

REFERENCES

Alberti, G., Zimmet, P., & Shaw, J. (2006). Metabolic syndrome—A new world-wide definition: A consensus statement from the International Diabetes Federation. *Diabetic Medicine*, 23(5), 469–480. [online] Available at: https://onlinelibrary.wiley.com/doi/full/10.1111/j.1464-5491.2006.01858.x [Accessed 11 June 2019]

Auler, F., Nakashima, A. & Cuman, R. (2013). Health Conditions of Recyclable Waste Pickers. *Journal of Community Health*, 39(1), pp.17–22. [online] Available at: https://www.researchgate.net/publication/249996807_Health_Conditions_of_Recyclable_Waste_Pickers [Accessed 19 July 2018].

Ballard, T., Coates, J., Swindale, A. & Deitchler, M. (2011). Household Hunger Scale: Indicator Definition and Measurement Guide. Washington, DC: Food and Nutrition Technical Assistance II Project, FHI 360. [online] Available at: https://www.fantaproject.org/sites/default/files/resources/HHS-Indicator-Guide-Aug2011.pdf [Accessed 2 November 2018].

Benson, K. & Vanqa-Mgijima, N. (2010). Organising on the streets: A study of reclaimers in the streets of Cape Town. *WIEGO Organizing Brief No. 4* [online] Available at: http://www.inclusivecities.org/toolbox/Organizing_on_the_Streets_web.pdf [Accessed 21 February 2019].

Burchi, F. & de Muro, P. (2016). From food availability to nutritional capabilities: Advancing food security analysis. *Food Policy*, 60, pp.10–19. [online] Available at: http://dx.doi.org/10.1016/j.foodpol.2015.03.008 [Accessed 4 February 2019].

Collins (2019a). Collins English Dictionary. [online] Available at: https:www.collinsdictionary.com/dictionary/english/vetkoek [Accessed 11 June 2019]

Collins (2019b). Collins English Dictionary. [online] Available at: https:www.collinsdictionary.com/dictionary/english/maas [Accessed 11 June 2019]

Connolly-Boutin, L. & Smit, B. (2015). Climate change, food security, and livelihoods in sub-Saharan Africa. *Regional Environmental Change*, 16(2), pp.385–399. DOI 10.1007/s10113-015-0761-x [online] Available at: https://www.scirp.org/(S(lz5mqp453edsnp55rrgjct55))/reference/ReferencesPapers.aspx?ReferenceID=1544134 [Accessed 4 February 2019].

Coppenrath, W. (2001). Problems in Nutritional Status Among Homeless Populations: An Introduction. *Nutrition Bytes* 7(1) [online] Available at: https://escholarship.org/content/qt5hm1p27p/qt5hm1p27p.pdf [Accessed 21 February 2019].

Creswell, J. (2003). *Research Design: Qualitative, Quantitative and Mixed Method Approaches*. Thousand Oaks, CA: SAGE

Creswell, J. (2007). *Qualitative inquiry and research design: Choosing from five approaches.* London: Sage.

Darmon, N. & Drewnowski, A. (2008). Does social class predict diet quality? *The American Journal of Clinical Nutrition*, [online] 87(5), pp.1107–1117. Available at: http://www.bvsde.ops-oms.org/texcom/nutricion/1107cn.pdf [Accessed 27 July 2018].

Dubihlela, J. & Dubihlela, D. (2014). Social Grants' Impact on Poverty among the Female-Headed Households in South Africa: A Case Analysis. *Mediterranean Journal of Social Sciences*, [online] 5(8), pp.160–167. Available at: https://www.researchgate.net/publication/287613642 [Accessed 19 July 2018].

Escott-Stump, S. & Earl, R. (2008). 'Guidelines for Dietary Planning' in Mahan, L. and Escott- Stump, S. *Krause's Food & Nutrition Therapy.* (12th ed.). St. Louis, Mo: W.B. Saunders. P337–362.

Faber, T. (2016). 'Meet the Bin Scavengers Saving South Africa R750 Million a Year'. [online] Available at: http://www.timeslive.co.za/sundaytimes/stnews/2016/05/08Meet-the-bin-scavengers-saving-SA-R750-million-a-year [Accessed 4 February 2019).

Food and Agricultural Organisation of the United Nations (FAO). (2009). 'World Summit on Food Security', *World Food Summit*, (November 2009), pp.1–7. [online] Available at: http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Declaration/WSFS09_Draft_Declaration.pdf [Accessed 4 February 2019].

Food and Agricultural Organisation of the United Nations (FAO). (2018). SOFI 2018 – The State of Food Security and Nutrition in the World, Global Food Insecurity Report. doi: 10.1093/cjres/rst006. [online] Available at: http://www.fao.org/3/I9553EN/i9553en.pdf [Accessed 4 February 2019].

Gross, R., Schoeneberger, H., Pfeifer, H. & Preuss, H. (2000). The Four Dimensions of Food and Nutrition Security: Definitions and Concepts. [online] Available at: http://www.fao.org/elearning/course/fa/en/pdf/p-01_rg_concept.pdf [Accessed 19 July 2018].

Hammond, K. (2008). 'Assessment: Dietary and Clinical Data' in Mahan, L. and Escott – Stump, S. *Krause's Food & Nutrition Therapy.* (12th ed.) St. Louis, Mo: W.B. Saunders. 383–410.

Hattingh, Z., Walsh, C.M., Bester, C.J. & Oguntibeju, O.O. (2008) An analysis of dietary micronutrient intakes in two age groups of black South African women. *West Indian Med J* 57 (5): 431–437. [online]. Available at: https://www.ncbi.nlm.nih.gov/pubmed/19565971/?ncbi_mmode=std [Accessed 27 July 2018].

Institute of Medicine of the National Academies. (2005). Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids and Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. Available at: http://www.nap.edu. [Accessed 18 April 2017].

IOM (Institute of Medicine) & NRC (National Research Council). (2013). Supplemental Nutrition Assistance Program: Examining the evidence to define benefit adequacy. Washington, DC: The National Academies Press.

Kolahdooz, F., Spearing, K. & Sharma, S. (2013). Dietary Adequacies among South African Adults in Rural KwaZulu-Natal. PLoS ONE, [online] 8(6), p.e67184. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3692416/pdf/pone.0067184.pdf [Accessed 27 July 2018].

Lee, B. & Greif, M. (2008). Homelessness and Hunger. *Journal of Health and Social Behavior*, [online] 49(1), pp.3–19. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4121392/pdf/nihms593479.pdf [Accessed 19 July 2018].

Lee, R. & Nieman, D. (2003). Nutritional Assessment. Boston: McGraw-Hill, New York.

Lee, R. & Nieman, D.C. (2007). Nutritional Assessment. (4th ed). McGraw Hill, New York.

Mahan, L. & Escott- Stump, S. (2008). Krause's *Food & Nutrition Therapy*. (12th ed.). St. Louis, Mo: W.B. Saunders.

Makhasana. S., Sidondi. N., Rule. S., Richards. R., Dlulane. G. & Sibeko. L. (2018). Report on the determination of the extent and role of waste picking in South Africa. [online] Department of Environmental Affairs, South Africa, pp.1–69. Available at: http://sawic.environment.gov.za/documents/5413.pdf [Accessed 19 Jul. 2018].

Malmauret, L., Leblanc, J. Ch., Cuvelier, I. & Verger, Ph. (2002). Dietary intakes and vitamin status of a sample of homeless people in Paris. *European Journal of Clinical Nutrition*. 56, 313–320.

Maree, K. (ed) (2007). First steps in Research. (1st ed). Pretoria: Van Schaik.

Mehay, C. (2017). Plastics Recycling Figures – More South Africans Recycling. [online] Plasticsnews.co.za. Available at: http://www.plasticsnews.co.za/plasticsnews/plastics-recycling-figures-,ore-south-africans-recycling.html [Accessed 21 February 2019].

Mchiza, Z.J., Steyn, N.P., Hill, J., Kruger, A., Schönfeldt, H., Nel, J. & Wentzel-Viljoen, E. (2015). A Review of Dietary Surveys in the Adult South African Population from 2000 to 2015. *Nutrients*, Vol. 7. pp. 8227–8250. doi:10.3390/nu7095389

Medina, M. (1997). Informal recycling and collection of solid wastes in developing countries: Issues and opportunities. United Nations University (UNU) / Institute of Advanced Studies (IAS) working paper no. 24. Available at: http://www.gdrc.org/uem/waste/swm-ias.pdf [Accessed on 21February 2019].

Moreira, P. & Padrão, P. (2004). Educational and economic determinants of food intake in Portuguese adults: A cross-sectional survey. *BMC Public Health*, [online] 4(1), pp.1–11. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC544354/pdf/1471-2458-4-58.pdf [Accessed 20 July 2018].

Mote, B.N., Kadam, S.B., Kalaskar, S.K., Thakare, S.T., Adhav., A.S. & Muthuvel, T. (2016). Occupational and Environmental Health Hazards (Physical and Mental) Among Rag-

Pickers in Mumbai Slums: A Cross-Sectional Study. *Science Journal of Public Health*. Vol. 4, No1, pp. 1–10. doi:10.11648/j.sjph.20160401.11

Mothiba, M. (2016). A study on working conditions and health status of waste pickers working at landfill sites in the City of Tshwane Metropolitan Municipality. Masters of Science in the subject Environmental Management. University of South Africa, South Africa.

National Department of Health (NdoH), Statistics South Africa (Stats SA), South African Medical Research Council (SAMRC) & ICF. (2019) South African Demographic and Health Survey 2016. Pretoria, South Africa, and Rockville, Maryland, USA: NdoH, Stats SA, SAMRC, and ICF [online] Available at: http://www.health.gov.za/index.php/component/phocadownload/category/539-sadhs-south-africa-demographic-and-health-survey-report?download=3325:sadhs-2016-report [Accessed 22 February 2019].

Oxfam (2014). Hidden Hunger in South Africa: The faces of hunger and malnutrition in a food-secure nation. pp. 1–44 [online] Available at: https://policy-practice.oxfam.org.uk/publications/hidden-hunger-in-south-africa-the-faces-of-hunger-and-malnutrition-in-a-food-se-332126 [Accessed 22 February 2019].

Pereira, L.M. (2014). 'The Future of South Africa's Food System: What is research telling us?' *Southern Africa Food Lab*. doi: 10.1117/12.851756. [online] Available at: http://awsassets.wwf.org.za/downloads/safl_the_future_of_south_africas_food_system.pdf [Accessed 21 February 2019].

Renzaho, A. & Mellor, D. (2010). Food security measurement in cultural pluralism: Missing the point or conceptual misunderstanding? *Nutrition*, 26(1), pp.1–9.

Rozman, M.A., de Azevedo, C.H., Carvalho de Jesus, R.R., Filho, R.M. & Junior, V.P. (2010). Anemia in recyclable waste pickers using human driven pushcarts in the city of Santos, southeastern Brazil. *Rev Bras Epidemiology* 13(2):1–11.

Schenck, R. & Blaauw, D. (2011). The work and lives of street waste pickers in Pretoria: A A case study of recycling in South Africa's urban informal economy. *Urban Forum* (4) 411–430. [online] Available at: http://repository.uwc.ac.za/xmlui/handle/10566/664 [Accessed 19 July 2018].

Schenck, R., Blaauw, D., Viljoen, J.M.M. & Swart, E.C. (2018). Social work and food security: Case study on the nutritional capabilities of the landfill waste pickers in South Africa. *International Social Work* 61 (4) 571–586. DOI: 10.1177/0020872817742703

Singh, A.R. & Singh, S.A. (2008). Diseases of poverty and lifestyle, well-being and human development. *Mens sana monographs*, *6*(1), 187–225. doi: 10.4103/0973-1229.40567 [online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3190550/ [Accessed 22 February 2019].

South African Food Database System (SAFOODS). (2016). Food Composition Database, Version 2016. Parow Valley, Cape Town: South African Medical Research Council.

South African Social Security Agency (SASSA). (2018). Grant Amounts. [online] Available at: http://www.sassa.gov.za/index.php/newsroom/355-sassa-grants-amounts [Accessed 22 February 2019].

South African Revenue Service (SARS). (2018). Value-Added Tax. [online] Available at: http://www.sars.gov.za/TaxTypes/VAT/Pages/default.aspx [Accessed 11 June 2019]

Statistics South Africa (StatsSA). (2018a). General household survey 2017. [online] Available at: http://www.statssa.gov.za/publications/P0318/P03182017.pdf [Accessed 8 November 2018].

Statistics South Africa (StatsSA). (2018b). Poverty on the rise in South Africa | Statistics South Africa. [online] Statssa.gov.za. Available at: http://www.statssa.gov.za/?p=10334 [Accessed 19 July 2018].

Steyn, N.P. (2006). 'Nutrition and chronic diseases of lifestyle in South Africa', in K. Steyn, J. Fourie, N. Temple (eds.), *Chronic diseases of lifestyle in South Africa*, pp. 58–64, Medical Research Council, Tygerberg.

Steyn, N.P., Wolmarans, P. Nel, J.H., Bourne, L.T. (2008) National fortification of staple foods can make a significant contribution to micronutrient intake of South African adults. *Public Health Nutrition*. Vol. 11, No 3, pp.307–313. doi:10.1017/s136898000700033x [online] Available at: https://www.cambridge.org/core/journals/public-health-nutrition/article/national-fortification-of-staple-foods-can-make-a-significant-contribution-to-micronutrient-intake-of-south-african-adults/EOCF41FEA2FA698BEFB7DACC366F574 [Accessed 11 June 2019]

Talukder, M.U., Alam, M. & Islam, A. 2015. Study on the Nutritional Status of the Street Children at Shabagh Area of Dhaka City. *International Journal of Nutrition and Food Sciences*. Vol. 4, No 3, pp.240–245. doi:11648/j.ijnfs.20150403.11[online] Available at: https://pdfs.semanticscholar.org/7881/83de28fdc4bd785b520e45cf8ba60c3318a2.pdf [Accessed 19 July 2018].

The Heart and Stroke Foundation of South Africa (HSFSA). (2017). 'Why is too much salt bad for your health?' [online] Available at: http://www.heartfoundation.co.za/wp-content/uploads/2017/10/Salt-Awareness-Week-Infographic-2017.pdf [Accessed 21 February 2019].

UNICEF. (1990). Conceptual Framework for the Causes of Malnutrition. [online] Available at: http://foodsecurity.gov.kh/pages/content/conceptual-framework-malnutrition [Accessed 21 February 2019].

Viljoen, J.M.M. (2014). 'Economic and Social Aspects of Street Waste Pickers in South Africa', PhD Thesis in Economics. University of Johannesburg, Johannesburg, South Africa.

Vhurumuku, E. (2014). 'Food Security Indicators' [PowerPoint Presentation] for the *Integrating Nutrition and Food Security Programming for Emergency response workshop*. [online] Available at: http://www.fao.org/fileadmin/user_upload/food-security-capacity-building/docs/Nutrition/NairobiWorkshop/5.WFP_IndicatorsFSandNutIntegration.pdf [Accessed 22 February 2019].

Vorster, H.H., Oosthuizen, W., Jerling, J.C., Veldman, F.J. & Burger, H.M. (1997). 'The nutritional status of South Africans: A review of the literature from 1975–1996', *Durban: Health Systems Trust* (1), 1–22, (2), 1–122.

Vorster, H.H. (2010). 'The link between poverty and malnutrition: A South African perspective', J*ournal of Interdisciplinary Health Sciences* 15(1), Art #435, 6 pages. DOI: 10.4102/hsag.v15i1.435

Walker, R. E. & I. Kawachi. (2012). Use of concept mapping to explore the influence of food security on food buying practices. *Journal of the Academy of Nutrition and Dietetics* 112:711-717. Doi: 10.1016/j.jand.2011.12.020. [online] Available at http://www.ncbi.nlm.nih.gov/m/pubmed/22709776/ [Accessed 19 July 2018]

World Health Organization. (2015). ‘Guideline: Sugar intake for adults and children’, Geneva: World Health Organisation (WHO) (March), pp.1–48. doi: 978 92 4 154902 8. [online] Available at: https://apps.who.int/iris/bitstream/handle/10665/149782/9789241549028_eng.pdf?sequence=1 [Accessed 8 November 2018].

Zewdie, A. (2014). Impacts of Climate Change on Food Security: A Literature Review in Sub Saharan Africa. *Journal of Earth Science & Climate Change*, 05 (08), pp. 1–4. Doi:10.4172/2157-7617.1000225.

ANNEXURE A:

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Department of Dietetics and Nutrition
Tel: +27 21-959 2760
Head of Department : Dr E Kunneke
E-mail: ekunneke@uwc.ac.za

INFORMATION SHEET

Project Title: The dietary intake, food (in)security and nutritional status of waste pickers in South Africa

What is this study about?

This is a research project being conducted by Professor Catherina Schenck at the University of the Western Cape. We are inviting you to participate in this research project because you are collecting waste on the landfill site to earn a living. The purpose of this research project is to determine the food (in)security, nutritional and socio-economic status of waste pickers in South Africa.

What will I be asked to do if I agree to participate?

You will be asked to share information about the landfill sites and the activities related to waste collection from the landfill. The fieldworker will ask the questions from questionnaires and photographs may be taken of the food you collect on the landfill site. You may choose to answer the questions that you feel comfortable with. The questionnaire will take 5-10 minutes to answer. The fieldworker will also ask to weigh you and measure your height. These measurements will take 2–5 minutes. You may choose not to participate in these measurements if you feel uncomfortable about doing so. You will be asked to give a brief summary of what you have eaten in the last 24 hours and what food items you collect from the landfill sites. You may choose not to participate in the dietary recall.

Would my participation in this study be kept confidential?

The researchers undertake to protect your identity and the nature of your contribution. To ensure your anonymity and confidentiality, we will not request your name. A code will be placed on the survey and other collected data. The researcher will use this code to link your survey, measurements and dietary recall. Any information that may identify you will be removed or kept safe. All questionnaires, measurements and dietary recalls will be kept safe in the office and locked cupboard of Prof Schenck and Prof Swart at the University of the Western

Cape. All electronic data will be analysed using identification codes and computer files will be password-protected. You have the right to refuse to answer any questions or refuse to take part in any measurements. If we write a report or article about this research project, your identity will not be revealed. Your identity will also be protected by removing the consent form from the completed questionnaire or data collection form.

What are the risks of this research?

There may be some risks from participating in this research study. You may stop the interview if you run the risk of losing the opportunity to collect waste. You may complete the questionnaire in writing if you want to. You may stop the interview or refuse to participate in the measurements if you feel exposed or embarrassed or if any questions upset you. Should you choose not to participate, you will not lose any benefits of any kind that you might otherwise qualify for.

What are the benefits of this research?

This research is not designed to help you personally, but the results may help the investigator learn more about the lives of the waste pickers and your contexts, how you survive, your nutritional health and food intake and how you support your families. We hope that, in the near future, other people might benefit from this study through improved understanding of people trying to survive in the informal economy through waste picking and recycling. We will use this information to help the population understand the nutrition situation of waste pickers in order to advocate for policies that will protect waste pickers. This study will also demonstrate your needs to health care workers to assist with interventions to prevent malnutrition and food insecurity and to improve your overall health.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalised or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by Professor Catherina Schenck and her research team at the University of the Western Cape. If you have any questions about the research study itself, please contact:

Professor Catherina Schenck
cschenck@uwc.ac.za
Private Bag x17 Bellville
7535
0828640600

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Dr Marcel Londt
Head of Department: Social Work
mlondt@uwc.ac.za
Private Bag x17 Bellville
7535
021 959 3170

Prof Anthea Rhoda
Dean of the Faculty of Community and Health Sciences
chs-deansoffice@uwc.ac.za
arhoda@uwc.ac.za
University of the Western Cape
Private Bag X17
Bellville 7535

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
University of the Western Cape
Private Bag X17
Bellville 7535
research-ethics@uwc.ac.za
Tel: +27 21 959 2988

This research has been approved by the University of the Western Cape's Research Ethics Committee (REFERENCE NUMBER: *2015/4/24).*

ANNEXURE B:

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Department of Dietetics and Nutrition
Tel: +27 21-959 2760
Head of Department : Dr E Kunneke
E-mail: ekunneke@uwc.ac.za

CONSENT FORM

Title of Research Project: The dietary intake, food (in) security and nutritional status of waste pickers in South Africa

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

This research project can include photographs of you collecting food and waste on the landfill sites. These photos will be used to get extra information about the landfill sites and to physically see the type of food that you collect and the environment you collect waste from. The information will be kept in the researchers' locked office in a computer file that is password-protected.

___ **I agree** to be photographed during my participation in this study.

___ **I do not agree** to be photographed during my participation in this study.

Participant's name…….
Participant's signature…….
Date……

Note: When consent is obtained from a person who is illiterate, a witness should be present.

Witness's name…….
Witness's signature…….
Date……

ANNEXURE C: (Schenck et al., 2018)

Department of Economics and Econometrics – University of Johannesburg
School of Economics – North-West University
Department of Social Work – University of the Western Cape

Dear Sir/Madam

We are researchers from the University of Johannesburg's Department of Economics and Econometrics, North-West University's School of Economics and University of the Western Cape's Department of Social Work. We are doing research on waste pickers in South Africa. The results from the research might also be published in scientific journals.

Activities of the project:

- We are going to ask you some questions that will take about 30 minutes of your time.

Please remember that:

- You do not have to do this. If you feel that you do not want to be part of the study you are free to withdraw at any time and your information will not be included in the results of the study.
- Your personal details and any other information will be kept confidential at all times.
- You have the right to ask questions about this study. If any questions arise while I am explaining this form, please ask them whenever you are ready. I will also give you time to think – please indicate if you want this time.
- No monetary compensation is offered for your participation.

We value your cooperation in this matter.

LANDFILL WASTE PICKERS SURVEY IN SOUTH AFRICA, 2015

Department of Economics and Econometrics – University of Johannesburg
School of Economics - North-West University
Department of Social Work – University of the Western Cape

SURVEY DETAILS
(Can be completed after the interview)

Interviewer: Complete the following questions after the interview.

Date of interview..... Time of interview.....…….....

Fieldworker name…….....

Geographical details of the site where interview took place:

Name of the landfill site.....……

Street address (of site): …….

City/Town/Suburb: .....…….

Questionnaire

Completed	Not Completed

SECTION A
This set of questions relates to the personal background of the respondent you are interviewing.

1. Respondent's gender:

Male	1
Female	2

2. With which cultural group do you associate yourself with?

African/Black	1
Coloured	2
White	3
Indian/Asian	4
Other	5
If other, please specify	

3. Language predominantly spoken by respondent. **Mark ONE only.**

English	1
Sesotho	2
Sepedi	3
Isizulu	4
Isindebele	5
Xhitsonga	6
Afrikaans	7
Setswana	8
Isixhosa	9
Tshivenda	10
SiSwati	11
Shona	12
Other	13
If other please specify ……....	

4. From which country do you originate?

South Africa	1
Zimbabwe	2
Namibia	3
Swaziland	4
Mozambique	5
Botswana	6
Lesotho	7
Other	8
If other please specify …….....	

5. If from South Africa, in which province were you born?

Gauteng	1
Mpumalanga	2
KwaZulu-Natal	3
Eastern Cape	4
Limpopo	5
North West	6
Free State	7
Northern Cape	8
Western Cape	9

6. How old are you?

7. Which of the following describes your current marital status?

Never married / Single	1
Separated / Divorced	2
Married (Traditional or Western)	3
Widowed	4
Living with a partner	5
Other	6
Other, specify...	

SECTION B
This set of questions relates to the respondent's education.

8. What is the **highest** school or tertiary qualification you have **passed**?

Grade

0	1	2	3	4	5	6	7	8	9	10	11	12
Post-School Qualification												13
Post-School Qualification. Please mention the qualification. ………………………………………………………………..												

Ask question 9 only if the waste pickers left school before passing Grade 12.

9. Why did you leave school before completing Grade 12?

....

10. Do you have any other training or skills that you might be able to use in another job?

Yes	1
No	2

11. If your answer to question 10 is **Yes**, please specify **what** training and skills you have, where you obtained the training and skills, and whether the training was formal or informal (fieldworker needs to probe).

1	2	3
Type of training/skill	Where obtained	Formal or informal

12. How well can you understand English? (fieldworker asks the question in English)

Not at all	1
Somewhat	2
Well	3

13. How well can you speak English?

Not at all	1
Somewhat	2
Well	3

14. Hoe goed kan jy Afrikaans verstaan? (Ask the question in Afrikaans)

Not at all	1
Somewhat	2
Well	3

15. Hoe goed kan jy Afrikaans praat?

Not at all	1
Somewhat	2
Well	3

SECTION C
This set of questions relates to the respondent's employment history.

16. Have you ever worked where you received a payslip?

Yes	1
No	2

17. If YES, what was your last full time job? (fieldworker needs to probe)

Job title: .....

18. For how long did you have the last full-time job?

Years ☐☐ Months ☐☐

19. Why did you leave your last job?

Laid off business/mine/factory closed	1
Laid off/ business moved	2
Laid off/ business downsizing	3
Disciplinary reasons	4
Quit the job because wage was too low	5
Quit the job because of medical reasons	6
Quit because of bad treatment from employer	7
Other, specify	8
Refused to answer	9

20. Are you currently looking for a full-time job?

Yes	1
No	2

21. If not, why not?

.....

22. What other job/s have you done before becoming a waste picker or while being a waste picker?

.....
.....
.....

SECTION D
This set of questions relates to the respondent's work as a waste picker.

23. What do you like about your work? (fieldworker needs to probe)

.....
.....
.....
.....

24. What about your work do you not like? (fieldworker needs to probe)

.....
.....
.....
.....

25. Why did you decide to collect recyclable waste? (fieldworker needs to probe)

.....
.....
.....
.....

26. How long have you been doing this job?

Years ……. Months …….....

27. What recyclable waste do you collect? (Mark all applicable)

Paper	1
Cardboard	2
Plastic	3
Cans	4
Glass	5
Tetrapak	6
Metals	7
Batteries	8
Globes	9
Other	10
If other, specify	

28. To whom do you sell the waste? Mark all applicable.

Private individuals	1
People from buy-back centres/depots	2
Other sellers	3
If other buyers, please specify	

29. Indicate whether buyers collect the waste products from you or whether you have to take (deliver) it to them?

They collect	1
I have to deliver to them	2

30. What does it cost you to get the waste from the landfill site to the buyer?

Rand

31. Are there goods that you collect for personal use?

No	1
Yes	2
If yes, please specify	

32. Do you collect food from the landfill site for own or family consumption?

Yes	1
No	2

33. If your answer is Yes to Question 29, what food do you collect for consumption?
.....
.....
.....

SECTION E
This set of questions relates to the income patterns of the respondents.

34. How much income did you earn last week for the waste you collected?

Rand.....

35. How much income do you earn from the waste collected during a **good week** and during a **bad** week?

1	Good week	R
2	Bad week	R

(Round off to the nearest Rand)

36. Is your income as a waste picker as good as expected?

Better	1
Worse than expected	2
As good as expected	3

37. What are the other sources of income available to you?

	Sources of income	**You (Rand)**	**Other household members (Rand)**
1	Another job?		
2	Child support grant?		
3	Disability grant?		
4	Old-age grant?		
5	Pension from a previous job?		
6	Other		
If other, please specify			

38. How many people (excluding yourself) depend on your income?

Number of people ☐☐

39. How many children do **you** have?
Number of children ☐☐

Number of children under 18 ☐☐

40. Do you send money away to relatives who do not live with you?

Yes	1
No	2

41. If your answer is yes to question 40, how often do you send them money?

.....

SECTION F
This set of questions relates to the respondent's access to basic needs.

42. In what type of structure do you usually sleep?

Construction site	1
Backyard room with sleep-in domestic worker	2
Backyard room	3
Veld/bushes	4
On the street	5
Backyard shack	6
Shack	7
Hostel/shelter	8
House (bricks/reeds, etc.)	9
Buy-back centre/depot	10
Other	11
If other, please specify	

43. How many times in the last month was there no food to eat of any kind in your house because of lack of resources to get food?

44. How many times in the last month did **you** go to sleep at night hungry because there was not enough food?

45. How many times in the last month did **anyone in your house** go to sleep at night hungry because there was not enough food?

46. How many times in the last month did **you** go for a whole day and night without eating anything at all because there was not enough food?

47. How many times in the last month did **anyone in your house** go for a whole day and night without eating anything at all because there was not enough food?

48. Where do you get your food? (Mark all applicable)

Prepare food at home	1
Buy ready-made food	2
On the landfill site	3
From other waste pickers	4
Somebody else, e.g. church/ individuals/restaurants, etc.	5

49. If you receive food from somebody else, e.g. church/individuals/restaurants, specify from whom…….....

50. Do you have access to the following while collecting waste? Please specify.

	Basic needs	**No**	**Yes, specify**
1	Drinking water		
2	Food		
3	Toilet		
4	Place to wash yourself		

SECTION G
This set of questions relates to the respondent's relationship with the municipality, buyers of waste and co-waste pickers.

51. How would you describe the relationship between you and the municipal workers on the landfill site?

.....
.....
.....

52. Do the waste pickers on the landfill site support each other?

Yes	1
No	2

53. If yes, in what way do you help each other? Mark all applicable.

Transport/getting lifts	1
Loans	2
Food	3
Shelter to sleep/housing	4
Care when sick	5
Personal care products	6
Help to collect/share what they have collected	7
Selling for each other	8
Clothing	9
Other	10
If other, please specify	

SECTION H
This question relates to work-related injuries and health risks.

54. What are the health and injury risks when collecting recyclable goods?
……..
……..

55. On a scale of 1–10 (10 being very happy and 1 being very unhappy), how happy are you with life at the moment?

1	2	3	4	5	6	7	8	9	10



56. Would you like to tell us anything else that concerns you or that you think we should know?

Specify…….....
.....

Interviewer: Thank the respondent for his or her participation.

For more information, contact:

Dr Viljoen: 084 556 2253 or
Prof Schenck: 082 864 0600

ANNEXURE D: Anthropometry record sheet

UNIVERSITY OF THE WESTERN CAPE

FOOD SECURITY, NUTRITIONAL AND SOCIO-ECONOMIC STATUS OF LANDFILL WASTE PICKERS (2015)

Name of fieldworker: **…… Fieldworker code**: | | | Checked by | | |

PARTICIPANT CODE NO						**INTERVIEW DATE (dd/mm/yy)**	D	D	M	M	Y	Y

ALL INFORMATION WILL BE TREATED CONFIDENTIALY

Gender	(circle relevant)	M	F

Weight 1	Taken to the nearest 0.1 kg				.		kg
Weight 2					.		kg
Height 1	Taken to the nearest 0.1 cm				.		cm
Height 2					.		cm

THANK YOU FOR YOUR PARTICIPATION.

ANNEXURE E: Dietary intake record sheet

UNIVERSITY OF THE WESTERN CAPE

FOOD SECURITY, NUTRITIONAL AND SOCIO-ECONOMIC STATUS OF LANDFILL WASTE PICKERS (2015)

Name of fieldworker: **…… Fieldworker code**: | | | Checked by | | |

PARTICIPANT CODE NO						**INTERVIEW DATE (dd/mm/yy)**	D	D	M	M	Y	Y

ALL INFORMATION WILL BE TREATED CONFIDENTIALLY

TIME	FOOD ITEM & PREPARATION	QUANTITY	CODE			

THANK YOU FOR YOUR PARTICIPATION.
PLEASE PROCEED TO HAVE YOUR WEIGHT AND HEIGHT MEASURED.