IMPACT OF ETHNIC FOOD MARKETS AND RESTAURANTS ON HOUSEHOLD FOOD SECURITY OF SUB-SAHARAN IMMIGRANTS IN GAUTENG PROVINCE, SOUTH AFRICA.

by

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DECLARATION

I declare that "**IMPACT OF ETHNIC FOOD MARKETS AND RESTAURANTS ON HOUSEHOLD FOOD SECURITY OF SUB-SAHARAN IMMIGRANTS IN GAUTENG PROVINCE, SOUTH AFRICA**" is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software. The summary result is attached.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or any other higher education institution.

Signature:… 

TP Mbombo-Dweba

Date: November 2017

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ABSTRACT

Background and motivation

Ethnic food markets and restaurants are the main source of immigrants' traditional foods in South Africa. Despite this, the actual availability and accessibility of ethnic foods from the ethnic food markets and restaurants has not been investigated. Furthermore, factors that influence the role of ethnic foods in the diets of immigrants, like perceptions of Sub-Saharan Immigrants towards South Africa food culture, and the safety of ethnic foods have not been established. Although a number of studies have been conducted on the identification of microbial hazards of cooked food in the informal sector, none have been conducted on ethnic foods of Sub-Saharan Immigrants.

Aim and objectives

The aim of this study was to assess the availability and accessibility of Sub-Saharan African immigrants' traditional food from ethnic food markets, shops and restaurants, establish immigrants' perceptions towards South African's food culture, and determine predictors of contamination of selected cooked food sold in the ethnic food markets, and restaurants. From this aim, eight objectives were formulated as follows:

(i) describe the immigrants' perceptions towards South Africa's food culture,
(ii) investigate the contribution of the ethnic food markets on the dietary patterns of immigrants,
(iii) investigate the availability, and accessibility of the ethnic foods available in the ethnic food markets, and restaurants,
(iv) document coping strategies adopted by immigrants when faced with shortage of their traditional foods or ingredients in South Africa
(v) identify factors associated with a move away from their ethnic foods and adoption of South African foods,
(vi) investigate the microbiological quality of selected cooked foods found in the ethnic food markets and restaurants, and
(vii) investigate predictors of contamination of ethnic foods bought from the restaurants and markets.

Methodology

A cross-sectional research design using a mixed methods approach was adopted to achieve the objectives of this study. The mixed method employed three instruments, namely: questionnaire, checklist, and laboratory microbial analysis. The study was conducted in Tshwane and Johannesburg metropolitan municipalities.

The study focused on two study populations: (i) immigrant households from West, East and Central Africa regions, and ii) entrepreneurs selling Sub-Saharan ethnic ready-to-eat (RTE) foods. The snowball sampling method was adopted to sample both study populations. A total of one hundred and ninety four (n=194) women and forty (n=40) entrepreneurs who met the inclusion criteria and agreed to participate were included in the study. A checklist was employed to assess restaurants and vending sites. Two samples of RTE ethnic foods were collected from each entrepreneur and submitted to the microbiology laboratory at the Council for Scientific and Industrial Research (CSIR). Data obtained from the questionnaire, checklist and microbial analysis were analysed, and descriptive statistics were presented as tables and figures. Multivariable and binary logistic regression models were fitted to the data to assess predictors of adoption and contamination respectively.

Results

Ethnic foods still featured prominently in the diets of immigrants, with only 7.7 % (n=15) indicating that they strictly followed a South African diet. Ethnic food markets are the main sources of ethnic foods for immigrants living in Gauteng.

Efforts to maintain ethnic diets by Sub-Saharan immigrants resident in South Africa are hindered by factors such as unaffordability (39.2%;n=76) and unavailability (25.3%; n=49) of their ethnic foods. Meanwhile, relying on less preferred food (38.7%; n=75) and replacing unavailable ingredients with similar ingredients (37.6%; n=73%) were identified as two main coping strategies that are adopted by immigrants when facing unavailability of their traditional food ingredients.

Four patterns of dietary acculturation were identified, namely, strict continuity with traditional foods (21.6%; n=42), very limited adoption (21.1 %; n=39), limited adoption (50.5%; n=98) and complete adoption (7.7%; n=15) of South African foods. The following were the most common food items that the respondents tended to adopt: pap (84.5%; n=164); fried potato chips (43.8%; n=85); cold drinks (42.8%; n=83); fast foods (37.6%; n=73); *sphathlo* (30.9%; n=60); and vetkoek (30.4%; n=59).

Four factors that were associated with adoption of South African foods included:

- spending R2500-R3499 (OR 3.34; p=0.017) and 3500-4500 (OR 3.99; p=0.030) on food,
- residing in the country between 3-6 years (OR 5.16; p=0.001),
- earning between 5000-10 000 (OR 0.52; p=0.040) and >R11 000 (OR 0.380; p=0.057), and
- being in part-time/temporary employment (OR 5.85; p=0.025).

The majority of the ethnic food entrepreneurs were West Africans (70%; n=28), belonging mainly to the 30-49 years old age group (88%; n=35). Over 35%% (n=14) of the entrepreneurs indicated that they had completed high school education, while 42.5% (n=17) had tertiary education. The majority (80%, n= 34) of vendors of ethnic foods did not have a certificate in food handling or hygiene practices. The majority (95%, n=38) of entrepreneurs operated in permanent structures with ceilings and walls. A majority (95%; n=38) also had access to tap water and flushing toilets. However, ownership of appliances such as thermometers (0%, n=0), microwaves (55%, n=22), and freezers (37.5%, n=15) was very low. There was also low adherence with regards to the following aspects: wearing of protective clothing such as caps (40%; n=24), apron (62.5%, n=25) and gloves (0%, n=0); not wearing jewellery (50%; n=20); keeping fingernails short and clean; and proper reheating of food.

Samples contaminated with total viable counts above the threshold of satisfactory counts ($<10^5$ CFU/g) was very high (71.3% , n=57). Over twenty percent (22.5%; n=18) of the food samples had unsatisfactory levels of coliforms ($>10^3$ CFU/g), and 17.5% (n=14) had unsatisfactory levels (>3 CFU/g) of *E. coli*. *Salmonella* was observed in only 3.8 % (n=3)

food samples. Being new in business (OR=0.010, p=.033), owning a freezer (OR .477; p= .052), not owning a microwave (OR .013, p=.074), and reheating per serving (OR .187, p=.048) were identified as significant drivers of contamination.

Conclusion

In the two metropolitans that were investigated only 40 vendors of ethnic foods could be identified. This number is too low to be able to supply the whole immigrant community with ethnic foods. Thus their role as a contributor to household food security is limited. As a result, although the majority of immigrants attempt to preserve their traditional diets, high ethnic food prices and unavailability of traditional ingredients forces them into bicultural eating patterns. Although bicultural eating patterns are supposed to protect against food insecurity, the adoption of unhealthy dietary habits and could render them vulnerable to food insecurity. Lack of knowledge of South Africa foods results in poor food choices. In the long run these unhealthy eating patterns could have negative implications on the nutritional health of immigrants and the health system of South Africa. Therefore, studies to identify foods with similar taste and nutritious ingredients could aid prevention of obesity and lifestyle diseases and inform culture-specific nutrition education programmes.

The high number of entrepreneurs without training on food hygiene and handling practices limits the role of the ethnic restaurants in the food security of immigrants living in Gauteng, and food quality is thus compromised. Therefore, there is a need for targeted training programmes which cater for the unique needs of the ethnic entrepreneurs to enable them to play a meaningful role in ensuring that immigrants who want to maintain their food culture are food secure. These programmes should also address the poor handling and hygiene practices that were observed in this study. This could be done by emphasising the World Health Organization's (WHO) five keys to safer food.

Results of the food contamination indicate that entrepreneurs are able to produce safe food, (as supported by only moderate contamination levels of coliforms and *E. coli*, which also suggests low risk of environmental and enteric contaminants). However, if these concerns are not addressed immediately by proper training and monitoring, they could

further compromise the role played by ethnic food markets in food security. Training and monitoring programmes should place more emphasis on the four factors that were identified as drivers of contamination.

Key words: ethnic foods, dietary habits, ethnic food availability, coping strategies, predictors of food adoption, food safety, predictors of contamination, food-borne diseases.

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LIST OF ACRONYMS

AIC:	Akaike Information Criterion
BIC:	Bayesian Information Criterion
CFU/g:	Colony forming Units per gram
CI:	Confidence interval
CSIR:	The Council for Scientific and Industrial Research
DAFF:	Department of Agriculture, Forestry and Fisheries
DoH:	Department of Health
DTI:	Department of Trade and Industry
E. Coli:	*Escherichia Coli*
FAO:	Food and Agriculture Organization of the United Nations:
HACCP:	Hazard analysis and critical control points
HIE:	Healthy Immigrant effect
NCDs:	Non-communicable Diseases
OR:	Odds ratio
RTE:	Ready to- eat foods
SADAC:	Southern African Development Community
UK	United Kingdom
USA:	United States of America
WHO:	World Health Organisation

PUBLICATIONS

a) Full articles published from thesis

Mbombo-Dweba, T.P., Agyepong A. O., Oguttu, J. W., Mbajiorgu, C. A. 2017. Assessment of dietary challenges faced by Sub-Saharan immigrants residing in the Gauteng Province: A pilot study. Journal of Consumer Sciences 2: 46-58. https://www.ajol.info/index.php/jfecs/article/view/158695/148316

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c) Abstracts from thesis presented at conferences

Mbombo-Dweba, T.P., Mbajiorgu, C. A, Oguttu, J. W., Agyepong A. O. 2016. Assessment of dietary challenges faced by Sub-Saharan immigrants residing in Gauteng Province: a pilot study. South African. 12th International SAAFECS Conference. St George Hotel and Conference Centre, Centurion, South Africa. February 22- 26, 2016.

Mbombo-Dweba, T.P., Mbajiorgu, C. A, Oguttu, J. W., Agyepong A. O. 2016. Food consumption patterns of West African Immigrants residing in Gauteng: preliminary results. Nutrition Congress, Lord Charles Hotel, Somerset West. September 3- 5, 2013.

Mbombo-Dweba, T.P., Mbajiorgu, C. A, Oguttu, J. W., Agyepong A. O. 2017. Food consumption patterns of Sub-Saharan African immigrants residing in Gauteng Province, South Africa. Food Studies Conference. Roma Tre University, Rome, Italy. October 25-26 2017.

Agyepong A. O., Mbajiorgu, C. A, Oguttu, J. W., **Mbombo-Dweba, T.P.** Coping Strategies Used by Sub-Saharan Immigrants to Cope with Unavailability and Accessibility of Ethnic Foods. Food Studies Conference. Roma Tre University, Rome, Italy. October 25-26 2017.

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CHAPTER 1

INTRODUCTION

1.1 Background

Recent immigration trends indicate that 70% of all African international migration is inter-regional and takes place within the continent (Ratha & Shaw, 2007; Adepoju, 2008; Njomo, 2012). The number of immigrants from Sub-Saharan Africa to South Africa has been on the increase due to unstable economic conditions, soaring ethnic conflicts, volatile political situations and drought situations in most African countries (Adepoju, 2008; Njomo, 2013; Statistics South Africa, 2013). These immigrants come to South Africa in search of better living conditions (Njomo, 2013). It is estimated that immigrants living in South Africa are between 1.6 and 2.1 million (Wilkinson, 2015; Chiumia, 2016). Immigrants are predominantly from Zimbabwe (42.6 %), the Democratic Republic of Congo (12.9 %), Nigeria (10.3%), and Lesotho (4.7%). The remaining 29.5% are from Rwanda, Burundi, Cameroon, Kenya, Tanzania, Uganda, Eritrea, Ethiopia, Somalia, Cote D'Ivoire, Gabon, Ghana, Niger, Sierra Leone, Togo, Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia and Zambia (South African Press Association, 2014). However, how the dietary patterns of these Sub-Saharan immigrants settling in South Africa is impacted has not received attention. This is shown by the lack of literature on the subject.

Although studies on dietary patterns of immigrants living in South Africa indicate that most immigrants prefer to maintain their original food culture when they settle in their host countries Njomo (2013); Garnweidner *et al.* (2012) and Vue *et al.* (2011) argue that they struggle to do so due to unavailability and inaccessibility of their traditional food ingredients.

Studies done, particularly in Europe and North America, show that subsequently immigrants undergo a high dietary acculturation which forces them to either adopt some of the host country's food culture while adhering to their own original food culture or adapting to new diets, while maintaining their original food culture only for special occasions (Kiptinness & Dharod 2011; Okafor *et al.,* 2014). This often results in unhealthy

eating habits (Kiptinness & Dharod 2011; Okafor *et al*., 2014; Terragni *et al*., 2014) which leads to the loss of what is known as "Healthy Immigrant Effect" (HIE) (Sanou *et al*., 2014), a phenomenon in which immigrants appear healthier than native- born people. The loss of HIE due to dietary changes is habitually associated with high intake of fat, salt and refined cereals (Dharod *et al*., 2011). This places immigrants at an increased risk of developing chronic diseases of lifestyle (Deng *et al*., 2013; Sanou *et al.*, 2014). The above observation clearly indicates that there is a need to have access to one's original food culture when people migrate to other places or countries.

Several studies conducted in Canada, Norway, and South Africa (Adekunle *et al*., 2010; Garnweidner *et al.*, 2012; Njomo, 2013; Sanou *et al.*, 2014), have observed that the importance of preserving one's food culture and the resistance of immigrants to adopting eating habits of host countries are responsible for increased demand for immigrants' traditional foods in their respective host countries. Three studies cited in an article by Roberts *et al*. (2011) on the popularity of ethnic foods in America indicate that as immigrant ethnic population increases so does the demand for their ethnic food products.

In addition, the unavailability of immigrants' food from the mainstream supermarkets has been reported in North America (Deng *et al.*, 2013; Dharod *et al*.,2013; Vahabi & Damba, 2013). Globally, unavailability of ethnic food ingredients has led to the emergence of ethnic shops and restaurants in main city centres, and South Africa is no exception (Njomo, 2012, 2013).

Despite the demand for ethnic foods that is on the increase, unavailability of immigrants' ethnic food from the mainstream supermarkets has been reported in South Africa's major supermarkets (Njomo, 2013). Moreover, the demand for Sub-Saharan Immigrants' traditional food is believed to be on the increase due to adoption of these foods by local people (Roberts *et al.*, 2011), who associate the traditional food of immigrants with high nutritive value and trendiness (Adekunle *et al.*, 2010). For example, Roberts *et al*. (2011) reported that, in America, the majority of local people have adopted immigrant ethnic foods so much that some of these cuisines are now considered part of the American food culture.

Globally, there are very few studies that have documented immigrant ethnicity and its relationship to consumption patterns (Adekunle *et al.*, 2010; Vue, Wolff & Goto, 2011; Garnweidner *et al.*, 2012; Njomo, 2013; Sanou *et al.*, 2014). In South Africa, only one study on Sub-Saharan immigrants' food consumption behaviour could be sourced (Njomo, 2011). Moreover, the study, which was conducted in Cape Town, did not consider the actual availability and accessibility of the ethnic foods from ethnic food markets, nor did it describe immigrants' perceptions towards South Africa's food culture, but considered the food consumption behaviour of Sub-Saharan immigrants and their experience and perceptions of South Africa's major supermarkets. Perceptions of Sub-Saharan immigrants towards South African food culture are crucial, especially in a country where availability and accessibility of ethnic foods could be a problem due to the reported unavailability from the mainstream supermarkets. Immigrants' perceptions towards their host country's food culture has been observed to play a major role in determining the adoption of the food culture of the host country (Garnweidner *et al.*, 2012). Immigrants tend to compare their original food culture to that of the host country and make a clear differentiation between them. Consequently, terms such as "our food" when referring to their original food, and "their food" when referring to the host country's food are often used. Based on their cultural and religious beliefs they then decide if the food is culturally appropriate or inappropriate (Jacobus & Jalali, 2011; Garnweidner *et al.*, 2012).

The increasing number of ethnic restaurants, shops and supermarkets makes the importance of food safety within this industry critical. From the scoping study on ethnic shops and restaurants in South Africa it emerged that these ethnic markets are generally informal, small, and independent. A number of studies (Rudder, 2006; Roberts *et al.*, 2011; Harris *et al*., 2015), focusing on microbial hazards associated with ethnic food sold in ethnic markets and restraunts globally, have raised several food safety concerns. These include the following: (a) an increase of 7% in the outbreaks of foodborne illness in the ethnic food markets between 1990 and 2000 (Quinland, 2013); (b) poor hygienic practices amongst ethnic food restaurants (Rudder, 2006; Robberts *et al*., 2011; Grace *et al*., 2015; Harris *et al*., 2015); (c) poor quality of food from a food safety perspective (Rudder, 2006;Njomo, 2012; 2013) and serious food safety violations within the

independent ethnic restaurants when compared to chain ethnic and non-ethnic restaurants (Roberts *et al.*, 2011; Harris *et al.*, 2015).

However, to date there have not been any studies conducted in South Africa to assess microbial quality and predictors of contamination of Sub-Saharan Immigrants' ethnic food (subsequently referred to as ethnic food) sold at immigrant ethnic food markets and restaurants (subsequently referred to as ethnic food markets and restaurants).

This study therefore sought to assess the availability and accessibility of ethnic foods from the ethnic food markets and restaurants for the Sub-Saharan immigrant ethnic community (subsequently referred to as immigrants) that is resident in South Africa. The study also sought to assess the microbial quality and predictors of contamination of selected RTE foods sold in ethnic food markets and restaurants in the Gauteng Province.

1.2 Rationale

As indicated in section 1.1, the number of Sub-Saharan immigrants living in South Africa is on the increase. There is a need for research to establish the dietary patterns of these immigrants and the challenges they face in terms of accessing their ethnic foods. An understanding of immigrants' dietary patterns and challenges could assist the health professionals and policy makers to design tailor-made nutrition programmes and provide maximum nutritional health equity. This will not only improve the health status of the immigrants, but also has the potential to prevent the burden that could ensue for the South African health care system as a result of poor or inadequate immigrants' nutrition. Lastly, understanding of the immigrants' dietary patterns could also create opportunities for agribusiness to develop products to meet the dietary requirements of the immigrant population.

1.3 Research problem

Initially, food security was defined as the access of food by all people, at all times for a healthy life (Department of Social Development & Department of Agriculture, Forestry and Fisheries, 2013). However, this definition was later expanded in the 1996 World Food Summit as "*a condition that exists when all people, at all times, have physical and*

economic access to sufficient, safe, nutritious food to meet dietary need and food preferences for an active and healthy life" (FAO, 2006, Department of Social Development & Department of Agriculture, Forestry and Fisheries, 2013). Therefore, for purposes of this study the latter definition was adopted because of its emphasis on food preferences. This implies that the availability, accessibility and safety of culturally appropriate food is an essential component of food security (Jacobus & Jalali, 2011; Vahabi & Damba, 2013).

Ethnic food markets and restaurants are the only source for immigrants' traditional foods in the majority of countries where studies on immigrant eating habits have been conducted. However, these have not been given much attention in South Africa. Furthermore, despite the reported preference by immigrants for maintaining their original food, and the unavailability of Sub-Saharan Immigrants' foods from the mainstream markets, the actual availability and accessibility of ethnic foods from the ethnic food markets and restaurants have not been investigated. Furthermore, the perceptions of Sub-Saharan Immigrants towards South Africa food culture are unknown. Though a number of studies have been conducted on the identification of microbial hazards of cooked ready-to-eat (RTE) food in the informal sector in South Africa, none have been conducted on ethnic foods of Sub-Saharan immigrants. As discussed above, improved understanding of eating habits of immigrants, and the role of ethnic markets and restaurant in the eating culture of immigrants, is crucial for improving the health status of the immigrants, to prevent the burden that could ensue for the South African health care system associated with poor or inadequate immigrants' nutrition. Understanding the food demand of immigrants could also create new opportunities for farmers and entrepreneurs within the South African agricultural value chain, thus improving incomes and reducing farm household poverty.

1.4 Research questions

a) What is the demographic profile of Sub-Saharan immigrant households and how could this affect accessibility to their traditional food?

b) Are ethnic foods readily available and easily accessible to Sub–Saharan immigrants living in South Africa?
c) What factors predict whether the immigrants will resist aculturation?
d) What is the demographic profile of entrepreneurs who sell Sub-Saharan immigrants food and how could this affect the risk of foodborne illnesses to consumers?
e) What is the microbial profile of selected cooked foods sold at the ethnic food markets and restaurants and what factors are significant for contamination of food sold at the ethnic restaurants, shops and markets selling Sub-Saharan Immigrant food?

1.5 Hypotheses

The following hypotheses were tested to realise some of the objectives of the study:

H1.

There are no factors that are significantly associated with adoption of South African food by immigrants.

H2.

There are no factors that are significant for contamination of food sold at the ethnic restaurants, shops and markets selling Sub-Saharan Immigrant food.

1.6 Aim of the study

The aim of this study was to assess the availability and accessibility of Sub-Saharan African immigrants' traditional food from ethnic food markets, shops and restaurants, establish immigrants' perceptions towards South African's food culture, and determine predictors of contamination of selected cooked food sold in the ethnic food markets, and restaurants.

1.7 Research objectives

The research objectives of this study included the following:

a) Investigate immigrants' perceptions towards South Africa's food culture by estimating proportions of immigrants who have adopted South African food, and record reasons for adoption, and types of food adopted.
b) Determine the contribution of the ethnic food markets to the dietary patterns of immigrants by assessing sources of ethnic foods, the number of times and reasons why ethnic foods are consumed, and other benefits of visiting ethnic food markets.
c) Investigate the availability, and accessibility of the ethnic foods by determining the proportions of the immigrants who indicated that ethnic foods were available, affordable, and accessible.
d) Document coping strategies adopted by immigrants when faced with shortage of their traditional foods or ingredients in South Africa.
e) Identify socio-economic factors (region of origin, age, marital status, qualifications, employment, household income, duration of stay) that are associated with adoption of South African foods.
f) Assess the demographic characteristics and hygiene practices of the ethnic food vendors.
g) Investigate the microbiological quality of selected cooked foods found in the ethnic food markets and restaurants by isolating and enumerating total viable counts, coliforms, *Escherichia coli*, and salmonella.
h) Identify predictors of contamination of ethnic foods bought from the restaurants and markets.

1.8 Main concepts of the study

The main concepts of this study are ethnic food markets, immigrants, ethnic restaurants, and microbial quality. The way in which these terms are conceptualised in this study is as follows:

a) Ethnic food markets- refers to open-air markets selling traditional food products that reflect immigrants' food habits and cooking methods. Foods sold at these markets and shops are culturally biased and segregated (Njomo, 2013).The foods maybe sold raw or cooked and are mainly informal.

b) Immigrants- refers to people that have moved from their areas of origin to settle in other areas. This can either be internal when the movement is within the same country, or internationally when they move from one country to the other. In this study, the term is used to refer to immigrants that have originated from West, East and Central Africa.

c) Ethnic food restaurants –is used to define restaurants that sell and serve cooked ethnic food. Foods sold at these restaurants are culturally based and segregated (Njomo, 2013).

d) Microbial analysis- refers to the series of microbial tests that were performed to determine the presence of pathogens and organisms termed as indicators of temperature violation in food handling.

e) Food security- refers to the state of having reliable access to sufficient, affordable, safe, nutritious food at all times to meet dietary needs and food preferences (FAO, 2006).

f) Predictors of contamination- refer to handling, preparation, and storage techniques that are associated with contamination of foods above the acceptable standard.

g) Food hygiene- includes a number of routines that should be followed to avoid potentially severe health hazards. Proper or improper application of these techniques were therefore assessed and analysed in order to predict contamination of food.

1.9 Anticipated benefits from the study

The anticipated benefits of the study were:-

(a) The present study will contribute towards the body of knowledge on the availability of different ethnic food consumed by Sub-Saharan immigrants residing in South Africa.

(b) The actual availability and accessibility of Sub-Saharan Immigrants' food is described for the first time in South Africa.

(c) Perceptions of Sub-Saharan Immigrants towards South Africa's food culture are documented for the first time in South Africa.

(d) This study documents for the first time the probability of occurrence of potential foodborne pathogens in food sold at the ethnic food markets shops and restaurants.

(e) The information gathered could assist the relevant authorities to design tailor made food safety programmes for entrepreneurs of Sub-Saharan Immigrant foods.

(f) This study will also broaden knowledge on the food accessibility challenges faced by the Sub-Saharan immigrant community, and suggests how they could be circumvented.

(g) The information gathered could assist nutritionist and interested groups to design tailor- made nutrition programmes that will cater for the needs of the Sub-Saharan immigrant community with a view to limiting the impact of lifestyle diseases associated with poor eating habits.

(h) This study could benefit agribusiness enterprises by creating new investment opportunities for farmers when addressing the new food demands.

1.10 Limitations of the study

The limitations of the study were:-

a) Due to time and financial constraints, the study was limited to one province, Gauteng. It is therefore not possible to generalise and apply the results to the other eight provinces of South Africa, especially with regard to the issues of ethnic food availability and utilisation. However, due to the fact that Gauteng hosts the largest number of immigrants in South Africa and the fact that the biggest Metropolis were selected as the study area, the author is of the view that the results of this study provide sufficient insights in the subject.

b) Due to time constraints, the study was cross-sectional in nature. The researcher is aware that the study might have yielded interesting results on the changes in diets that occur over time if the study had been longitudinal. The inclusion of immigrants that have stayed for longer than three years mitigated this limitation.

c) Due to lack of a sampling frame and the subsequent sampling method that was used, the study was restricted to urban areas.
d) Though there are number of microorganisms responsible for foodborne illnesses, only four were used to assess the quality of the food in the present study, due to limited resources. However, the use of indicator organisms (total viable counts and coliforms) can be used to indicate the level of hygiene and presence of pathogens.
e) There were only three African regions that could be investigated in this study. This was done because, based on the statistics, apart from Southern Africa which was excluded after the pilot study, these are the most dominant immigrant groups in South Africa. (Statistics South Africa, 2014b).

1.11 Thesis outline

The outline of the chapters is as follows:

This chapter (chapter one) provides background and rationale to the study, the research problem, assumptions / hypothesis, research questions as well as the aim and objectives of the study. Key concepts around which the of the study is built, such as ethnic food markets, immigrants, ethnic food restaurants, microbial analysis and predictors of contamination were also defined. The chapter concludes by highlighting the limitations of the study.

Chapter 2: Literature review

This chapter starts by defining ethnic foods and ethnic food restaurants, and also gives an overview of the African immigrants in South Africa in terms of numbers and countries of origin. The food- related challenges encountered by immigrants upon resettlement in host countries and their impact on dietary choices are reviewed. The chapter also highlights food safety concerns raised by other researchers on ethnic food markets and restaurants. At national level food safety regulations that are relevant to ethnic markets are summarised and the three micro-organisms that were isolated in the study are discussed. Gaps in the literature are also identified, especially in the South African context.

Chapter 3: Materials and Methods

Chapter three provides a brief explanation of the study area. The methodological framework that was followed in the study is illustrated. The research design, research instruments and data collection instruments are discussed. The chapter concludes by discussing the ethical considerations and constraints, and outlines ways in which constraints were dealt with in order to augment the quality of the research process and results. The processing of data is also presented.

Chapter 4:Results and discussion

This chapter is devided into 3 sections:-

Section A: Continuation with ethnic dietary patterns: lessons from sub-Saharan immigrants residing in Gauteng

In this chapter the results and the discussion of the main findings are presented. The chapter is divided into six sections: socio-demographic characteristics and economic details; immigrants' perception towards South Africa's food culture; the contribution of the ethnic foods and ethnic markets to dietary patterns of Sub-Saharan immigrants; availability and accessibility of the ethnic foods; coping strategies; and factors associated with adoption of South African foods. Conclusions and recommendations about the continuation of ethnic dietary patterns are also provided.

Section B: Demographic characteristics and hygiene practices of ethnic food vendors

The chapter commences by presenting socio-demographic profiles of the food vendors that participated in the study. This is followed by a description of the hygiene facilities and equipment owned by different shops and food handling practices, including personal hygiene. Results are synthesised, and linkages between results and the literature are discussed. Recommendations from the results are then provided as the concluding remarks of this chapter.

Section C: Microbial quality of the selected ethnic foods and predictors of contamination

In chapter six results of microbial quality of the selected ethnic foods are presented. This chapter consists of four sections namely: - characteristics of the food samples collected; contamination with total viable counts; contamination with coliforms and *Escherichia coli*; contamination with salmonella; predictors of contamination and discussion of the results. This chapter concludes by giving recommendations.

Chapter 5: Summary, recommendations and conclusion

A summary of the main findings is provided in this chapter. Recommendations regarding intervention strategies and future research are also made. Lastly, the chapter draws conclusions from the main findings.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter the literature relevant to the study is reviewed and discussed. Prior to discussing the literature, the chapter begins by giving a detailed definition of the terms ethnic foods and ethnic restaurants.

2.2 Defining ethnic foods and ethnic restaurants

Various definitions of ethnic foods have been put forward due to its broad nature (Verbeke & Lopez, 2005; Leung, 2010; Kwon, 2015). According to Verbeke & López (2005) the term ethnic foods refers to an expression of culture, attitudes, values, religion and country of origin through food. In other words, these are food products that are specific and associated with a particular cultural group or region. Ethnic foods refers to foods from other countries that are different from the traditional food culture of the host country (Leung, 2010). The term also refers to food that has been adapted by mixing both local and imported ingredients and prepared at home, and / or includes commercially available foods that have been adapted to suit taste and preference of the host country (Leung, 2010).

According to Leung (2010), ethnic foods include:

- Ready meals
- Cooking and table sauces
- Cooking ingredients
- Beverages
- Accompaniments and snacks
- Seasonings Spices and herbs

Kwong (2015) defines ethnic foods as traditional food that is specific to a certain ethnic group but is also accepted and consumed by people outside that ethnic group. Therefore, ethnic foods can either be confined to a specific ethnic or cultural group or can be so familiar to the consumers that they are no longer considered as such but part of the mainstream food culture (Verbeke & López, 2005).

Many countries have seen an increase in the demand for ethnic foods due to growing immigrant populations (Verbeke & López, 2005; Leung, 2010). Globalisation and travelling also contribute to the increasing demand for ethnic foods as consumers become more adventurous (Leung, 2010), and ready to experiment with foods other than their regular diet (Agarwal & Dahm, 2015). This increased demand for ethnic foods has prompted growth in the number of ethnic restaurants and markets worldwide. The term ethnic restaurants therefore refers to all restaurants that are serving ethnic foods. The majority of these restaurants are independently owned and have limited resources when compared to franchised restaurants (Leung, 2010; Agarwal & Dahm, 2015). For the purposes of this study the term *ethnic foods* refers to all foods and ingredients other than South African cuisine that are characteristic of other African regions and / or cultures.

2.3 Overview of the immigrant population in South Africa

According to the 2011 census, 5.7% of the South African population is foreign born (Statistics South Africa, 2013). Furthermore, a total of 6801 permanent residence permits were approved in 2013, compared to 1283 that were approved in 2012. Although the number for temporary residence has been fluctuating, over 100 000 permits per year were approved in 2011, 2012 and 2013 (Statistics South Africa, 2014a). It is therefore clear that the number of immigrants in South Africa has been increasing over the years (Statistics South Africa, 2014b).

According to Statistics South Africa (2014a) two thirds of immigrants in South Africa are from Africa. This increasing number of immigrants in South Africa from other African states is attributed to unstable economic conditions, soaring ethnic conflicts, volatile political situations and drought situations in the countries where these immigrants come from (Adepoju, 2008; Njomo, 2013; Statistics South Africa, 2013), which means that

immigrants come to South Africa in search of better living conditions. It is estimated that the number of immigrants from other African countries living in South Africa is between five to ten million (Njomo, 2013). Njomo (2013) argues that these immigrants are predominantly from the SADAC region, Central, West, and East Africa. The majority of these immigrants come from Zimbabwe (42.6 %), followed by DRC (12.9 %), Nigeria (10.3%) and Lesotho (4.7%) (South African Press Association, 2014).

2.4 Socio-economic status of immigrants

Although there is a paucity of studies on the socio-economic status of Sub-Saharan immigrants living in South Africa, studies conducted in other parts of the world suggest that the general trend is for immigrants to be of a low socio-economic status. According to Hadley (2010) and Sanou *et al.* (2014), socio-economic status of immigrants is a major mediating factor in food insecurity, and is associated with lower incomes and low employment levels (Hadley *et al*., 2010; Vahabi & Damba, 2013; Anderson *et al*., 2014). The phenomenon of immigrants being of low socio-economic status is even higher amongst refugees as they are characterised by lack of formal education, language barriers, and lower employment levels (Hadley *et al*., 2010; Kiptinness & Dharod, 2011; Anderson *et al.*, 2014). Lack of education not only makes it difficult for immigrants to find employment, thus limiting their financial resources, but also renders them vulnerable to food insecurity (Kiptinness & Dharod, 2011; Vahabi & Damba, 2013; Anderson *et al.*, 2014). For example, in a study conducted by Kiptiness & Dharod (2010) in the United States (USA) amongst Bhutanese refugees, 64% of the participants had no formal education. As a result only 2% were able to get part-time or full-time employment. Similar results were found by Hadley (2010) who studied Somali refugees in the USA. According to Hadley, the majority of the households (88%) that participated in his study had lower monthly household incomes. Vahabi & Damba (2013) came to the same conclusion in their study of Latin American immigrants living in the USA, in which they found that the majority of the participants (57, 1%) had low income due to difficulties in finding decent jobs. In a study by Anderson *et al.* (2014) of Sudanese refugees living in the USA, about 71% of the refugees who had experienced food insecurity were of a low education and income status.

In the literature, low employment levels of immigrants has also been associated with the inability to speak the host country's official language (Shackelford, 2010; Anderson *et al.*, 2014). This was confirmed by Vahabi & Damba (2013) who reported that language difficulties were a major hindrance to employment amongst Latin American immigrants despite the fact that the majority were well educated and had extensive work experience. As a result, the majority of these immigrants were either unemployed or had low-paying or seasonal jobs. This phenomenon is consistent with the findings of a study by Anderson *et al.* (2014), which showed that language barriers have a bearing on low employment levels among immigrants. It is further reported that low employment levels are aggravated by employment restrictions imposed on foreign nationals (Shackelford, 2010). Results of similar studies conducted in the African continent seem to suggest the same socio-economic trends. For example, Liberian immigrants residing in Ghana were unemployed and fell into the category of low or middle income earners (Ross *et al*., 2016). This finding was consistent with a study conducted by Njomo (2012) in Cape Town, who observed that up to 48% of the population studied was either unemployed or holding low paying jobs.

2.5 Food security status of the immigrants

Several authors are of the opinion that food insecurity is highly prevalent amongst immigrants, especially Sub-Saharan immigrants (Dharod *et al.*, 2011; Jacobus & Jalali, 2011; Anderson *et al.*, 2014), and that it is worse among the newly settled immigrants and refugees (Hadley *et al*., 2010). A study by Hadley *et al.* (2010) conducted in Midwestern USA amongst refugees, showed that the majority (78%) of the respondents had experienced food insecurity. These refugees had come from countries like Sierra Leone, Liberia, Somali, Ghana, Somali, and Togo. Similar results were found by Dharod *et al.* (2011) in a pilot study conducted amongst Somali refugees living in USA, who reported that 72% of the study population were food insecure. Another study conducted amongst African Immigrants in Lewiston (USA) also revealed major challenges with regard to food access (Jacobus & Jalali, 2011). Vahabi & Damba (2013) are of the view that a low socio-economic status impacts on a household's ability to access adequate food by altering quality and quantity of food purchases.

Furthermore, several researchers (Dharod *et al.*, 2013; Anderson *et al.*, 2014; Sanou *et al.*, 2014) are of the view that immigrant households of low socio-economic status tend to adopt unhealthy dietary transitions. An illustrative example is the observation by Anderson *et al.* (2014) on Sudanese immigrants in the USA who replaced high-cost and micronutrient-dense food items with cheaper energy-dense, processed food and snacks. This form of dietary change is unhealthy because it lacks dietary diversity and results in excessive consumption of energy. and unhealthy fats. These inappropriate dietary changes are associated with weight gain, development of type 2 diabetes, cardiovascular diseases and other nutrition-related problems (Schönfeldt & Hall, 2012). In Africa, the tendency to adopt unhealthy eating patterns was also observed by Ross *et al.* (2016). The observed unhealthy eating habits included intake of high sugar and fried/ salty snacks, candy, sweet baked goods and sweetened fruit drinks.

Studies indicate that due to the high levels of food insecurity within immigrant communities, the majority of them end up depending on social support programmes (Dharod *et al.*, 2011, 2013; Jacobus & Jalali, 2011; Anderson *et al.*, 2014). These food assistance programmes vary from country to country. Some offer money to unemployed immigrants, while others offer food items (Vahabi *et al.,* 2011). However, it has been shown that social support programmes are not able to solve the problem of food insecurity among immigrants (Dharod *et al.*, 2011; Vahabi *et al.*, 2011; Anderson *et al.*, 2014). For example, 55% of Somali immigrant households in the USA that received social support once a month received benefits that lasted for less than a month, which rendered them vulnerable to food insecurity (Dharod *et al.*, 2011). This was confirmed by Vahambi & Damba (2013), who showed that the majority of respondents who received money from the state welfare programme in Toronto, Canada could not meet their household food costs. Furthermore, Anderson *et al.*(2014) reported that social support programmes were insufficient, by noting that recipients were unable to cover their food and housing costs. In fact, according to some authors, the prevalence of food insecurity tends to be higher among the beneficiaries of social support programmes (Dharod *et al.*, 2011; Vahabi *et al.*, 2011; Vahabi & Damba, 2013). Although food security was not mentioned specifically in a study by Ross *et al.* (2016), more Liberian refugees living in Bududuram refugee

camp than Ghanaians reported to have borrowed money in the past year and low employment levels suggest vulnerability to food insecurity.

Studies conducted in the USA and Canada indicate that, food assistance programmes lack cultural sensitivity (Jacobus & Jalali, 2011; Vahabi *et al.*, 2011; Vahabi & Damba, 2013). This lack of cultural sensitivity often leads to food banks and shelters supplying immigrants with limited and culturally inappropriate foods (Vahabi *et al.*, 2011). Research has shown that immigrants were not happy with food banks supplied to them that included unfamiliar foods (Vahabi *et al.*, 2011; Vahabi & Damba, 2013). These unfamiliar foods included canned and dried foods which immigrants were unable to prepare, as opposed to fresh foods that immigrants are accustomed to. Provision of culturally inappropriate food was also reported in shelters and soup kitchens provided to immigrants (Jacobus & Jalali, 2011; Vahabi *et al.*, 2011). As a result, the majority of these programmes failed to alleviate food insecurity amongst immigrants (Vahabi *et al.*, 2011).

It is therefore obvious that socio-economic status of immigrants, which steadily decreases upon settlement in host countries, does negatively influence their food security status. In South Africa, apart from the potentially negative impact of the low economic status of immigrants on their food security status, the author is of the view that the situation could also negatively impact on their health status. A large number of unhealthy immigrants could in turn place tremendous pressure on the South African public health system. Therefore, to help mitigate this potential burden on the public health system, evidence-based data is required. This notwithstanding, there is no evidence of studies that have assessed the socio-economic and food security status of the growing population of immigrants in South Africa**.**

2.6 Factors that affect dietary choices of immigrants upon resettlement in host countries

2.6.1 Difficulty in navigating the new food environment

Several challenges in navigating the new food environment have been widely documented in the literature as risk factors to food inaccessibility (Hadley *et al*., 2010; Kiptinness Catherine, 2010; Dharod *et al.*, 2011; Mannion *et al*., 2014; Terragni *et al.*,

2014). These include unfamiliar food purchasing environment, unfamiliar food items, and cooking practices. This group of factors that have been classified as non-income factors aggravate food inaccessibility among immigrants who by virtue of low household incomes are prone to negative dietary choices (Hadley *et al*., 2010; Dharod *et al.*, 2011; Mannion *et al*., 2014; Terragni *et al.*, 2014).

Unfamiliar shopping environment has been identified as one of the causes of shopping difficulties amongst immigrants upon resettlement. Large supermarkets are reportedly one of the most prominent overwhelming features that immigrants are confronted with upon migration (Hadley *et al*., 2010; Kiptinness Catherine, 2010; Terragni *et al.*, 2014; Wilson & Renzaho, 2014). This is attributed to the fact that most immigrants are accustomed to small shops and open markets back in their countries of origin. In such environments immigrants find it difficult to locate and identify items they need, thus curtailing their shopping capabilities (Hadley *et al*., 2010; Njomo, 2012; Terragni *et al.*, 2014).

Furthermore, most large supermarkets sell mainly frozen and processed foods, as opposed to fresh foods that most immigrants are familiar with (Hadley *et al*., 2010; Terragni *et al.*, 2014). This therefore becomes a challenge, as most immigrants do not know how to incorporate these foods into their meals. Additionally, supermarkets found in their new host countries are characterised by food that is packaged and wrapped, thus making it difficult to identify the food items (Terragni *et al.*, 2014; Wilson & Renzaho, 2014). This, coupled with language barriers, leads to most food items being excluded as it forces immigrants to stick to their traditional foods and thus restricts the variety of food being consumed (Hadley *et al*., 2010).

Several researchers (Hadley *et al*., 2010; Kiptinness & Dharod, 2011; Dharod *et al.*, 2013; Terragni *et al.*, 2014; Wilson & Renzaho, 2014) argue that even in countries where the large supermarkets do stock ethnic foods, the majority of immigrants still prefer to buy from the small ethnic retailers. This could be due to the overwhelming environment in the supermarkets or due to cultural familiarity and familiarity with the language and trust since small ethnic shops are usually owned by fellow countrymen (Dharod *et al.*, 2013). Additionally, the ethnic shops offer more than just ethnic foods, they act as social centres

where immigrants can meet friends and socialise. They are also cultural consultants, and information sharing centres (Jacobus & Jalali, 2011; Njomo, 2013). However, this is contrary to what was observed in South Africa, where Njomo (2013), Sub-Saharan African immigrants in his study indicated that they prefer to buy their ethnic foods from the mainstream supermarkets. In fact, these respondents indicated that they regularly patronise major supermarket chains such as Shoprite, Pick n Pay, Checkers, Spar, and Woolworths to source food. The above observation is attributed to the belief that supermarkets tend to sell products which are cheaper, of a wider variety, and of better quality. Given that this observation was made in a study that was limited in scope, the view that immigrants prefer mainstream supermarkets over ethnic food retailers deserves further investigation to ascertain if it is the general trend. The study by Njomo (2013) was conducted only in the Western Cape, which in comparison to other regions does not have a large population of immigrants (Landau & Gindrey, 2008; Njomo, 2013). Secondly, over half (58%) of the study sample were men despite the fact that previous research indicates that grocery shopping is predominantly a female domain (Garnweidner *et al.*, 2012; Terragni *et al.*, 2014).

New food items have also been identified as further barriers to accessing adequate food amongst immigrants in host countries. The problem here is lack of knowledge on how to prepare and include these new foods in their diets (Hadley *et al*., 2010; Mannion *et al.*, 2014; Sanou *et al.*, 2014; Terragni *et al.*, 2014). For example, in South Africa it is reported that Sub-Saharan immigrants often complain that food sold at the large supermarkets is unfamiliar and new, especially to those that have just relocated (Njomo, 2012). Over 40% of immigrants surveyed by Hadley (2010) indicated that they were not familiar with food in the shops, and the majority (60%) indicated they did not know how to prepare the food found in the shops. This is further complicated by the fact that immigrant women often associate the term “safe” food with known foods (Garnweidner *et al.*, 2012; Mannion *et al.*, 2014). According to Mannion *et al.* (2014) in a study that was conducted to assess the appropriateness of the Market Guide Resource that was developed by nutritionists to assist Sudanese refugee women with the selection of healthy foods revealed that it was ineffective. The portable, colour-coded guide which contained pictures of fresh and packaged foods failed due to the fact that apart from the resource using a foreign

language it also contained mainly food items that were unfamiliar to the group. Generally, new foods create distrust and uncertainty with regards to safety of foods. This uncertainty and mistrust limits the number of food items for immigrants, especially when familiar food is not available (Terragni *et al.*, 2014).

2.6.2 Immigrants' perceptions towards host country's food culture

Immigrants' perceptions towards host country's food culture has been observed to play a major role in determining the adoption of the food culture of the host country. Garnweidner *et al.* (2012) is of the view that immigrants tend to compare their original food culture to that of the host country and make a clear differentiation between the two. Consequently, terms such as "our food" when referring to their original food and "their food" when referring to host country's food are often used. Based on their cultural and religious beliefs immigrants then decide if the food of the host country is culturally appropriate or inappropriate.

From available literature (Garnweidner *et al.*, 2012; Vahabi & Damba, 2013; Mannion *et al.*, 2014), reasons for negative perceptions vary from person to person. Garnweidner *et al.* (2012), and Vahabi & Damba (2013) suggest that negative perceptions are caused by differences in the taste, while Mannion *et al*. (2014) presupposes that they are caused by distrust of the new food. However, irrespective of the reasons for the negative perceptions, negative perceptions lead to rejection of the host country's food culture (Vahabi & Damba 2013; Garnweidner *et al.* 2012). Therefore in host countries where there are issues with unavailability and inaccessibility of immigrants' ethnic food food insecurity is a possibility.

A typical example of immigrants rejecting the host country's food is illustrated by a study conducted amongst Hmong women residing in the USA that reported that most immigrant mothers viewed the host country's food as being unhealthy and less filling (Vue *et al*., 2011). A study conducted in Norway amongst African and Asian immigrants also showed that the immigrants had negative perceptions in that they perceived the host country's food as tasteless, not filling and lacking nutrients. As a result of these negative perceptions, the host country's food was sometimes not considered as food by

immigrants but as snack (Vue *et al.*, 2011; Garnweidner *et al.*, 2012). These negative perceptions were also observed by Vahabi & Damba (2013) in a study conducted in Canada amongst Spanish and Portuguese immigrants who indicated that the quality, taste and smell of the host country's food was different from what they were used to. Furthermore, the same immigrants believed that Canadian food posed health hazards, especially to children due to its poor nutritional value, high fat and salt content. This resulted in Canadian food being considered as culturally inappropriate for them. Similarly, Mannion *et al.* (2014) observed that Sudanese refugees residing in Canada excluded most food items from their diets because they associated the host country's food with obesity due to its perceived high fat content. Probably unbeknown to them, the fear of obesity has a scientific basis related to the fact that it is associated with the development of non-communicable diseases (NDCs) such as cancers, cardiovascular diseases, chronic respiratory diseases and diabetes. NCDs increase health care costs, deplete household resources, slow down poverty reduction initiatives (Schönfeldt & Hall, 2012; WHO, 2014), and result in premature deaths (WHO, 2014). In 1990 NCDs were responsible for 27% of the total death rate, and this rate is expected to escalate to 50% in developing countries by 2020 (Schönfeldt & Hall, 2012). It is further reported that NCDs were the leading cause of deaths globally, accounting for 68% of the world's 56 million deaths in 2012 (WHO, 2014).

Based on these findings it is clear that the perception of immigrants of the host nation's food is a major barrier to food acquisition amongst immigrants. In addition, it has the potential to impact on the food security of the immigrant community.

Cultural sensitivity is described as the ability to use one's knowledge, and sensisitivity to acknowledge and respect the differrences that exist when encoutering diverse groups and individuals (Garnweidner *et al.*, 2012). Apart from social assistance programmes not being culturally sensitive, negative perceptions to these programmes also affect nutrition education and health promotion programmes (Garnweidner *et al.*, 2012). For example, as was alluded to in the previous section, a nutrition resource which was meant to be a nutrition education resource tool for immigrants proved ineffective. One of the reasons for the failure of the said nutrition resource tool was the fact that Canadian foods that were

used as examples were considered unhealthy by immigrants. Vue *et al.* (2011) and Garnweidner *et al.* (2012) argue that nutrition messages become ineffective when they are not customised and are culturally insensitive.

Negative perceptions could therefore have serious implications for food security of immigrants especially where there is scarcity or difficulty in accessing their original food in the host countries. This emerged in a study that was conducted amongst Sudanese refugees residing in USA, where a large proportion of those that experienced higher levels of household food insecurity preferred traditional food (Anderson *et al.*, 2014). This means that health practitioners in the host countries need to be cognisant of immigrants' food culture and incorporate this knowledge into nutrition programmes. This will enable health care professionals to design tailor-made communication messages that take into account background, religious beliefs and context (Garnweidner *et al.*, 2012). In countries like South Africa where immigrants' dietary patterns have not been established (Njomo, 2012), studies on immigrants' food culture as well as immigrants' perceptions towards host countries' food culture are necessary. The use of ethnic food markets and restaurants as case studies to learn and understand immigrants' food culture is a good starting point.

2.6.3 Language barriers

Inability to speak the host country's official language has been associated with food insecurity amongst immigrants in studies done in the USA and in Canada (Hadley *et al.,* 2010; Vahabi *et al.*, 2011; Vahabi & Damba, 2013; Anderson *et al.*, 2014). Studies also reveal that language difficulties directly affect immigrants' ability to access food by restricting shopping choices (Vahabi & Damba, 2013), their ability to read labels (Hadley *et al.,* 2010), and benefit from promotional information such as discounts and coupons (Vahabi *et al.*, 2011; Vahabi & Damba, 2013).

Lack of proficiency in English restricts the number of shops immigrants utilise to buy their groceries, as observed by Vahabi & Damba (2013). The same authors concluded that respondents tended to avoid small convenience stores due to language difficulties. Instead, they preferred large chain stores where they could search for food items

independently without seeking assistance from shopkeepers. Consequently, this could have negative implications for food security in cases where chain stores are located far away from residential areas, as proximity to the food source is a major determinant of food access (Jacobus & Jalali, 2011). In fact, long distance to grocery shops is known to increase transportation costs and in this way could negatively impact on immigrants' ability to access food (Vahabi & Damba, 2013).

Language barriers also result in inability to read food items, nutritional labels, and selection of appropriate food to purchase (Hadley *et al.,* 2010; Vahabi *et al.*, 2011; Vahabi & Damba, 2013). Studies conducted amongst Latin Americans in Toronto, Canada, found that they struggled to understand ingredients and nutritional composition of food, making it difficult for them to make healthy choices. The result could be restricted food choices and a decrease in the variety of foods consumed, especially when access to traditional foods is limited. Similar studies conducted in Canada amongst Sudanese women, and in Norway among South Asian, African, and Middle Eastern immigrants, confirmed these findings. These studies revealed that difficulties in language impeded immigrants ability to read packaging information and, as such, recognise food (Mannion *et al.*, 2014; Terragni *et al.*, 2014).

This has the potential to negatively impact on the food security of immigrants, as the ability to read food labels plays a major role in selection of nutritious food. In view of this, language programmes should be provided and made more accessible to immigrants through subsidies and constant evaluation to determine their effectiveness to facilitate immigrants becoming proficient in reading the local language as soon as they have settled in their new home (Jacobus & Jalali, 2011).

2.6.4 Challenges to accessing traditional ingredients in the host countries

As reflected under section 1.3, accessing healthy, culturally appropriate food is essential for food security to be realised by any immigrant (Jacobus & Jalali, 2011; Vahabi & Damba, 2013). However, available evidence suggests that although most immigrants prefer to maintain their traditional diets, they are unable to do so due to unavailability and inaccessibility of traditional ingredients (Renzaho & Burns, 2006; Garnweidner *et al.*,

2012; Njomo, 2013; Vahabi & Damba, 2013; Sanou *et al.*, 2014; Terragni *et al.*, 2014). This is in addition to the factors mentioned above that have the potential to negatively affect the food security and nutritional status of immigrants. It forces them to replace their diets with unhealthy food items (Kiptinness & Dharod, 2011).

The unavailability of immigrants' traditional foods, especially from the mainstream supermarkets, has been highlighted in several host countries including South Africa, Canada, and North America (Deng *et al.*, 2013; Dharod *et al.*, 2013; Njomo, 2013; Vahabi & Damba, 2013). Unavailability of ethnic food ingredients in South African markets has led to the emergence of ethnic shops and restaurants in main city centres around the country. However, these ethnic food shops are unable to stock sufficient amounts and variety of foods to satisfy the market (Njomo, 2013).

In South Africa, information on ethnic markets is scanty. Only one study could be sourced, and the study in question was limited in scope, as discussed earlier on under section 1.1. In view of this, studies in other provinces, especially Gauteng, which is home to the largest number of Sub-Saharan immigrants in South Africa are needed (Landau & Gindrey, 2008). Such studies should assess the availability and accessibility of ethnic foods for the immigrant community resident in South Africa.

Accessibility of immigrant traditional food ingredients is exacerbated by the high prices of these foods in the host countries (Jacobus & Jalali, 2011; Deng *et al.*, 2013; Njomo, 2013; Popovic-Lipovac & Strasser, 2015). The majority of immigrants (73, 3%) who participated in the study by Njomo (2013) indicated that ethnic foods for Sub Saharan immigrants living in South Africa are very expensive compared to countries like Canada and America. The cause of the high prices is the unavailability of these traditional food ingredients from the major grocery stores (Njomo, 2013; Vahabi & Damba, 2013), and high export prices (Jacobus & Jalali, 2011; Njomo, 2012). This is a concern when one considers the fact that the majority of immigrants have low incomes due to low employment levels. As a result, the majority of immigrants tend to resort to consumption of high-calorie, low nutrient- dense food (Kiptinness & Dharod, 2011; Vahabi & Damba, 2013), a trend that is associated with weight gain and development of chronic diseases of lifestyle (Kiptinness & Dharod, 2011; Popovic-Lipovac & Strasser, 2015).

2.6.5. Pressure from children to adopt the host country's food

Pressure from children to adopt their host country's food has been described as one of the challenges immigrant mothers experience upon resettlement. This is because, after children of immigrants get exposed to the host country's food culture during young school-going age, they tend to adopt the eating habits of the host country and reject the dietary patters of the countries where their parents came from (Vue *et al.*, 2011; Mannion *et al.*, 2014; Terragni *et al.*, 2014; Wilson & Renzaho, 2014). Vue *et al.* (2011) and Dharod *et al.* (2013) hold the view that children are usually more easily acculturated than their parents, due to peer pressure, media, and environment. The result of this is that most children of immigrants tend to prefer the host country's food over the traditional food of the countries their parents came from (Vue *et al.*, 2011; Dharod *et al.*, 2013; Mannion *et al.*, 2014). This causes frustration amongst mothers who lack knowledge and do not trust the food culture of the host country (Dharod *et al.*, 2013).

Terragni *et al.* (2014) observed that the reason children easily acculturate is because children become reluctant to take food to school that is different from what the rest of the children bring for lunch. Subsequently, most mothers are often conflicted between the desire to indulge children's preferences versus that of wanting to uphold traditional eating patterns (Mannion *et al.*, 2014).

The other problem associated with the pressure from children to adopt the host country's food is related to convenience. In a study done in Australia by Wilson & Renzaho (2014), the refusal of children to eat their traditional food was associated with the additional inconvenience of carrying food to school which required reheating. The problem that arises as a result of this, is that parents often choose unhealthy foods as a response to the demands of their children (Vue *et al.*, 2011). Choosing unhealthy foods is a result of not being familiar with the host country's food culture, as discussed in earlier sections in this thesis. Dharod *et al.*(2013) support this view by noting that such children tend to prefer fast foods to the traditional ethnic foods that the parents want them to eat or take to school. Preference for fast foods over ethnic foods could have dire consequences for dietary changes and malnutrition among immigrant families. In view of this, there is a

need to investigate whether this is true for the immigrants from Sub-Saharan Africa living in South Africa.

2.6.6. Role of religion in determining immigrants' food choices in host countries

Religious beliefs play a major role in shaping the dietary patterns of people. Certain religious affiliations often result in what is known as food avoidance, a situation whereby members are prohibited from consuming certain foods (den Hartog *et al.*, 2006; Garnweidner *et al.*, 2012). Fundamentally, food avoidances define what food is and what is not acceptable to consume.

Food avoidances are either temporary or permanent, but those that are due to religious affiliations tend to be permanent, because the foods in question are regarded as being impure or hold a sentimental value. The two most well-known religions that endorse permanent food prohibitions are Muslims and Hindus (den Hartog *et al.*, 2006). According to Jacobus & Jalali (2011) food avoidances are the reason why immigrants could experience food insecurity, despite the availability of traditional ingredients in host countries.

In the case of Muslims, who have to eat halal food (food prepared in a certain manner by trained Muslim men and women), they are frequently not sure if the food they are buying is actually halal or not, which forces them to restrict their food baskets to fewer food items (Jacobus & Jalali 2011; Harrow 2013); Terragni *et al.* 2014; Garnweidner *et al.,* 2012). This lack of trust causes Muslim immigrants to exclude all foods affected by religious rules from their diets (Garnweidner *et al.*, 2012; Terragni *et al.*, 2014). This phenomenon of religiously "safe" food was highlighted in a study that was conducted amongst the African immigrant population residing in Lewiston, Maine, in the USA. Due to issues related to trust, most respondents in the study preferred small ethnic markets run by fellow countrymen who most likely were Muslims themselves. Apart from halal meat and the exclusion of pork, separate utensils have be used for halal products otherwise it becomes contaminated and then it becomes haram (i.e., food that is forbidden according to Islamic food laws and customs) (Harrow, 2013). However, the availability of these special personnel is usually a problem in host countries. As a result, halal products have to be

imported from abroad which in turn inflates the costs of such foods, thus limiting the availability and accessibility of halal products due to import costs and lack of competition. Additionally, it is reported that most Muslims prefer to source imported products such as rice, spices, dried fruits and condiments from these halal speciality shops just to ensure that they are not haram (Jacobus & Jalali, 2011).

Similar to the Islamic religion, Hindus have numerous permanent food avoidances (den Hartog *et al.*, 2006; Harrow, 2013). However, contrary to Islamic belief, Hindus avoid certain food not because they are considered unclean but out of respect (den Hartog *et al.*, 2006; Harrow, 2013). A typical example of this is a cow, which is highly respected in Hindu culture and so cannot be killed. As a result, all beef or beef products are avoided (den Hartog *et al.*, 2006; Harrow, 2013). Other food avoidances in the Hindu culture include alcohol, and animal products such as rennet, eggs, or gelatine of animal origin. Furthermore, due to the need to avoid beef and beef related products, prevention of cross-contamination during food preparation becomes very crucial. As a result, any food suspected of being contaminated is completely avoided. Similar to Muslims, in the Hindu culture, separate utensils and food preparation areas should be used when cooking food. Consequently, fear of cross-contamination has been cited as a main reason why the majority of Hindus avoid eating in or from public places. Furthermore, there are certain rituals that need to be adhered to when preparing, cooking and serving food to Hindus (Harrow, 2013). The result could be the suspicion alluded to in the preceding section, especially when food is sold by people outside this religious group. Consequently, this could have food inaccessibility implications and adverse effects on food security.

Based on this review, it is apparent that religious beliefs do act as barriers to accessing sufficient food amongst immigrants, especially if the religious beliefs of the host country differ vastly from the country of origin of the immigrants. In South Africa, for example, the majority (85,5%) of the population are Christians, with 2% and 1 % of the population affiliated to Islam and Hinduism respectively (Statistics South Africa, 2014b). The low percentage of both the Muslim and Hindu population could have a negative impact on the availability and accessibility of religiously appropriate food for Muslim and Hindu immigrants. This has the potential to adversely impact on the health of immigrants

belonging to these religious groups as it limits food choices and could result in monotonous diets. The most notable feature about this is the exclusion of meat in most immigrants' diets due to the fear of eating food that is religiously unacceptable (Terragni *et al.*, 2014). Consuming a limited variety of food is associated with malnutrition. Exclusion of meat without proper replacement could result into nutrient deficiencies such as protein, iron and vitamin A deficiencies (Schönfeldt & Hall, 2012)**.**

2.6.7 Climate change related barriers

Apart from being the causal effect of migration, climate change can also be the driver of many food related challenges that immigrants encounter in host countries or destinations (McMichael et al. 2012; McMichael, 2014). Climate change driven migration is usually abrupt, therefore aftermaths are comparable to those of refugees, as the affected usually have limited choice of the destination; ending up in developing countries that have limited resources (McMichael et al., 2012). In cases where climate change migration results in large-scale population displacements, people often end up in settlements that are crowded, poorly ventilated, and poor sanitation resulting in adverse food related challenges (McMichael et al., 2012; Pendleton et al., 2014).

Firstly, as mentioned above overpopulation that results leads to loss of arable land and natural environments that societies depend on for their well-being, thus affecting agricultural productivity not only for the immigrants but for native communities as well (McMichael et al., 2012). As population grows; forests, swamps, lakes and other habitats are cleared for residential areas, causing loss biodiversity thus affecting lives and livelihoods of those that are directly dependent on healthy ecosystems (Berjak et al., 2011). Inadequate arable land combined with loss of biodiversity in turn forces immigrants whom mostly originate from rural areas to depend mainly on shops for access of food, making them vulnerable to price fluctuations.

Secondly, these conditions result in disease outbreaks such as cholera, typhoid hepatitis A, measles, respiratory diseases, diarrheal diseases and malaria (McMichael et al., 2012). Apart from putting pressure on the health system that is already under siege due

to overcrowding, these diseases decrease productivity and earning capacity which in turn affects negatively the economic resources of accessing food (WHO, 2013).

2.7 Food safety in ethnic food markets and restaurants

Food safety refers to a series of activities that are undertaken to prevent foodborne illnesses by ensuring safe handling, preparation and storage of food (Republic of South Africa, 2003a). Worldwide failure to comply with acceptable food safety standards is reportedly responsible for an estimated 2.2 million deaths annually, especially within poor communities (WHO, 2013). Further to this, the effects of foodborne illnesses not only threaten the life of individuals concerned but have adverse economic consequences on communities, businesses and countries. They negatively affect the health care systems, tourism, productivity and livelihoods (WHO, 2013; Grace *et al*., 2015).

Available literature indicates that food safety is a growing concern within the ethnic food industry (Rudder, 2006; Roberts *et al.*, 2011; Njomo, 2012, 2013; Stenger *et al*., 2014). In the USA and Europe alone foodborne illness outbreaks related to ethnic food safety increased from 3% to 11% between 1990 and 2000 (Quinlan, 2013). This is attributed to poor hygienic practices (Rudder 2006; Roberts *et al.,* 2011; Grace *et al.,* 2015; Harris *et al.,* 2015), poor quality of food (Rudder, 2006; Njomo, 2012, 2013), and failure to comply with food safety regulations (Rudder, 2006; Roberts *et al.*, 2011; Harris *et al.*, 2015).

Hygienic food handling practices by employees are critical in preventing cross-contamination of food, equipment and utensils (Harris *et al.*, 2015). Yet many studies show that hygienic practices are not followed by employees in informal food markets like ethnic food restaurants (Rudder, 2006; Roberts *et al.*, 2011; Grace *et al.*, 2015; Harris *et al.*, 2015). A study conducted Bolton, Greater Manchester by Rudder (2006), found that the majority (65%) of ethnic retailers failed to meet the minimum standard of food hygiene and lacked the necessary knowledge required to implement effective food safety measures. Furthermore, majority (78%) of ethnic retailers in the latter study were considered to be a high risk for contamination and therefore suspected to be the cause of foodborne illnesses such as *Escherichia coli*. Roberts *et al.* (2011) also observed that

a number of violations in the ethnic food restaurants studied were directly related to poor employee hygienic practices.

According to Quinland (2013), dirty floors, work surfaces and equipment, and a lack of disinfectants were among the top hygienic concerns within the ethnic food restaurants in a study that was conducted in the Greater Manchester, UK. Poor hygienic practices have been associated with cultural food handling methods and beliefs which are often contrary to the food safety guidelines, and lack of knowledge and skills to implement effective monitoring systems of personal hygiene and food handling practices (Harris, 2015). Harris (2016) is of the view that ethnic food restaurant operators and employees often lack information with regards to good hygiene practices and basic resources such as tap water, power supply and waste disposal facilities.

The quality of food sold by ethnic retailers has been identified as being of a poor quality from a food safety perspective (Rudder, 2006; Njomo, 2012, 2013). Food safety concerns have been reported by Stenger *et al.* (2014) amongst Hispanic families residing in the USA, who were obtaining their food from ethnic food retailers. It has also been shown that immigrants who attempt to maintain their original food culture experience a high number of foodborne illness incidences (Stenger *et al.*, 2014).

In South Africa the majority (55%) of Sub-Saharan immigrants that participated in a study that was conducted in the Western Cape complained about the poor quality of food sold by ethnic retailers (Njomo, 2012). Njomo (2013) goes on to suggest that food at these shops is often decomposed, smells and tastes bad. Ethnic retailers who were interviewed by Njomo (2013) attributed the poor quality of food to poor methods used to preserve the food in question, the length of time it spends in their stores before it is sold, and a lack of skills and resources to transport ethnic food from supplying countries to South Africa. This could also be due to the fact that the value chain within the ethnic food retailers in South Africa is complex and extended, and hence prone to contamination (Hawkes *et al*., 2015). This, coupled with the poor resources associated with an informal sector like this one, means that the potential to compromise the quality of food on the informal market is quite high. Of note though, is that although food safety concerns are well documented in the literature there is a paucity of studies that have assessed the microbiological quality of

foods in informal markets like ethnic markets and restaurants (Roberts *et al.*, 2011). This is particularly true in South Africa (Oguttu, 2014).

Available research suggests that the majority of the ethnic food markets and restaurants fail to comply with food safety regulations (Rudder, 2006; Roberts *et al.*, 2011; Harris *et al.*, 2015). For example, in a study by Rudder (2006), a number of the ethnic retailers failed to meet the minimum standards of the food legislation which states that food premises should have soap, proper drying methods and a basin. In addition, the majority of the structures in which these businesses operated were in breach of the legislation. They had damaged equipment, poor ventilation, and broken floors and ceilings.

Failure to adhere to regulatory requirements was observed in studies conducted in the USA by Roberts *et al.* (2011) and Harris *et al.* (2015). Even within the ethnic markets, variations in adherence to regulatory requirements have been observed. For example, Roberts (2011) observed that independent ethnic markets had more critical and non-critical violations recorded, as compared to chain-ethnic restaurants and non-ethnic restaurants. Moreover, Harris *et al.* (2015) concluded that failure by ethnic restaurants to comply with the food legislation as stipulated by the USA's Food and Drug Administration in the Employee Health and Personal Hygiene Handbook is a national issue. Non-compliance was attributed to cultural differences, and the inability of restaurant operators to understand and comprehend government regulations (Roberts *et al.*, 2011; Harris *et al.*, 2015). Poor communication of food safety regulations due to language barriers has also been blamed for non-compliance of ethnic food markets and restaurants (Rudder, 2006; Roberts *et al.*, 2011). Language barriers make it difficult to train the actors within this sector (Rudder, 2006).

Based on the preceding section, it is clear that food safety is a major problem within the ethnic food markets. However, since food safety concerns associated with ethnic markets have not been documented, studies to ascertain food safety concerns in the ethnic retail industry, especially in a country like South Africa where this industry is still in its infancy and remains the only source of ethnic foods for Sub-Saharan immigrants, are needed. Furthermore, studies that look at food safety within the ethnic retail sector would act as a preventative measure of foodborne illnesses within this growing section of the population

of South Africa. This could thus reduce the resources that would be required to treat the outbreak of illnesses if the matter is not given the attention. Moreover, research on food safety knowledge amongst the ethnic restaurant and ethnic food markets managers will enable the authorities to develop appropriate training manuals.

2.8 An overview of the South African food safety regulations relevant to ethnic food markets and restaurant

The regulation of food safety in South Africa falls within the realm of three departments, namely: Health (DoH); Trade and Industry (DTI); and Agriculture, Forestry and Fisheries (DAFF). Under these departments there are several acts and regulations applicable to food safety.

Below is a list of food safety acts and regulations found under the Department of Health that are applicable to ethnic food restaurants and markets:

(i) Foodstuffs, Cosmetics and Disinfectants Act No: 54 of 1972: This act regulates "*sale, manufacture and importation of foodstuffs, cosmetics and disinfectants and provides for incidental matters*" (Republic of South Africa, 1972). This means that all foodstuffs that are manufactured and/or sold in South Africa, or imported into the country should comply with this Act. The Act regulates the manufacture, sale and importation of prohibited substances, contaminated food products, and substances that increase mass or volume of foodstuff. It also prevents use of products that conceal damage or inferior quality. In the case of ethnic food markets, where most ingredients are imported in their processed state, this Act is of special relevance as entrepreneurs have to ensure that they are in compliance with manufacturing and transportation guidelines. The Foodstuffs, Cosmetics and Disinfectants Act is very relevant to ethnic food markets as some of the ingredients are imported from neighbouring countries. Under this Act, there are eight regulations that are relevant to ethnic food markets. The name of the regulation and government notice number are summarised in Table 2.1, together with a brief description of each piece of legislation.

Table 2. 1: Regulations relevant to ethnic food markets falling under Act No: 54 of 1972

Responsible Department	Regulation	Government Notice Number
Department of Health	Regulation governing solvents in foodstuff	No. R. 911 of 2001
Department of Health	Regulation regarding processed foodstuffs	No. R 723 of 10 August 2001
Department of Health	Regulations governing microbiological standards for foodstuffs and related matters.	No. R. 490 of 8 June 2001
Department of Health	Regulations relating to salt.	No. R 1368 of 21/12/2001
Department of Health	Regulation governing the tolerances for certain seeds in certain agricultural products.	No. R. 1225 of 4 October 2002
Department of Health	Regulation relating to the application of hazard analysis and critical control point system (HACCP System).	No. R. 908 of 27 June 2003
Department of Health	Regulation relating to prohibition of the sale of comfrey, foodstuffs containing comfrey and jelly containing konjac.	No.R.1408 of 10 October 2003
Department of Health	Regulations relating to the powers and duties of inspectors and analysts conducting inspections and analyses on foodstuffs and at food premises.	No. R. 328 of 20 April 2007
Department of Health	Regulations relating to the reduction of sodium in certain foodstuffs and related matters	No. R. 214 of 20 March 2013

I. Regulation No. R. 911 of 2001 regulates the use of benzene and methanol by setting maximum limits that are permissible in beverages manufactured, sold or imported into South Africa. Any food product that has these ingredients in excess of the stipulated limits cannot be sold in South Africa (Republic of South Africa, 2001a).

II. Regulation No. R 723 of 2001 states that processed food products should not be contaminated, infected or decayed (Republic of South Africa, 2001b). Therefore ethnic markets have to ensure that all the food ingredients used conform to this regulation.

III. Regulation No. R 1368 of 21/12/2001 prescribes the amount of sodium chloride, iodation and food additives that may be added to food grade salt (Republic of South Africa, 2001c). Salt sold or used in ethnic markets must conform to this requirement.

IV. As indicated in Table 2.1, there is also a regulation on microbiological standards for foodstuffs and related matters (No. R. 490 of 8 June 2001), which guides the microbial analysis of foodstuffs, and the allowed microbial limits of different types of food intended for human consumption.

V. The regulation on the tolerances for certain seeds in certain agricultural products (No. R. 1225 of 4 October 2002) sets out guidelines on the permissible amounts of certain seeds (*Argemone Mexicana L., Convolvulus Crotolaria, Datura, Lolium temulentum, Ipomea purpura Roth, and Xanthium* species) in agricultural products such as barley, buckwheat, grain sorghum, groundnuts, maize, oats, oilseed rape, rice, rye, soy beans, sunflower seeds and wheat (Republic of South Africa, 2002a).

VI. The application of the hazard analysis and critical control point system (HACCP System) regulation (No.R. 908 of June 2003) prescribes that the HACCP System be implemented by all food handling enterprises (Republic of South Africa, 2003a). The regulation goes on to state that no food handling enterprise may handle food without a valid certificate from a qualified person employed by a South African National Accreditation System accredited body.

VII. The other regulation relevant to the ethnic markets is Regulation No. R. 1408 of 2003, which bans the importation and sale of comfrey and any foodstuffs that contains comfrey as an ingredient (Republic of South Africa, 2003b). Comfrey is a popular medicinal herb which is used topically to treat injuries, arthritis, gout and diarrhoea but has been banned in many countries due to its association with liver failure (Curtis, 2002).

VIII. The regulations relating to the powers and duties of Inspectors and Analysts of foodstuffs and at food premises authorise inspectors to demand documents and information on any matter provided for in the Act, inspect foodstuffs, and take samples for microbial analysis (Republic of South Africa, 2007). The regulation

also provides guidelines on how the samples maybe collected, transported and delivered to the Analyst.

(ii) The National Health Act No. 61 of 2003. This Act provides a framework for a structured standardised health system of the Republic of South Africa, as stipulated by the Constitution and other laws in all spheres of the government with regards to health services and other related matters (Republic of South Africa, 2004). Under this Act there is one regulation that is applicable to ethnic food markets and restaurants, which is presented in Table 2.2.

Table 2. 2: Food safety legislation applicable to ethnic food markets falling under Act No. 61 of 2003

Responsible department	Regulation	Government Notice Number
Department of Health	Regulations governing general hygiene requirements of food premises and transport of food	No. R. 918 of 30 July 1999 corrected in 723 of 12 July 2002

The relevance of the above Regulation to ethnic food markets rests on the fact that ethnic food markets are operated as businesses transporting and selling food to the consumers. This Regulation stipulates the requirements in terms of certification that entrepreneurs should possess before they can sell food, provisions that should be adhered to when handling and transporting food, and the requirements of food premises and facilities that are used to sell food (Republic of South Africa, 2002b).

The Department of Trade and Industry has at least one Act that is relevant to ethnic food markets. The name and explanation thereof is presented under Table 2.3.

(iii) Consumer Protection Act No 68 of 2008. This Act establishes national norms and standards to protect consumers and to improve consumer information in order to prevent unfair business practices (Republic of South Africa, 2009). Therefore, immigrant entrepreneurs need to familiarise and align their businesses with this Act, as they conduct business in South Africa.

The Acts that are administered by the Department of Agriculture, Forestry and Fisheries (DAFF) that are relevant to the ethnic food markets and food safety are summarised in Table 2.3 below:

Table 2. 3: Relevant Acts falling under the subsidiary of the Department of Agriculture relevant to ethnic food markets.

Name of the ACT	ACT Number	Description
Agricultural Product Standards	No. 119 of 1990 for food safety and quality information.	This act regulates sale and export of certain agricultural products, sale of certain imported agricultural products and related matters. The act includes all products of animal and vegetable origin and substance produced solely or partially from animal and vegetable substances (Republic of South Africa, 1990)
Meat Safety Act	No.40 of 2000.	This act regulates safety of animal products by developing national standards for abattoirs, controls the importation and exportation of meat to ensure safety of meat and related matters (Republic of South Africa, 2000).
Genetically Modified Organisms (GMOs)	No. 15 of 1997	The GMO act establishes national norms and standards for responsible production, use, importation, distribution and application of genetically modified products. This is to ensure that all GMO activities are carried out in a manner that minimises risk to the environment, humans and animals. Furthermore, it develops procedures for notification of specific activities.

2.9 Microbiological organisms isolated in this study

Quality of food was assessed using total viable counts, coliforms, *Escherichia coli.* and *Salmonella spp.* A brief description of the micro-organisms that were isolated and the role of each in food safety is provided.

a) Total viable counts

The total viable count estimates the number of micro-organisms that are able to grow in an aerobic environment. The test for total viable count are used as indicator organisms

to assess the quality of RTE foods. Their presence in food is an indication of potential problems with the shelf-life, sanitation, handling and storage practices (BC Centre for Disease Control, 2011). These micro-organisms may include bacteria, fungi or yeast.

The interpretation of total viable counts is dependent on the type of food, cooking method (BC Centre for Disease Control, 2011), and storage and handling (Centre for Food Safety, 2014). Depending on the food type, there are different acceptable levels of total viable count.

According to the BC Centre for Disease Control (2011) food is classified into the following three categories:

i. Category 1

This category consists of RTE foods that have been cooked completely without requiring subsequent handling such as storage, mixing, or adding before sale or consumption (Department of Health Canada, 2010; BC Centre for Disease Control, 2011). Typical examples include soups, cooked meat, vegetables, fish, takeaway food and bread (Department of Health Canada, 2010). The acceptable maximum levels of total viable count in this category is $<10^5$ CFU/g (Department of Health Canada, 2010; BC Centre for Disease Control, 2011). Therefore, food in this category that has aerobic counts above 10^5 is deemed unacceptable for human consumption (Centre for Food Safety, 2007).

ii. Category 2

These are RTE foods that require handling prior to sale, consumption or distribution (Department of Health Canada, 2010; BC Centre for Disease Control, 2011). This category also includes foods that require to be assembled from RTE foods (Department of Health Canada, 2010), e.g. hot dogs, burgers and sandwiches. The cut-off point for this food category is $\geq 10^7$ CFU/g (Department of Health Canada, 2010).

iii. Category 3

This category is made up of fresh fruits and vegetables, fermented foods, sprouts, cultured dairy products, or any foods containing the aforementioned foods as an ingredient. This group of food products is expected to contain high viable counts due

to high microbial flora present in them (BC Centre for Disease Control, 2011), and as a result, they are exempted from the total viable count limits.

b) Coliforms

Coliforms are not a species but a group of bacteria that are found naturally in the faeces of warm-blooded animals, aquatic environments and soil (BC Centre for Disease Control, 2011). They are non-spore forming organisms that produce gas and acid upon fermentation (Yin & Ding, 2009). Coliforms generally do not cause illness, but they are used to assess the microbial quality of RTE foods (BC Centre for Disease Control, 2011). The presence of coliforms in food in high numbers is suggestive of poor handling practices during food manufacturing and preparation (Yin & Ding, 2009). The cut-off point for coliforms is $<10^3$ CFU/g (Department of Health Canada, 2010; BC Centre for Disease Control, 2011)**.**

c) Escherichia coli (E. coli)

Escherichia coli is a member of the *Enterobacteriaceae* family that inhabits the gastrointestinal tract of humans (Waghela, 2004; Baylis *et al*., 2011), domestic birds, and open-air environments (Beauchamp & Sofos, 2010). Therefore, its presence in food indicates direct or indirect contamination with faeces (Centre for Food Safety, 2007; BC Centre for Disease Control, 2011). This bacterium is highly adaptable and can survive in different parasite carriers. It is mesophilic in nature, with an optimal temperature of 35-42°C (Beauchamp & Sofos, 2010). While most strains of *E. coli* are non-pathogenic, some are pathogenic and responsible for human diseases such as meningitis in children, chronic urinary tract infections, diarrheal diseases (Beauchamp & Sofos, 2010; Baylis *et al.*, 2011), and infections of the blood (Baylis *et al.*, 2011). Classic hosts of this bacterium include children under the age of 5 years, the elderly, adults with impaired immune system, individuals who are genetically predisposed to infection due to their blood type, and adults who have travelled to foreign destinations (Beauchamp & Sofos, 2010). Clinical manifestations of *E. coli* infections include loose watery stools, mild to severe abdominal pain, mild fever, headache, nausea, and vomiting (Beauchamp & Sofos, 2010). *Pathogenic E. coli* are transmitted through

contaminated water, food, animals and humans. Pathogenic *E. coli* are classified into the following prototypes:

- Enteropathogenic *E. coli* (EPEC): Their incubation and duration is variable and their clinical manifestations include chronic diarrhoea and malnutrition in children (Beauchamp & Sofos, 2010).
- Enteroaggregative *E. coli* (EAEC): Their incubation and duration is variable and their clinical manifestations include watery or bloody diarrhoea and fever in children (Beauchamp & Sofos, 2010).
- Enteroinvasive *E. Coli* (EIEC): EIEC presents itself as watery diarrhoea, abdominal cramping and fever in children and its incubation takes between 1-3 days and (Beauchamp & Sofos, 2010).
- Enterotoxigenic *E. coli* (ETEC): mainly affects travellers and infants. Incubation varies between 1-3 days and can last between 3-7 days (Beauchamp & Sofos, 2010).
- Enterohemorrhagic *E. coli* (EHEC): affects children and the elderly. Persons infected with this bacterium develop symptoms between 1- 8 days after infection, and illness can last between 4-10 days. Its clinical manifestation includes bloody diarrhoea, kidney failure and haemolytic-uremic syndrome.
- Diffuse adherent *E. coli* (DAEC): DAEC causes persistent diarrhoea mainly in children who are older than 2 years and are immunocompromised (Waghela Suryakant D., 2004). Other information regarding this bacterium strain is yet to be known.

These six prototypes of bacteria are collectively known as diarrhoeagenic *E. coli*. Furthermore, all these classes have human reservoirs and are mainly transmitted via the faecal-oral route, except for EHEC, which is also found in animals, especially ruminants (Baylis *et al.*, 2011). The acceptable level for *E. coli* in RTE food is <3 CFU/g (BC Centre for Disease Control, 2011).

d) Salmonella

Salmonella was first identified in France around the 19th century (Bailey *et al*., 2010), and is a member of the family *Enterobacteriaceae* family (Baylis *et al.*, 2011). It is a non-spore-forming bacterium is able to thrive under extreme environmental conditions. The optimal growth temperature for *Salmonella* is 35 to 40°C and an optimum pH of between 6.5 and 7.5 (Baylis *et al.*, 2011). *Salmonella* is mainly found in the gastrointestinal tract of mammals (Bailey *et al.*, 2010) but has also been isolated from birds (especially domestic birds and eggs), seafood, reptiles, (Bailey *et al.*, 2010; Baylis *et al.*, 2011) and vegetables (Bailey *et al.*, 2010).

According to the Centre of Diseases Control and Prevention (CDC), *Salmonella* is the second highest cause of bacterial foodborne illnesses (Baumler, 2004). In humans *Salmonella* bacterium is responsible for the disease called salmonellosis (Bailey *et al.*, 2010; Baylis *et al.*, 2011). Salmonellosis is classified into two distinct diseases: non-typhoid salmonellosis and typhoid fever (Baylis *et al.*, 2011). Typhoid *salmonellosis* is transmitted by humans only. Non-typhoidal *Salmonella* are carried by both humans and animals. While typhoid salmonellosis is common in developing countries, non-typhoid occurs worldwide (Gal-Mor, Boyle & Grassl, 2014). The incubation of this bacterium is between 12 to 72 hours, and symptoms can last from 4 to 7 days (Bailey *et al.*, 2010; Baylis *et al.*, 2011). Salmonella affects mainly children, the elderly and people with impaired immune system. Although most people are able to recover without treatment, in some cases the bacterium can spread to various body sites. The symptoms include diarrhoea, fever and abdominal cramps (Baylis *et al.*, 2011). In severe cases salmonella can result in reactive arthritis, Reiter's syndrome and death (Bailey *et al.*, 2010).

2.10 Summary

In this chapter various aspects regarding immigrants and ethnic food markets were discussed. These include overview of the immigrant population, socio-economic and food security status of the immigrants in general. These factors influenced the the formulation of specific questions in the questionnaire to investigate relevance of these issues for the

sub-Saharan immigrant population living in South Africa. Several dietary challenges that affect dietary choices of immigrants upon resettlement in the host country and concerns of safety of the ethnic foods were also apparent in the literature. This justified the tabulated objectives of the study mentioned in chapter 1 (section 1.7).

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CHAPTER 3

MATERIALS AND METHODS

3.1 Introduction

This chapter departs by giving a brief description of the study area, maps and the reasons why the study area was chosen. Research design as emanated from the literature discussed in chapter and objectives of the study (section 1.7) is also explained. The literature review gave the researcher an idea of how related studies have been approached by other scholars, thus enabling the selection of the most suitable research design and methods. The objectives also played a major role in determining the research design and research instruments to be used to best answer the research objectives.

3.1.1 Study area: Location and population

The study was conducted in Gauteng Province, South Africa (Figure 3.1). In terms of land area, Gauteng is the smallest province of the nine provinces of South Africa, comprising 17,010 square kilometres (Gauteng Online, 2016). Although Gauteng is the smallest province, it has the largest population (12. 728 million citizens) (Statistics South Africa, 2014b). The study focused on Johannesburg and Tshwane, the biggest municipalities of the three municipalities in Gauteng. Johannesburg is the commercial capital of Gauteng Province, while Pretoria is the capital of the Republic of South Africa (Gauteng Online, 2016).

Figure 3. 1: Map showing city of Johannesburg (Local Government 2016)

Figure 3. 2: Map showing City of Tshwane (Local Government 2016)

3.1.2 Suitability of the study area

The reason for the selection of this study area is that Gauteng hosts the highest number of Sub-Saharan immigrants in South Africa (Landau & Gindrey, 2008; Njomo, 2013). This is in addition to Gauteng Province having the highest number of both internal and international migrants, with 46% of South Africa's international immigrants residing in Gauteng. This is attributed to its economic dominance both in South Africa and Southern Africa (Landau & Gindrey, 2008). Johannesburg and Tshwane metropolitan areas host the highest number of both internal and international immigrants (Landau & Gindrey, 2008). Based on this, the two metropolitan municipalities were chosen over other Gauteng municipalities because it was envisaged that the researcher would be able to reach the required number of participants.

3.1.3 Weather patterns of Gauteng Province

Gauteng has hot summers and mild winters. Although the rainy season occurs from September to May, most rain is received from December to January. Rain usually occurs in the late afternoon. Gauteng receives an annual precipitation of 543 mm. Thunderstorms and hailstorms do occur but are usually very brief. In Johannesburg, the average minimum temperature in summer is 17°C and maximum is 28°C, with occasional heatwaves, while in winter the average temperature range from 4 -16°C. Pretoria experiences similar weather patterns but temperatures are usually two degrees higher and it receives more rainfall than Johannesburg.

3.2 Research design

A research design is a detailed plan of how a research study is going to be conducted and, as such, guides the selection of the data collection methods and analysis of data (Delport, 2002). A mixed methods research design was adopted for this study. There are different variations in which mixed methods can be implemented in a study. These variations are mainly based on the emphasis and timing that a study places on either qualitative or quantitative data. Creswell (2009) presents six major mixed methods models, namely:

(i) sequential explanatory model,

(ii) sequential exploratory model,

(iii) sequential transformative model,

(iv) concurrent triangulation strategy,

(v) concurrent embedded strategy, and

(vi) concurrent transformative strategy.

For this study, the concurrent embedded approach was employed. The Concurrent embedded strategy is a mixed method process whereby qualitative and quantitate data are collected, analysed and interpreted concurrently (Creswell & Clark, 2007). The word embedded means there is a primary method, which is used as a main method and a secondary method serving as a supportive database or the secondary method may be addressing a different question (Creswell, 2009). In this study, the quantitative method was the main method used to collect data, while the qualitative method was used to provide explanations. In analysis the data was not compared but placed side by side in order to gain broader perspective on the research problem.

The purpose of the study was exploratory and descriptive in nature. According to Rubin & Babbie (2013), exploratory studies are conducted when the subject of the study is unknown to the researcher. Given that Sub-Saharan immigrant ethnic foods is a fairly new phenomenon and/or concept in South Africa, it called for an exploratory study to generate new insights and understanding. In terms of time dimension this study was cross-sectional in nature. The aim was to explore, describe and understand relationships all at once through the collection of primary data. The point of departure was to explore what ethnic foods are available at the ethnic food markets and restaurants in Gauteng Province, explain the contribution of these ethnic food markets and restaurants to food security of immigrants, and assess the microbiological quality of food sold by vendors in these ethnic markets. This was done by first establishing the availability, accessibility and variety of the immigrants' food at ethnic food markets and restaurants, then assessing the

microbial quality of the foods sold at these ethnic food markets and restaurants, and identifying predictors of contaminations.

In the philosophical paradigm, attention was given to micro theory, which attempts to understand social life through the interactions at individual and small group level (Babbie, 2008). Structural functionalism, also known as social systems theory, was used to view the community where the research would be conducted as a social system or organism that is made up of different parts, each of which contributes to the functioning of the whole system (Babbie, 2008). According to structural functionalism none of the parts can survive unless each part does its job, and none of the parts of the system can survive except as part of the whole body, (something which was thought to be of specific interest in this research). The parts of the immigrants' community was understood within this philosophical paradigm, focussing firstly on the ethnic markets and restaurants which are the main source of immigrants' traditional food, and secondly on the households of immigrants who were viewed as consumers of the traditional foods sold by the ethnic markets.

3.3 Data collection methods and instruments

Data collection methods are sets of measuring instruments that are used to collect information about objects of a study. There are two types of data: primary and secondary data. Primary data is new information collected directly from its original source(s), while secondary data is data that has been collected and compiled for another purpose. In this study three data collection methods were used to collect primary data: questionnaire, checklist, and food microbial analysis.

A questionnaire is a form that contains a set of questions or statements that have been formulated from research objectives, to obtain facts and opinions from participants about the subject in question (Delport, 2002). There are five types of questionnaire: mailed questionnaire, telephonic questionnaire, personal questionnaire, questionnaire delivered by hand, and group administered questionnaire (Delport, 2002; Bryman, 2012). In this study, questionnaire delivered by hand containing a set of closed and open questions were used to obtain responses. The questionnaire was administered to women

representing households in order to document perceived availability, accessibility, and variety of food sold at the ethnic food markets, restaurants and shops, and perceptions towards South Africa's food culture. The questionnaire were completed by the fieldworkers in the presence of the respondents to avoid the problems of low response rate and unanswered questions highlighted by Delport (2002).

A checklist is an instrument that is used to gather information on behaviours and/or characteristics of the participants in order to address a research problem (Creswell, 2009). A checklist was administered to ethnic food entrepreneurs to assess the predictors of contamination at ethnic restaurants and markets.

Food microbial analysis refers to microbiological tests that are undertaken to determine the safety and quality of food. In this study microbiological tests that were undertaken included enumeration of Total Colony Counts, Coliforms, *E. coli*, and isolation of *Salmonella spp*.

3.3.1 Development of the questionnaire

A semi-structured questionnaire was developed to accommodate the three objectives of the study (Annexure I). The questionnaire contained closed and open-ended questions. The questionnaire was divided into eight sections. The first section mainly contained demographic questions such as age, marital status, educational status, employment status, household income, region of origin, and duration of residence in South Africa. Section B was specifically on immigrants' continuity with original food culture. It comprised aspects about the number of times traditional food is eaten per week, the importance of traditional food culture, reasons for continuing with traditional food culture, and challenges they experience with retaining their traditional food culture. Section C concerned the adoption of South African food culture. Section D focussed on the perceived availability of the immigrants' traditional food in South Africa. Section E had specific questions on the accessibility of the immigrants' food. Section G was a three-day recall which was used as a triangulation tool to assess the inclusion of both immigrants' traditional food and South Africa food.

3.3.2 Development of the checklist

The checklist used in this study (Annexure II) was adapted from the checklist used by Oguttu (2014) which showed a similarity to the two objectives of this study. The checklist by Oguttu (2014) was adapted accordingly to capture demographic profile and non-verbal occurrences that have a bearing on hygienic principles. The checklist was used to assess the risk factors for microbial contamination amongst food vendors as outlined in the Five Keys to Food Safety. The five keys are: keeping clean, separation of raw and cooked food, cooking thoroughly, keeping food at safe temperatures, and use of safe water and raw materials (WHO, 2006). These Five Keys to Food Safety are critical food handling behaviours by food vendors, which have been identified as key to preventing foodborne illnesses (WHO, 2006).

The first section of the checklist comprised of demographic information questions such as the age of the food vendor; age of the business, educational level, nature of the business and place of origin of the entrepreneurs. Section B of the checklist contained non-verbal behaviours that are critical in prevention of food borne illnesses formulated using the Five Keys to Food Safety. These non-verbal behaviours were assessed by observing the behaviour of the food vendors while working at the business premises.

3.3.3 Food microbial analysis

Isolation and enumeration of the selected bacteria was done at the CSIR using the standard methods below:

- Horizontal method for the enumeration of microorganisms SANS4833:2007 (edition 2) was utilised to isolate and enumerate total colony counts.
- Coliforms were enumerated using the horizontal method for the enumeration of Coliforms SANS 4832:2007: (edition 2).
- For *E. coli*, the horizontal method for the enumeration of beta-glucuronidase-positive *Escherichia coli* ISO 16649-2 (edition 1) was used.
- To isolate *Salmonella,* the *Salmonella* Precis Method for the Detection of *Salmonella* species SANS 6579: 2003 (edition 2)/ Precis was used.

3.4 Sampling strategy and sampling procedure

A sample is a fraction of the population that is drawn from the population of interest (also referred to as the study population) that gets included in the study (Strydom & Venter, 2002). This is a time and cost effective measure that is taken to make the study manageable, as inclusion of the total population is usually impossible (Babbie & Mouton, 2001). As mentioned in section 3.2, this study considered three samples. Different sampling strategies were employed to select cases for inclusion in this study for each sample, and these are discussed below.

3.4.1 Sampling strategy for questionnaire interview

The first activity of the study was the administration of the questionnaire to women from households. Quota sampling was applied to divide Sub Saharan immigrants into sub-groups depending on their regions of origin (East, Central, or West Africa). Out of a total of 200 households targeted one hundred and ninety eight (n=198) agreed to participate in the study. Out of the 194 participants, eighty (80) were from West Africa, fifty eight (58) from East Africa, fifty six (56) from Central Africa. Quota sampling is a non-probability sampling method that is used to ensure that that the sample drawn is close to being a replica of the population. In the absence of a sampling frame, this was considered the most suitable sampling method, and it was adopted to ensure that households from each of the regions targeted were well represented. The decision on the number of participants to include per region was based on the 2013 Statistics South Africa's report which indicated that amongst the three regions selected for this study, West Africans were the leading recipients of both temporary and permanent residence permits in 2011 and 2013 respectively (Statistics South Africa, 2013, 2014a). Even though these statistics do not give a total number of Sub-Saharan immigrants in South Africa, they do suggest that there could be more immigrants from West Africa when compared to East and Central Africa, hence a bigger number of participants from West African region were included in this study. Snowball sampling was utilised to select each participant. According to De Vos (2001), snowball sampling is ideal in cases where the phenomena are somewhat unknown to the researcher, and when members of the population are difficult to locate

(Rubin & Babbie, 2013). Rubin & Babbie (2013) are also of the view that the snowball sampling method is very useful for research that is based on minority groups.

In this study key informants from each region were identified and recruited as data collectors. This was done to gain entry, as entering this community proved to be difficult during a pilot study that was conducted prior to the actual data collection. Each key informant identified at least two women representing households from each region, who then identified other households.

The inclusion criteria are described below:

a) Participants had to be immigrants from West, East or Central Africa.
b) Only women currently involved in meal planning and preparation in their homes were interviewed. The main reason for this was that women are regarded as the main custodians of the original food culture of their families in the host countries. They prepare, preserve, and serve indigenous foods to their families, thus ensuring that original food culture is retained (Njomo, 2013).
c) Participants had to be willing to participate in the study.
d) Participants had to be older than 18 years.

This data was collected from July 2015 to November 2015.

3.4.2 Sampling of the ethnic food entrepreneurs

As the second activity of this study, entrepreneurs who sell Sub-Saharan immigrants ethnic foods were identified using the snowball sampling technique. The aim was to reach as many as possible food vendors, but only forty (n=40) could finally be reached. In the absence of a sampling frame for entrepreneurs operating in Gauteng, based on the number of immigrants in South Africa (2.1 million reported under section 1.1 of Chapter 1) and sampling criteria, forty (40) entrepreneurs only in Johannesburg and Tshwane is estimated to be 90% of the total population.

The sampling criteria for this group were as follows:

a) They had to be selling Sub-Saharan ethnic RTE foods

b) He / she had to be older than 18 years
c) They had to be willing to participate in the study.

The entrepreneurs were sampled so as to be assessed for adherence to hygienic principles of food handling. A checklist was utilised for this purpose. As mentioned in the previous section, it was difficult to enter this community, something which could possibly be attributed to difference in language, or the fact that xenophobic attacks had taken place less than two years before this study commenced. A postgraduate student of West African origin was therefore identified and employed as a data collection assistant. The said student was very familiar with the ethnic food market entrepreneurs because he regularly patronises these markets. Furthermore, the student was conversant with many of the languages spoken by the entrepreneurs. As a result, the entrepreneurs were more willing to co-operate with the student than the researcher who is a South African. The data was collected from October 2015 to December 2015.

3.4.3 Sampling of the food samples

Two food samples were collected from all the ethnic food entrepreneurs that had participated in the assessment of hygienic principles alluded to in section 3.5.2. The collection of samples from the entrepreneurs who kept both raw and cooked products in the premises was of special interest in this study as previous studies have shown that the risk of food contamination is increased due to cross contamination as raw food samples usually contain higher bacterial counts compared to cooked samples. The risk is aggravated by using the same utensils for both raw and cooked food without cleaning (Mosupye & von Holy, 2000).

Only ready to eat food samples were collected and submitted to the laboratory for analysis. In cases when one entrepreneur was selling more than two food types falling in this category, random sampling was used to determine the food sample to be collected. Food sampling was conducted from October to December 2015. The checklist was administered on the same day the food sampling was conducted.

3.5 Methodological framework

Figure 3.2 represents the methodological framework adopted for this study.

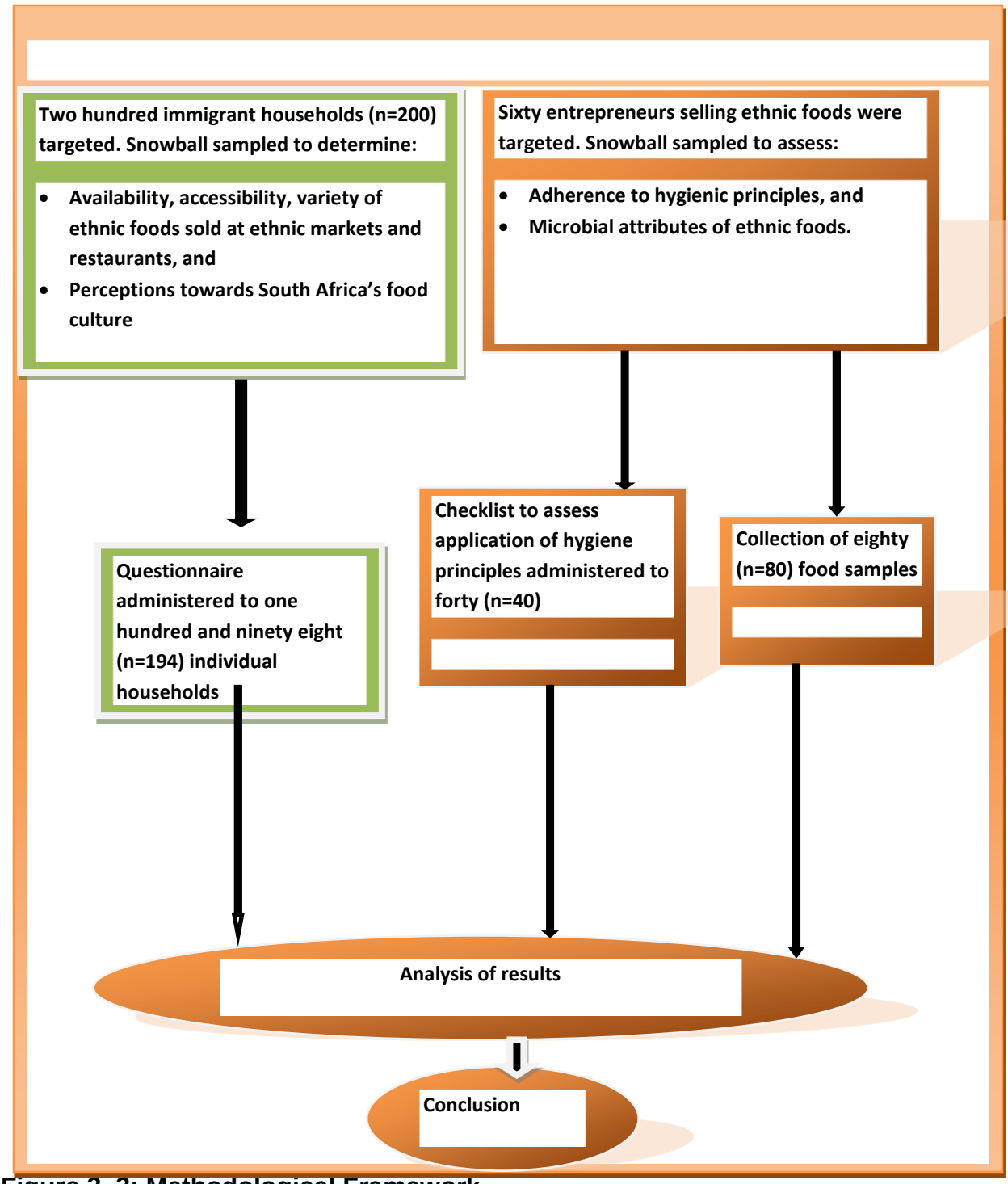

Figure 3. 3: Methodological Framework

3.6 Field work: Pilot study

A pilot study is done to determine if participants understand the questions well and to ensure that relevant data is collected (Strydom, 2002). Furthermore, it is done to estimate time, costs, and to pre-empt problems that may arise during the actual data collection phase (Strydom, 2002; Bryman, 2012). The pilot was conducted in Tshwane and Johannesburg Municipalities a month before the main data was collected. The piloting engaged 34 immigrants on continuity with original food culture, accessibility and availability of their ethnic food in South Africa.

The pilot study led to three significant changes. First, it revealed the need to modify the questionnaire so as to improve the response rate of some questions that were deemed too sensitive. For example, questions on household income and age, which most respondents were not comfortable responding to were modified, and ranges of income and age were instead asked in the final questionnaire. Secondly, it was after the pilot study that the need to make use of data collectors who are of Sub-Saharan African descent became apparent due to language difficulties and the fact that most respondents were not comfortable talking to the researcher who happens to be a South African. Thirdly, after the pilot study, immigrants from the Southern African countries of Zimbabwe, Namibia, Lesotho, Mozambique, Swaziland and Malawi were dropped as part of the main study population. This was due to the fact that the majority who had been interviewed indicated that their traditional food culture was not significantly different from the South African food culture and as such they were familiar with most products that are found in the major supermarkets.

3.7 Main Data gathering

Data collection took place between July and December 2015, 2 months after the piloting of the questionnaire (as discussed in section 3.6).

3.7.1 Questionnaire

The questionnaire were completed by fieldworkers in the presence of respondents in their homes or places of employment. This improved the response rate and prevented the loss

of questionnaire. It also assisted in preventing the misinterpretation of questions and ensured participation of all persons including those that are illiterate. Respondents were willing and forthcoming with the information, but at times questionnaire completion had to be suspended to allow respondents to attend to their duties.

3.7.2 Checklist

A checklist was administered to those entrepreneurs who had agreed to participate in the study. This activity took place at the premises where food was prepared and sold.

3.8 Laboratory analysis

Laboratory analysis will be discussed under the following subheadings: collection of samples; preparation of samples; culturing of bacteria and enumeration of bacteria.

3.8.1 Collection of the samples

Food samples were purchased and collected using takeaway compostable meal clam containers that are utilised by entrepreneurs to sell takeaway food. Samples were collected on the same day on which the checklist was administered to the entrepreneurs. Samples were kept in cooler boxes that contained ice packs to keep the temperatures below -4°C. The samples were then transported and delivered to the CSIR within two hours of collection and analysed immediately.

3.8.2 Preparation of the samples

Except for *Salmonella*, for which 25g was used, 20 g of each food sample was mixed with 180 ml of buffered peptone water, which gave 1:10 dilution. The suspension was further diluted by adding 1ml of 9ml buffered peptone to give 1:100 dilutions. One millimetre (1 ml) of this dilution was then added to 9ml buffered peptone water to give 1:1000 dilutions. Each of these dilutions was plated out (1ml) separately. Non-selective agar was used to plate total colony counts and coliforms while selective media was used to plate *E. coli* and *Salmonella*. Food samples were then incubated according to specification for each microorganism, in 90 cm diameter Petri dishes. All the plating were done in duplicates.

3.8.3 Culturing of bacteria

a) Total colony counts

Using a pour plate method, plate agar was used to enumerate total colony counts. Plates were incubated at 30°c for 72 hrs.

b) Coliforms *and E. coli*

Pour plate method using Violet-Red-Bile MUG agar (Biolab, RSA) was utilised to enumerate coliforms. The plates were incubated at 37°C for 18 to 24 hours. *Escherichia coli* ATCC 25922 was used as positive control.

c) Detection of *Salmonella*

Buffered peptone was used for pre-enrichment at 35ºC for 16-20 hrs. Then 0.1ml of pre-enrichment solution was plated on Brilliant Green Agar (Oxoid, Canada), and incubated aerobically at 42 ºC for 24-48hrs. *Salmonella enteritidis* was used as positive control.

3.8.9 Enumeration of bacteria

A Coulter counter was used to count the colonies. Bacterial counts were recorded as CFU/g. The counting range per plate was 300. Colonies above 300 were recorded as >300 000, meaning they were too numerous to count (TNT) after three dilutions. The computing method suggested by Frankhauser (2008) was used to compute the CFU/g using the following formula:

- CFU/Plate X suspension factor X dilution factor X aliquot factor = CFU/g.
- The suspension factor = 20g in 180 mL
- The dilution factor = 1 in 1000.
- Aliquot factor = 1ml that was inoculated on each Petriflm TM.

Therefore, CFU/g= CFU/Plate x 10 (suspension) factor x 10 (inverse of the dilution) X 1 (mL/ amount inoculated on each Petrifilm).

3.9 Data analysis

This section provides a description of how data was handled, analysed and summarised to achieve the objectives of the study.

3.9.1 Quantitative data analysis

Quantitative data was captured in MS Excel by four different people working independently. The data was then cross-checked and cleaned by two people to check for inconsistencies and errors. The data was analysed using SPSS (version 23) and Stata. The following statistical tests were performed to achieve the objectives of the present study:

a) To investigate continuation with ethnic dietary patterns, data was analysed using descriptive statistics and logistic regression analysis using Stata (version 14) as explained below:

i. Descriptive statistics

Due to small numbers some variables (age, marital status, qualifications, employment, household income, and duration of stay) were recoded before analysis. Descriptive statistics was performed to determine frequency and proportions of different variables of interest, and presented as frequency tables, graphs and charts.

ii. Logistic Regression analysis

To assess the relationship between independent variables (region of origin, age, marital status, qualifications, employment, household income, duration of stay) and outcome (adoption of South African food), a logistic regression model (below) as explained by Hosmer & Lemeshow (2000) was fitted to the data. Prior to fitting variables into a logistic regression model, bivariate analysis for each individual independent variable and the outcome (food adoption) was conducted.

The logistic regression function models the probability that the binary response is a function of a set of predictor variables $\boldsymbol{X} = [X_1, X_2, ..., X_p]^T$ and regression coefficients $\boldsymbol{\beta} = [\beta_0, \beta_1, ..., \beta_p]^T$ as given by the equation below:

$$\pi(\mathbf{X}) = \left[\frac{e^{\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_p X_p}}{1+e^{\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_p X_p}} \right]$$

Automatic backward stepwise selection was used to identify variables to be included in the model. This was followed by fitting a series of logistic models to account for all the variables that had been omitted by the backward stepwise approach. The final model was tested using goodness of fit as described by Hosmer-Lemeshow. In addition, both the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were used to assess the models to determine the model with the best fit.

b) To investigate the demographic characteristics and hygiene practices of the ethnic food vendors, microbial quality of food, and identify predictors of contamination, data was analysed using descriptive statistics and a binary logistic model using SPSS (version 23), explained below:

i. Descriptive statistics

Descriptive statistics was used to determine the relative frequencies of the socio-demographic profile of the food vendors, hygiene facilities, food handling practices and personal hygiene, product assortment, and prevalence of contamination. These were then displayed as frequency tables, graphs and charts.

ii. Binary logistic model

The relationship between food contamination (using total viable counts as the dependent variable) and independent variables (age of business, qualification, freezer, microwave, disinfecting surfaces between handling raw and cooked food, reheating of RTE food, manner in which food is reheated, temperature at which food is reheated, and ventilation at ethnic food premises) was assessed using a binary logistic model. Prior to analysis, the results of the total viable count were recoded into a binary variable with 0 standing for negative and 1 standing for positive. A cut- off point of $<10^4$ CFU/g prescribed by British Colombia Centre for Disease Control was adopted to classify food samples as either negative or positive . According to this criterion food samples that have $<10^4$ CFU/g are considered satisfactory, while samples between 10^4 to $<10^5$ CFU/g are regarded

as cautionary, but samples with ≥10^5 are considered unsatisfactory for human consumption (BC Centre for Disease Control, 2011). For the purposes of this study, food samples were classified as negative if they had <10^4 CFU/g or positive if it had ≥10^4 CFU/g).

Due to small numbers in some of the categories the following independent variables were recoded before data analysis commenced:

- Age of business= 0 standing for less than 3 years and 1 for 3 or more years.
- Qualification= 0 standing for below tertiary qualification while 1 was used for those having at least tertiary education.

Stepwise forward selection was used to identify independent variables to be included in the binary logistic model. The final model was tested using goodness of fit as described by Hosmer-Lemeshow. In addition, both AIC and BIC were used to assess the models to determine the model with the best fit.

3.9.2 Analysis of qualitative data

Qualitative data was analysed using Marshall and Rossman's approach described by De Vos (1998). Note cards of available data were used to organise data manually. Prominent themes were identified by noting recurring patterns from the participants' responses. Patterns, themes and categories were then generated from the data. These were then sorted logically to identify discrepancies and develop new insights. Emerging hypothesis was evaluated and challenged against the data. Furthermore, data was evaluated for adequacy, credibility and functionality. The researcher then looked for possible explanations of the emerging data and gave descriptions thereof. This data was then used as a supportive database for the quantitative data.

3.10 Ethical considerations

Ethical approval (Ref #: 2014/CAES/113) for this research was granted by the ethics committee of the College of Agriculture and Environmental Science at the University of South Africa before the study commenced (Annexure III). Written informed consent was

obtained from all household members and entrepreneurs who participated in the study (Annexure 1V). The consent form was read and explained to each participant, who had to sign before the interview or checklist was administered. This consent form explained the details of the study and assured participants that information would only be used for the purposes of the study and that no individual names would be mentioned. Furthermore, participants were informed that participation was voluntary, and that they were free to withdraw from the study at any stage. To ensure anonymity, no names of household members or entrepreneurs were recorded on the questionnaire.

Research assistants used to collect data for this study were of Sub-Saharan origin and conversant with the language of the participants. Apart from being familiar with the language they were also chosen because they are university students who are familiar with principles of data collection. Furthermore, before commencing with data collection the research assistants were trained and given the opportunity to familiarise themselves with the contents of the questionnaire. Furthermore, to pre-test their understanding, the same research assistants were used during the pilot study which was carried out to test the questionnaire.

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CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, findings of the study are presented. This chapter is divided into three sections. The three sections comprises of themes that were informed by the eight objectives of this study discussed in section 1.7. Under each theme, results, discussions and references are provided. The themes are:

- Continuation with ethnic dietary patterns: lessons from sub-Saharan immigrants residing in Gauteng.
- Demographic characteristics and hygiene practices of vendors of ethnic foods.
- Microbial quality of the selected ethnic foods and predictors of contamination.

4.2 Section A: Continuation with ethnic dietary patterns: lessons from sub-Saharan immigrants residing in Gauteng

Results and discussions of the continuation with ethnic dietary patterns: lessons from sub-saharan immigrants residing in Gauteng are presented in this section. This section covers the first four foci of the research problem, namely:

- to determine immigrants' perceptions towards South Africa's food culture;
- determine the contribution of ethnic food and ethnic food markets on the dietary patterns of immigrants;
- investigate the availability and accessibility of the ethnic foods available in ethnic food markets, and restaurants;
- document coping strategies adopted by immigrants when faced with shortage of their ethnic foods or ingredients in South Africa.

4.2.1 Socio-economic information of the respondents

In this section, the economic and the socio-demographic information is described under the following headings:

(i) Demographic profile of the participants,

(ii) Socio-economic profile of the participants.

4.2.1.1 Demographic profile of the participants

The demographic profile of the respondents is presented in table 4.1. Nearly half of the respondents (49.5%; n=96) were under 29 years of age, followed by respondents who were between 30 and 39 years of age (33%; n=64). Most respondents (58.2%; n=113) were not married. More than half (56.7%; n=110) of the respondents had tertiary education, and rest (43.3%; n= 84) had only high school education or lower. More than half (62.9%; n=122) of the respondents had lived in South Africa for more than four years. More respondents (41%; n=80) were from West Africa, as compared to those from Central Africa (30%; n=58) and East Africa (29%; n=56).

Table 4. 1:The demographic details of respondents (n=194)

Variable	Level	Number of respondents (n)	Percentage (%)
Age	<29 years	96	49.5
	30–39 years	64	33.0
	>40 years	34	17.5
Total		194	100.0
Educational level	Below tertiary education	84	43.2
	Tertiary education	110	56.7
Total		194	100.0
Marital status	Unmarried	113	58.2
	Married	81	41.7
Total		194	100.0
Duration of residence in South Africa	>3 years	72	37.1
	4–6 years	60	30.9
	7 years or more	62	32.0
Total		194	100.0
Region of origin	West Africa	80	41.0
	East Africa	56	29.0
	Central Africa	58	30.0
Total		194	100.0

4.2.1.2 Socio-economic profile of respondents

Table 4.2 describes employment status, household income and money spent on food, as reported by the respondents.

As shown in Table 4.2 most respondents (41.2%; n=80) were self-employed and only 31.4% (n=61) were in full-time jobs. Although the nature of their self-employment was not specifically asked in this study, personal observation during data collection suggested

that the majority of the respondents who indicated that they were self-employed worked as hairstylists.

Table 4. 2:Socio-economic profile of respondents (n=194)

Variable	Level	Number of respondents (n)	Percentage (%)
Employment status	Full-time jobs	61	31.0
	Part-time / temporary jobs	21	11.0
	Self-employed	80	41.0
	Unemployed /Student	32	17.0
Total		194	100.0
Household income per month	No response	3	1.5
	Under R5 000	62	32.0
	R5 000–R10 000	56	28.9
	R11 000–R15 000	41	21.1
	>R20 000–R25 000	32	16.5
Total		194	100.0
Money spent on food per month	>R1 499	80	41.2
	R1 500–R2 499	43	22.2
	R2 500–R3 499	45	23.2
	R3 500–R4 500	26	13.4
Total		194	100.0
Money spent of ethnic food per month	Less than R300	41	21.1
	R301-R600	53	27.3
	R601-R900	27	13.9
	R901-R1200	24	12.4
	Above R1200	49	25.2
Total		194	100.0

Assessment of the household income per monthly revealed that most respondents (32.0%; n=62) earned under R5 000 and only 16.5% (n=32) earned above R20 000.The results also revealed that most respondents (41.2%; n=80) spent less than R1500 and only 13.4% (n=26) spent between R3500 to R4500 on food per month. The amount spent on ethnic foods per month also varied across the respondents, with most respondents (27.3%; n=53) indicating that they spent between R310 – R600 per month. This was followed by 25.2% (n=49) who indicated that they spent more than R1200 on ethnic foods per month.

4.2.2 Immigrants' perceptions towards South Africa's food culture.

The immigrants' perceptions towards South Africa's food culture, adoption of South African food, level of adoption, reasons for adopting or not adopting, and South African food that had been adopted were investigated and are presented in this section**.**

4.2.2.1 Adoption of South African food

Out of 194 respondents, 78.4 % (n=152) indicated that they had adopted the South African food culture (Table 4.3). Among those who had adopted South African foods the level of adoption varied considerably. The following four (4) patterns of dietary acculturation emerged: strict continuity with their traditional food (21.6%; n=42); very limited adoption (21.1%; n=39); limited adoption (50.5%; n=98); complete adoption of South African food culture (7.7%; n=15).

Table 4. 3:Adoption of South African food among respondents (n=194)

Variable	Level	Number of respondents (n)	Percentage (%)
Adoption of South African food	Yes	152	78.4
	No	42	21.6
Total		194	100.0
Level of adoption	Strict continuity with traditional Food	42	21.6
	Limited adoption	98	50.5
	Very limited adoption	39	20.1
	Strictly SA food	15	7.7
Total		194	100.0
Reasons for adopting	Not applicable	42	21.6
	Traditional food too expensive	76	39.2
	Unavailability of traditional food	49	25.3
	Convenience	15	7.7
	I like South African food	8	4.1
	My kids prefer it	4	2.1
Total		194	100.0
Reasons for not adopting	Not applicable	152	78.4
	Unfamiliar taste	33	17.0
	Inability to cook SA food	6	3.1
	SA food is unhealthy	3	1.5
Total		194	100.0

Complete adoption of South African food was defined as eating South African food during all mealtimes and eating traditional food only on special occasions, such as at cultural gatherings, weddings and naming ceremonies.

Limited adoption meant eating South African food in combination with traditional food; very limited adoption was defined as eating traditional food at all mealtimes, while eating South African foods only when visiting friends or dining out. Strict continuity with traditional food meant that the respondents always eat traditional food for all meals.

During the interviews it became clear that immigrants did not distinguish food that was part of the South African cuisine from globalised or westernised foods. They considered all food – including fast foods – to be part of the traditional South African food culture, as long as it fell outside their original food culture.

Respondents gave various reasons for adopting South African food (see Table 4.3). Among the households that reported having adopted the South African food culture the most common reason was that the price of traditional food was too high (39.2%; n=76), followed by the unavailability of traditional food (25.3%%; n=49).

Of the 42 respondents that indicated that they had not adopted the South African food culture, the main reason given was the unfamiliar taste (17.0%; n=33%). Other reasons included inability to cook South African food (3.1%; n=6) and that they believed that the food is unhealthy (1.5%; n=3).

4.2.2.2 Food adoption per region

Although the difference between the regions with regard to food adoption was minimal, the results showed that slightly more respondents (80.4%; n=45) from the East African region (Table 4.1 and Figure 4.1) had adopted South African food compared to those from Central (79.3%; n=46) and West Africa (76.2%; n=61).

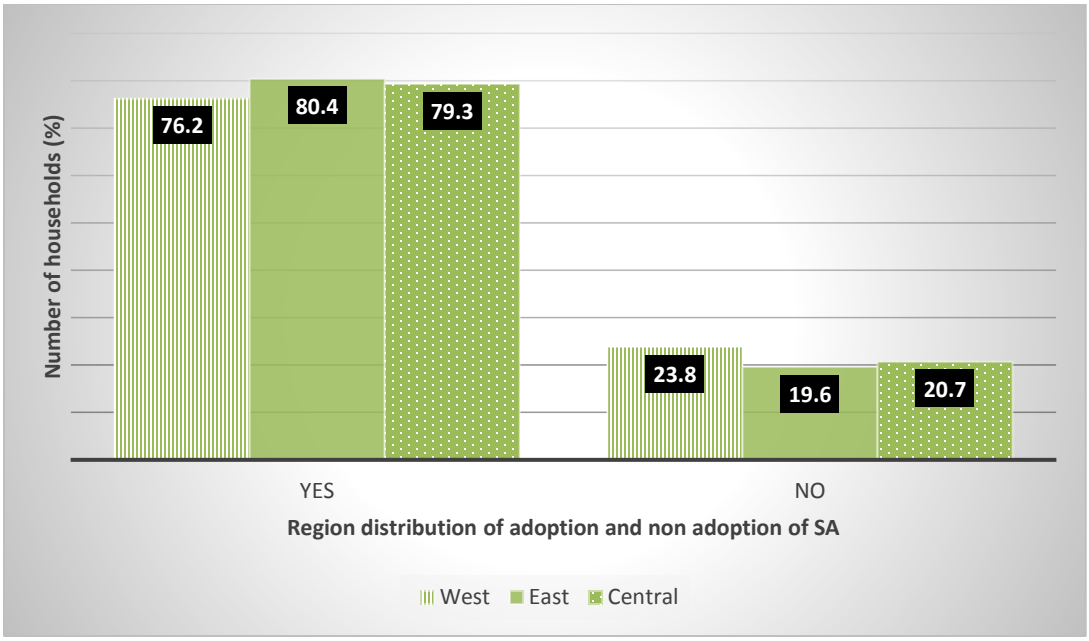

Figure 4. 1: Adoption of South African food by region

4.2.2.3 Level of adoption per region

Although slightly more respondents from East Africa indicated that they had adopted the South African food culture (Figure 4.1 and Figure 4.2), it was respondents from the Central African region that had the highest numbers that strictly followed a South African diet.

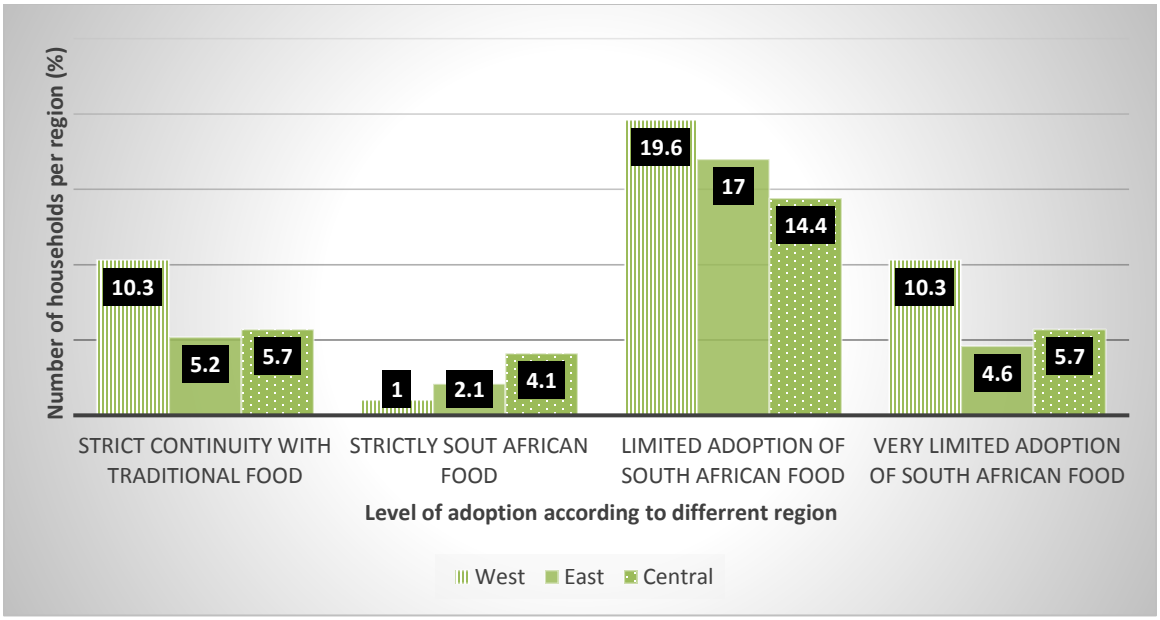

Figure 4. 2: South African food adoption per region

Most respondents who indicated that they strictly continue with their traditional food were from West Africa (10.3%; n=20). This was followed by 5.7% (n=11) respondents from Central Africa and 5.2% (n=10) from East Africa who also indicated that they strictly adhere to their traditional foods.

4.2.2.4 The South African foods that were adopted more frequently

The most common food items that the respondents had started eating since settling in South Africa (Figure 4.3) included: pap (84.5%; n=164); fried potato chips (sometimes known as slap chips) (43.8%; n=85); cold drinks (42.8%; n=83); fast foods (37.6%; n=73); *sphathlo* (30.9%; n=60); fat cakes (commonly known as *amagwinya*) (30.4%; n=59); and spinach (24.2%; n=47). In most cases respondents listed more than one food item, which explains why the percentages in some cases add up to more than 100%. Other items that have been adopted by immigrants included braai meat (roasted meat) (15.5%; n=30), samp (coarsely ground mealie meal) and beans (11.9%; n=23), and chakalaka (a spicy vegetable relish) (9.8%; n=19).

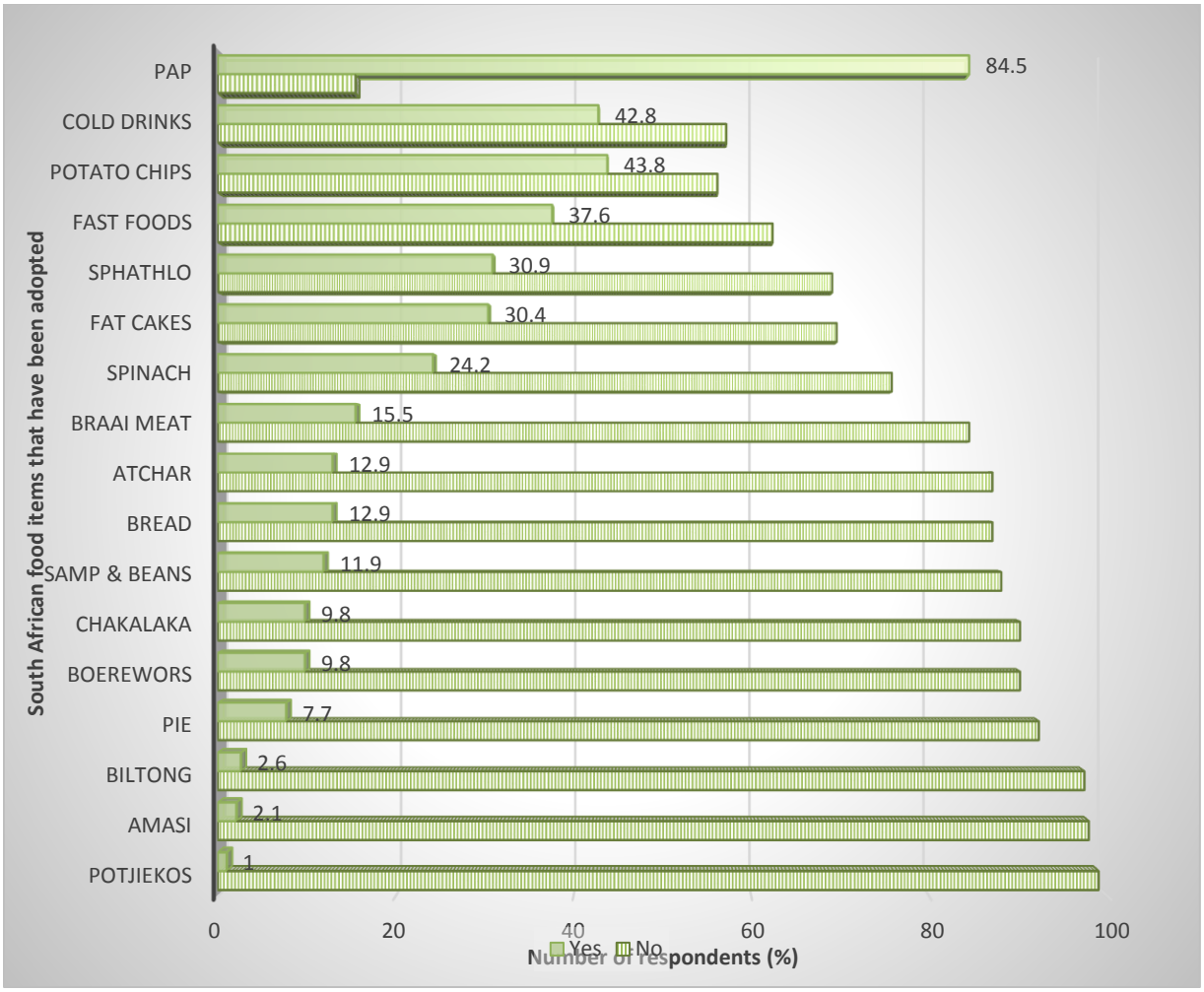

Figure 4. 3: Proportions of South African foods that have been adopted by immigrants

The most popular fast food outlets among respondents were Kentucky Fried Chicken, McDonald's, Steers, Nandos and Roman's Pizza**.**

Sphathlo (Figure 4.4), atchar (Figure 4.5) and *amagwinya* (Figure 4.6), common in the black townships of Gauteng were among the foods frequently patronised by immigrants. S*phathlo* (sometimes known as *kota*) is an African burger made of a quarter loaf of bread and usually filled with ingredients, such as potato chips, cheese, polony, russians (spicy sausages), atchar (a spicy condiment), fried eggs and tomato sauce.

Figure 4. 4: Isiphathlo

(Ingredients list: white bread, potato chips, cheese, polony, russians, atchar, fried eggs and tomato sauce*)*

Figure 4. 5: Atchar

(Ingredients: green mangoes, salt, sunflower oil, green chillies, red chillies, mustard powder, vinegar and atchar masala).

Figure 4. 6: Amagwinya (Fat cakes)

4.2.3 Contribution of ethnic foods and ethnic markets to dietary patterns of sub-Saharan immigrants

Results on the importance of ethnic foods in the diet of the immigrants, the main sources of ethnic foods, the number of times respondents consumed ethnic foods and reasons thereof are presented in this section.

4.2.3.1 The importance of ethnic foods

Results obtained from the survey showed that all (100% n=194) Sub-Saharan immigrants believed that their ethnic foods are important to them, and that, given opportunity, they would like to consume their ethnic foods on a daily basis.

4.2.3.2 Main sources of ethnic foods

Three different sources of ethnic foods were identified, and they included:

- Ethnic food markets;

- Relatives living in South Africa; and or
- Relatives back home

Overall, the majority of the respondents (94.8%; n=183) indicated that they source their ethnic foods from the ethnic food markets as shown in Figure 4.7. Only 2.1% (n=4) indicated that the ethnic foods were shipped to them by the family back home. Results also indicated that none of the Sub-Saharan immigrants' household obtained their ethnic foods from the major South African supermarkets.

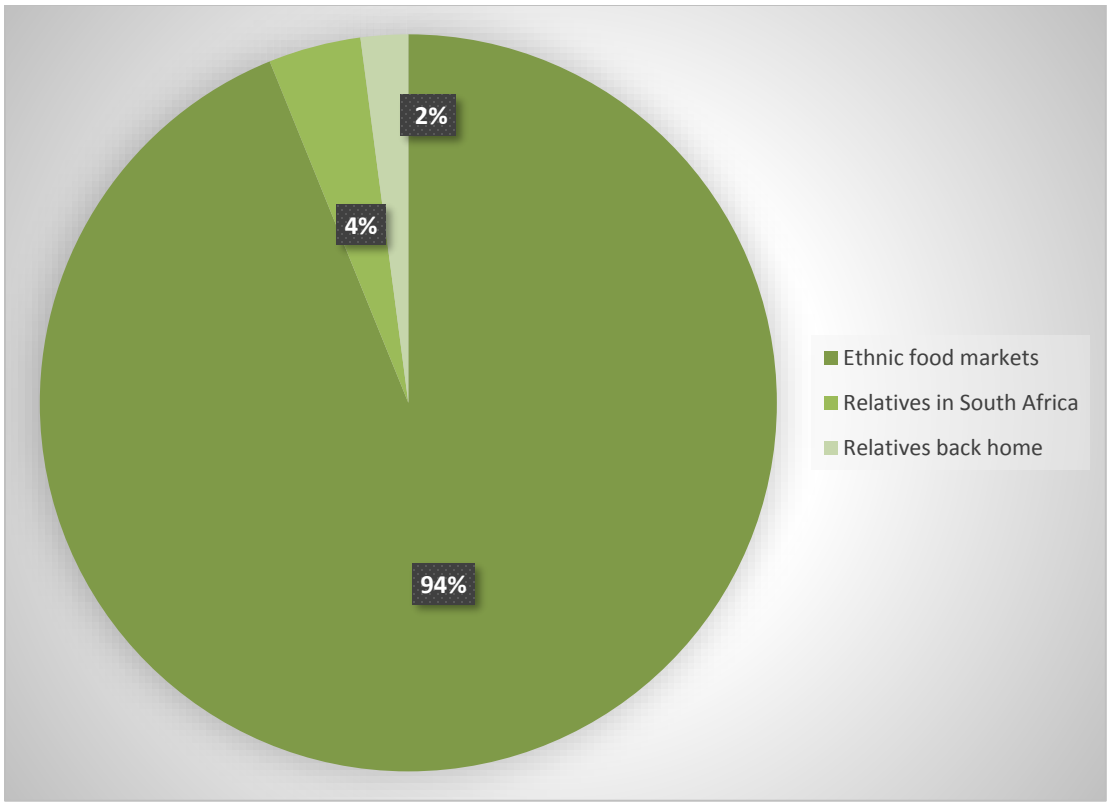

Figure 4. 7: Source of ethnic foods

4.2.3.3 Frequency of consumption of ethnic foods among respondents

Overall, most of the respondents (39.2%, n= 72) indicated that they consume ethnic foods three times a week. This was followed by 32% (n=62) who indicated that they consumed ethnic foods once a week (Table 4.4). Very few (7.2%; n=14) respondents indicated that they consumed ethnic foods only during special occasions.

Table 4. 4: Consumption and procurement of ethnic foods (n=194)

Variable	Level	Number of respondents (n)	Percentage (%)
Number of times ethnic foods is consumed	Every day	42	21.6
	Three times a week	76	39.2
	Once a week	62	32.0
	During special occasions	14	7.2
Total		194	100.0
Number of times ethnic food markets are visited	Once a month	44	22.7
	Twice a month	73	37.6
	Three times a month	44	22.7
	Four times a month	16	8.2
	More than 4 times a month	17	8.8
Total		194	100.0

In terms of the number of times ethnic food markets are visited, most respondents (37.6%, n=73) visited ethnic food markets twice a month and followed by those who visited them three times or once a month (22.7%, n=44).

4.2.3.4 Reasons why ethnic foods are important to Sub-Saharan immigrants

Four reasons why ethnic foods are important amongst the Sub-Saharan community were given.

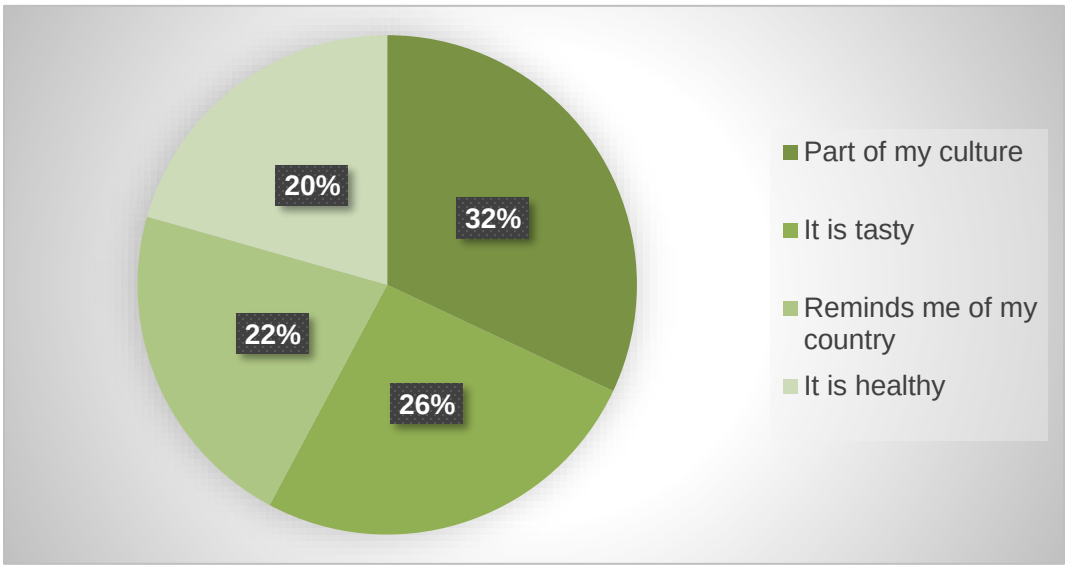

Figure 4. 8: Reasons why ethnic foods are important to Sub-Saharan immigrants

The most common reason for wanting to retain their food culture, as shown in Figure 4.8, was that ethnic food is part of their culture (32%; n=62). The next most common reason of why ethnic food is important was that ethnic food is tasty, followed by the fact that it reminded respondents of their home country (21.6%; n=24).

4.2.3.5 Other benefits of ethnic food markets

Apart from being the main source of food for the participants, the results of this study revealed that ethnic food markets and restaurants offer other social benefits (Figure 4.9). Of those respondents who indicated that there were benefits the largest number (20.6%; n=40) reported they used their visits to these markets to meet friends. 18,5% (n=35) indicated that while at the ethnic markets they get to hear news from back home and only 5,2% (n=10) indicated that they also use ethnic food shops and restaurants to send messages back home.

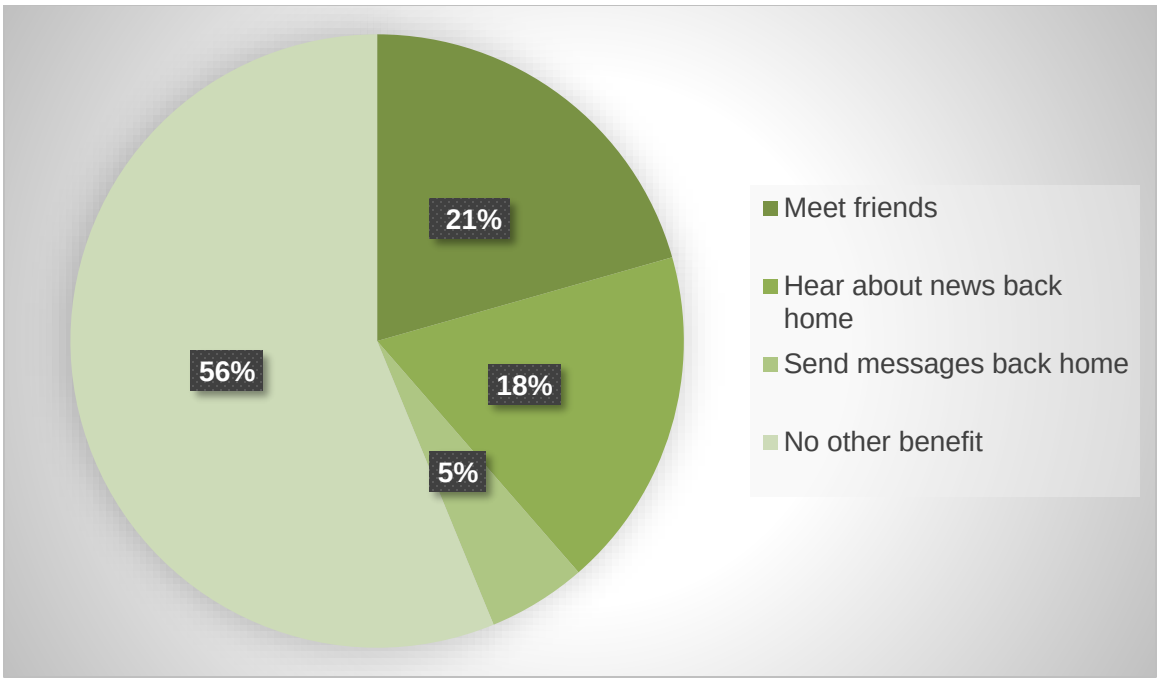

Figure 4. 9: Other benefits obtained from visiting ethnic food markets

4.2.4 Availability, and accessibility of ethnic foods

In this section availability and accessibility of ethnic foods from the South African foods markets is described. Where ethnic foods are viewed as not being available, strategies that are adopted to improve accessibility are also presented.

4.2.4.1 Availability and accessibility of ethnic foods

Availability and accessibility of the ethnic food markets are the focus here in terms of physical availability of food, affordability (in terms of cost), variety of the traditional foods, quality of the foods in terms of perception of the participants, and accessibility of the shops in terms of proximity.

The study revealed that availability of ethnic foods varied among respondents. Table 4.5 indicates that 32.5% (n=63), reported that ethnic foods were highly available, while 67.5% (n=131) reported that ethnic foods were somewhat unavailable. Only 7% (n=14) respondents reported that that ethnic foods were affordable, with 65% (n=126) indicating that they are slightly unaffordable and 27.8% (n=57) reporting that they are very unaffordable.

Table 4. 5: Availability and accessibility of ethnic foods (n=194)

Variable	Level	Number of respondents (n)	Percentage (%)
Traditional food availability	I always find what I am looking for	63	32.5
	I sometimes do not find what I am looking for	109	56.2
	I hardly find what I am looking for	22	11.3
Total		194	100.0
Affordability of traditional food	Food is affordable	14	7.0
	It is slightly unaffordable	126	65
	It is very unaffordable	54	27.8
Total		194	100.0
Variety of traditional food	Wide variety	47	24.2
	Limited variety	113	58.2
	Very limited variety	34	17.5
Quality of the food	Excellent quality	24	12.4
	Poor quality	123	63.4
	Very poor	47	24.2
Total		194	100.0
Accessibility of the shops	Very accessible	73	38.0
	Slightly inaccessible	97	50.0
	Very inaccessible	24	12.0
Total		194	100.0

Of the 194 participants of the study, 24.2% (n=47) reported that there was a wide variety of ethnic foods. Majority (75.8%, n=147) of the respondents indicated that the variety of the ethnic foods was limited. There were 63.4% (n=123) respondents who indicated that the quality of ethnic food sold at the ethnic food markets was poor. Out of the 88% (n=170) respondents who were dissatisfied with the quality of the ethnic foods sourced on the ethnic markets, 24.2% (n=47) indicated that the quality was very poor. Only 12.4% (n=24) reported that the quality was excellent.

4.2.4.2 Ethnic foods that are not available in South African food markets

The results of the study revealed that there were a number of familiar traditional food items that were difficult to find in South African markets. This included mainly staple foods such as plantain, fufu, pounded yam, cocoyam, cassava, kenkey, banku and processed cassava (Table 4.6). Respondents from East Africa said that they struggled to locate mainly staple foods, meat and meat products. These staple foods included sorgum, cassava, millet flour, green bananas and groundnuts, while meat and meat products that were difficult to get included goat meat, grasshoppers, fresh tilapia, dried fish and silver fish.

Table 4. 6: Ethnic foods that are difficult to locate in South African markets

Food type	West	East	Central
Staple foods	Plantain, fufu, pounded yam, pounded fufu, cocoyam, cassava and cassava products (*eba*), *kenkey*,and *banku*.	Sorghum, cassava, yam, millet flour, green banana, ground nuts,	Plantain
Meat and meat products	Snails	Goat meat, grass hoppers, fresh tilapia, dried fish, silver fish	Edible insects, goat meat, bush rat, caterpillar, mudfish
Vegetables and fruit	Cocoyam leaves, cassava leaves	*Masau*, peas, fresh beans	Cassava leaves, African leaves, Chadian pineapple, epinard, *ngai-ngai*, pulm nut, cocoyam leaves

Immigrants from Central Africa struggle mainly to find vegetables and fruits such as cassava leaves, African leaves, Chadian pineapple, epinard, *ngai-ngai*, palm nut, cocoyam leaves and meat products such as edible insects, goat meat, bush rat, caterpillar, and mudfish.

4.2.5 Coping strategies

Coping strategies used by Sub-Saharan immigrant households to cope with unavailability and inaccessibility of ethnic foods are summarised in Table 4.7. Respondents were

requested to select all the coping strategies utilised by them, hence the numbers do not add up to 100% (n=194). The results revealed that there are 6 coping strategies that are mainly adopted. The most common strategies are relying on less preferred food (38.7%; n=75), and replacing the unavailable ingredients with similar ingredients that are in the market (37.6%; n=73). The least used coping strategy was borrowing food from relatives (11.9%, n=23).

Table 4. 7:Strategies used by Sub-Saharan immigrants to cope with unavailability and inaccessibility of ethnic foods (n=194)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Coping strategies	Rely on less preferred food	75	38.7
	Replace with similar ingredients	73	37.6
	Skip a meal	34	17.5
	Limit portion sizes	30	15.5
	Use spices to acquire desired taste	30	15.5
	Borrow from relatives	23	11.9

4.2.6 Investigating factors associated with adoption of South African foods

As explained in chapter three (section 3.9.1, a, ii) factors associated with adoption of South African food were investigated by testing for association between the independent variables (region of origin, age, marital status, education, employment, household income, duration of stay) and the binary dependent variable (adoption; 1= adopted and 0 = not adopted). Due to the small numbers in some of the categories, the following variables were recorded: age, marital status, qualification, duration of residence, income and amount spent on food. The associations were tested using both bivariable and logistic regression.

4.2.6.1 Results of the bivariate analysis

Cross-tabulation for each individual independent variable was performed with the outcome (food adoption) (Table 4.8). Using bivariable analysis, duration of residence was the only variable that was significantly associated (Chi2 =11.724, p=0.003).

Table 4. 8: Results of the bivariate analysis

Variable	Categories	Adopted %, (n)	Not adopted %, (n)	Chi²	P-value (P>z
Age	<29 years	80.2 (77)	19.8 (19)	0.641	0.726
	30-39 years	75 (48)	25.0 (16)		
	>40 years	79.4 (27)	20.6 (7)		
Marital status	Unmarried	75.2 (85)	24.8 (28)	1.562	0.211
	Married	82.8 (67	21.6 (14)		
Region	West	76.3 (61)	23.7 (19)	0.372	0.830
	East	80.3 (45	20.7 (11)		
	Central	79.3 (46)	21.7 (12)		
Qualification	Below tertiary	73.1 (62)	26.2 (22)	1.800	0.180
	Tertiary education	81.8 (90)	18.2 (20)		
Duration of residence	< 3years	83.6 (56)	16.4 (11)	11.724	**0.003**
	3-6years	63.3 (38)	36.7 (22)		
	>7 years	86.6 (58	13.4 (9)		
Employment status	Student/ unemployed	84.4 (27)	15.6 (5)	6.608	0.085
	Self-employed	72.5 (58)	27.5 (22)		
	Part-time / temporary	66.7 (14)	33.3 (7)		
	Full-time	86.9 (53)	13.1 (8)		
Income per month	<R5000	69.2 (45)	80.8 (20)	5.0100	0.171
	R5000-R10 000	82.1 (46)	17.9 (10)		
	R11 000-R20 000	85.4(35)	14.6 (6)		
	>R20 000	81.3 (26)	21.7 (42)		
Amount spent on food per month					
	<R1499	82.5 (66)	17.5 (14)	4.344	0.227
	R1500-R2499	83.7 (36)	16.3 (7)		
	R2500-R3499	68.9 (31)	31.1 (14)		
	R3500-R4500	73.1 (19)	26.9 (7)		
	Total	78.4 (152)	21.6 (42)		

4.2.6.2 Multivariable analysis of factors associated with adoption of South African foods

As indicated in section 3.9.1 the logistic model described below was fitted to the data to determine factors that predict adoption of South African foods by Sub-Saharan immigrants.

$$\pi(\mathbf{X}) = \left[\frac{e^{\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_p X_p}}{1+e^{\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_p X_p}} \right]$$

The final model was tested using goodness of fit as described by Hosmer-Lemeshow (Hosmer & Lemeshow, 2000). Both the AIC and the BIC for the saturated model and the most parsimonious model are presented in Table 4.9. The rest of the AIC and BIC are presented in Annexure V.

Table 4. 9: Model fitting information

Model	Model fitting criteria		Good-of-fit test
	AIC	BIC	
Model B	199.944	248.962	p <0.06
Final model	196. 297	238.779	p <0.06

Table 4.10 presents results of the reduced model (only including factors found to be significant when using backward stepwise regression models).

Table 4. 10:Predictors of adoption of South African food

Adoption	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval
Amount spent on food					
Reference point (under R1499)					
1500-2499	1.59	0.91	0.81	0.42	.518-4.89
2500-3499	3.34	1.69	2.39	**0.017**	1.24-9.02
3500-4500	3.99	2.55	2.17	**0.030**	1. 144-13.98
Duration of residence					
Reference point (less than 3 years)					
3-6 years	5.16	2.61	3.25	**0.001**	1.91-13.92
>7years	1.35	0.77	0.53	0.594	.44-4.15
Income					
Reference point (<R5000)					
5000-10 000	0.52	0.13	-2.56	**0.040**	.13-.95
>11 000	0.38	0.19	-1.91	**0.057**	.14-1.02
Employment status					
Reference point (student/unemployed)					
Self-employed	2.32	1.47	1.34	0.181	.67-8.01
Part-time/Temporary	5.85	4.63	2.24	**0.025**	1.24-27.57
Full-time	1.64	1.19	0.69	0.491	.39-6.83
Marital status					
Reference point (unmarried)					
Married	.48	.22	-1.57	0.116	.97-1.19
Educational level					
Reference point (below tertiary)					
Tertiary education	.62	.27	-1.09	0.275	.27-1.45
_cons	0.737998	0.518487	-371	0	.0186224- .2924651

Accounting for the amount spent on food the results showed that the odds of adopting South African food for those spending between R2500-R3499 were 3.34 (p=0.017) times likely to adopt South African foods compared to those spending under R1499. While those that indicated that they spend between R3500-R4500 were 3.99 (p=0.030) times likely to adopt compared to those spending less than R1499 per month.

The results showed that odds of adoption amongst Sub-Saharan immigrants that had been residing in South Africa for 3-6 years is 5.16 times those with duration of residence less than 3 years. The difference was highly significant (p=0.001).

However, higher income was protective against adoption (OR 0.52, 95 % CI:0.32, 0.86). The difference was highly significant (p=0.040) for those earning between R5 000-R10 000 and (p=0.057) for those earning above R11 000.

The results also revealed that odds of adoption amongst those employed on a temporary/part-time basis was 5.85 times those of students /unemployed respondents. The difference was highly significant (p=0.025)

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4.2.8 Discussion of the results of the analysis

a) Socio demographic results

In this study (Table 4.1), majority of the immigrants sampled (82.5%) were below 40 years of age. This was expected and is consistent with the past studies that have indicated that the majority of the immigrants are young (Vahabi & Damba, 2013; Anderson *et al.*, 2014) and have probably moved in search of better economic conditions. The age distribution of the respondents in the present study are consistent with the report by Statistics South Africa (2014a) that indicated that the majority of the recipients of temporary and permanent residence permits are between the ages of 15 and 64 years. This signifies that the majority of immigrants belong to the economically active group.

From the results of this study most immigrants were fairly well educated, with over half of the respondents (56.7%; n =110) holding tertiary education. The high educational levels reported in this study are consistent with some previous findings (Vahabi & Damba, 2013; Okafor *et al.*, 2014). In a study conducted by Vahabi & Damba (2013) in Toronto among Latin American immigrants, the majority of respondents (78.6%) had more than secondary school diploma.

However, these results are in contrast with other studies (Hadley *et al*., 2010; Kiptinness & Dharod, 2011; Anderson *et al.*, 2014), which reported very low education levels amongst immigrants who were studied. For example, in a study by Kiptiness & Dharod (2010) conducted in the USA amongst Bhutanese refugees, 64% of the participants had no formal education, while in a study by Anderson *et al.* (2014) only 17.5% immigrants had tertiary education. The inconsistencies between these studies and this study could be attributed to the immigration status of the immigrants. Unlike the current study, which included immigrants with various immigration statuses, the latter studies exclusively focused on refugees. Previous research shows that refugees are extremely vulnerable to having low levels of education due to the fact that most countries of origin have been experiencing civil wars for a number of years (Kiptinness & Dharod, 2011; Anderson *et al.*, 2014).

Previous studies show that the marital status of immigrants has a significant effect on the consumption patterns and adoption of host country's food. In a study by Njomo (2012) unmarried immigrants spent less on food and ate at restaurants more frequently compared to their married counterparts, who prepared most meals at home. Furthermore, previous research conducted in Oslo, Norway, also indicates that husbands tend to be reluctant to adopt host country's food, which serves as a hindrance to adoption of host country foods (Garnweidner *et al.*, 2012).

In this study, 62.9% (n=122) had been in the country for more than three years. This is comparable to findings of previous studies (Njomo, 2012) conducted among Sub-Saharan immigrants in South Africa, which revealed that most respondents (59%) had been living in South Africa for over 3 years. Therefore, in light of the fact that the immigrants under study had been living in South Africa for a while (> 3 years), it is possible that they would have attained a certain degree of familiarity with the local foods and eating patterns (Njomo, 2013). On the other hand, since the length of residence of the majority of the respondents (68%) is less than 7 years, this might suggest that majority of the respondents were first generation immigrants. Therefore, they would be expected to still be having strong ties to their traditional foods, as suggested by Sturkenboom *et al.* (2015). This explains the bicultural eating patterns observed in this study.

The unemployment rate in South Africa is currently sitting at 27.7 % (Statistics South Africa, 2017). This unemployment rate is one of the highest in the world, and is assumed to be even higher among immigrants. The reason for this is that countries impose a number of employment restrictions on foreign nationals (Shackelford, 2010). It therefore makes sense that only 31.4% (n=61) of the respondents were in full-time jobs, and most respondents (41.2%) in this study were self-employed. Although the nature of the self-employment was not investigated in this study, personal observation during data collection suggested that the majority who indicated that they were self-employed worked as hairstylists. This observation is supported by the fact that the majority (76.3%; n=145) earned below ZAR15 000 per month, which is below the average national income of ZAR17 517 (Statistics South Africa, 2016). According to Statistics South Africa (2016), the average for general services is even lower, ranging from R11, 456 to R11 7454 per

month. In the view of this, these findings suggest that the study population was not able to secure decent jobs. This confirms previous reports that most immigrants hold low-paying jobs (Vahabi & Damba, 2013; Anderson *et al.*, 2014). In a study done in Cape Town, South Africa, most immigrants are employed as security guards, cashiers, cleaners or waiters (Njomo, 2012).

The results of this study revealed that over half of the respondents (56.7%; n=110) had university degrees, yet only 31.4% (n=64) had fulltime jobs and only 23.7% (n=46) earned above the national monthly average income. These results are consistent with previously published evidence on the inability of immigrants to find jobs or hold low- paying jobs despite holding high educational qualifications (Vahabi *et al.*, 2011; Creese & Wiebe, 2012; Vahabi & Damba, 2013). For example, in a study by Vahabi & Damba (2013), 86% of the immigrants who had college or university degrees had low-paying jobs, yet 61.4% respondents' main source of income was social assistance such as provincial or municipal welfare or child grant. Despite having university degrees, vast job experience and strong English proficiency, 79% of the men and 71 % of the women were under- or unemployed in a study that was conducted amongst Sub-Saharan immigrants living in Canada (Creese & Wiebe, 2012). Low income was associated with higher dietary changes and poor food choices in previous studies (Dharod *et al.*, 2013; Anderson *et al.*, 2014; Sanou *et al.*, 2014).

b) Immigrants' perceptions towards South Africa's food culture.

Consistent with previous studies by Garnweidner *et al.*, 2012; Njomo, 2013; Sanou *et al.*, 2014 the current study revealed that although the majority of immigrants try to preserve their traditional food culture upon resettlement, some level of dietary acculturation takes place. For example, in a Norwegian study on African and Asian immigrants conducted by Garnweidner *et al.* (2012), different patterns of dietary acculturation were observed. While in a study by Njomo (2013) although immigrants maintained their traditional food culture, the majority only ate it three times a week. Even though there was the question on what these immigrants eat on the other days of the week, authors were of the view that dietary acculturation was taking place. Sanou *et al*.(2014) also confirms these findings by stating

that although immigrants try to maintain their traditional diets, circumstances do compel them to deviate from their original diets.

Similar to the previous studies conducted amongst immigrants from Africa and Asia (Garnweidner *et al.* 2012; Park *et al.* (2014), several patterns of dietary change were observed in this study, and these includedstrict continuity with traditional food culture, limited adoption, very limited adoption, and strictly South African food. In a study of African and Asian immigrants, it was observed that immigrants followed three patterns of dietary acculturation, namely, strict continuity, flexible continuity and limited continuity of the original food culture (Garnweidner *et al.*, 2012). According to Park *et al.* (2014) Mongolian immigrants living in Korea either followed a traditional diet, transitional or strictly Korean diet. None of the immigrants in the present study had fully adopted South African food habits. As explained in section 4.2.1 even immigrants following strictly South African food culture still consumed their traditional food at special events. This is consistent with the results of the study by Garnweidner *et al.* (2012). Other studies also confirm that the majority of immigrants follow bicultural eating patterns (Garnweidner *et al.*, 2012; Deng *et al.*, 2013; Shisana *et al.*, 2013). Although bicultural eating patterns are believed to be essential in preventing negative health outcomes which could result in food insecurity amongst immigrants (Kiptinness & Dharod, 2011), several studies have shown that, due to the low socio-economic status of immigrants, they often make unhealthy dietary changes (Dharod *et al.*, 2013; Anderson *et al.*, 2014; Sanou *et al.*, 2014). In the present study, very few immigrants (21.6%; n=42) followed strictly traditional foods, which could be due to the unavailability and inaccesibility of traditional foods from South Africa's mainstream supermarkets, as suggested by Njomo (2012).

The different levels of adoption of South African food culture seen in this study supports the view that dietary acculturation does not move in a linear process. Several authors argue that immigrants residing in North America do not just change their diets from traditional to strictly new foods immediately upon resettlement (Satia, 2010a; Garnweidner *et al.*, 2012; Deng *et al.* 2013). On the contrary, immigrants tend to retain traditional diets, by finding new ways of composing traditional dishes by including some

traditional ingredients (and excluding others), while adopting new ones from the host country's cuisine (Satia, 2010a).

As was observed in previous studies (Garnweidner *et al.*, 2012; Deng *et al.*, 2013), high prices and unavailability of traditional food were the main reasons for adopting South African foods. This suggests that dietary change is involuntary and might happen haphazardly before immigrants get a chance to familiarise themselves with the local food culture. Based on findings of this study, acculturation among SA immigrants is not a voluntary process, but is imposed on them due to unavailability, inaccessibility and the inconvenience of cooking traditional food (Vue *et al.*, 2011). This has important policy implications as evidence suggests that most immigrants often replace pricey, nutrient-rich foods with cheaper, energy-dense but low-micronutrient foods (Anderson *et al.*, 2014). According to Deng *et al.* (2013), when dietary acculturation occurs, breakfast is the first meal to be replaced by food items such as oatmeal, milk, bagels and cream cheese, a transition that predisposes the consumers to obesity and type 2 diabetes, while keeping dinner and weekend meals strictly traditional (Garnweidner *et al.*, 2012). Although there are dietary guidelines for the general South African population (Vorster, Badham & Venter, 2013), there is no record of nutrition education programmes that target immigrants in South Africa.

Reasons for not adopting South African food such as unfamiliar taste (17%, n=33) and the belief that the South is unhealthy (1.5%, n=3) was only shared by a few participants in this study. This is in contrast with past studies that reported that most immigrants had negative perceptions towards host country food culture (Garnweidner *et al.*, 2012; Vahabi & Damba, 2013; Mannion *et al.*, 2014). This could be attributed to the different methodologies that were utilised in these studies. Unlike in the studies cited above which were purely qualitative, the main methodology for this study was quantitative, so it possible that this study did not capture as detailed a description and explanation of the perceptions of immigrants towards South African food culture as qualitative methods would have done. Studies show that resistance to adoption of the new food culture is associated with taste (Garnweidner *et al.*, 2012; Dharod *et al.*, 2013; Vahabi & Damba, 2013). This is consistent with the findings of this study, which showed that unfamiliar taste

contributed to some immigrants not adopting South Africa's food culture. A similar observation was made by Vahabi & Damba (2013) in a study they conducted in Toronto among Latin American immigrants. They too concluded that difference in the taste of food resulted in a rejection of the new food culture. Although only 3.1% of respondents indicated that they are unable to cook South African food, this is still a cause for concern because, inability to cook the host country's food has been associated with high food insecurity among immigrants (Hadley, Patil & Djona, 2010; Terragni *et al.*, 2014).

Regarding the changes in food habits, the results of this study indicated that intake of energy-dense, highly processed food such as potato chips, atchar, fat cakes and *sphathlo* among immigrants increased significantly after they had settled in South Africa. The popularity of the aforementioned food items is not surprising because they are affordable and readily available on the streets of Gauteng. The high intake of energy- dense foods seen in this study is consistent with the findings of previous studies (Deng *et al.*, 2013; Lesser *et al.,* 2014; Okafor *et al.*, 2014). Research on African immigrants living in the USA shows that the dietary changes were characterised by high levels of fat, sugar and cholesterol (Okafor *et al.*, 2014). Lesser *et al*. (2014) found an increase in the intake of convenience foods, fizzy drinks, desserts, candy, and dining out among Asian immigrants residing in Canada. Similarly, Ross *et al.* (2016) found that Liberian refugees living in Ghana reported increased consumption of candy, baked goods, starchy vegetables and oil compared to Ghanaians who were following a more traditional healthier diet. Holmboe-Ottesen & Wandel (2012) also concluded in their study that the dietary changes made by South Asian immigrants living in Europe were unhealthy. These dietary behaviours are to be highly discouraged as they put immigrants at risk of developing lifestyle diseases such as obesity, cardiovascular disease and type 2 diabetes (Deng *et al.*, 2013; Okafor *et al.*, 2014). Based on these findings, the researcher is of the view that Sub-Saharan immigrants living in South Africa could be at risk of developing lifestyles diseases.

In the literature, unhealthy food choices observed among immigrants have been attributed to low socio-economic status. This is because the poor-quality food items they adopt are usually less costly than nutritious food (Dharod *et al.*, 2011; Okafor *et al.*, 2014). In addition, Okafor *et al.* (2014) suggest that since most immigrants live below the poverty

line in their new home countries, they are usually forced to work in multiple low-paying jobs, thus reducing food accessibility and time to prepare traditional food dishes. In view of the fact that the majority (76.3%) of the immigrants studied live below the average monthly gross income of ZAR17 517 (Statistics South Africa, 2016), they are likely to experience difficulty in accessing nutritious food. This could explain the reported increase in consumption of fried potato chips, *sphathlo*, and *vetkoek* that are sold as convenient street foods in South Africa. Apart from economic constraints, the increase in the consumption of unhealthy fast foods could also be due to a lack of knowledge on how to prepare new food items. Unhealthy nutrition transitions have also been associated with lifestyle factors, such as urbanisation and globalisation, which result in the high accessibility of fast foods and fizzy drinks (Satia, 2010a). Furthermore, it is reported that prior to immigration, most immigrants are accustomed to small shops, open markets and fresh foods (Njomo, 2012; Terragni *et al.*, 2014); therefore, moving to a place like Johannesburg or Pretoria – where there are many large supermarkets – could curtail their shopping capabilities.

Immigrants do not always respond negatively when faced with the challenges of adopting new food cultures. Some authors have found that immigrants sometimes make positive dietary changes (Lesser *et al.*, 2014; Sanou *et al.*, 2014). The question, then, is what causes these immigrants to make positive changes, while others do not. Could it be due to lack of knowledge, unfamiliarity with the cooking methods, or new foods that prevent immigrants from making healthy food choices? Available evidence suggests that positive dietary changes are associated with targeted nutrition education initiatives (Lesser *et al.*, 2014).

c) *Contribution of ethnic food and ethnic food markets on dietary patterns of Sub-Saharan immigrants*

The importance of food preferences is enshrined in the 1996 World Food Summit definition of food security (FAO, 2006). This implies that the availability and accessibility of culturally appropriate food is an essential component of food security (Jacobus & Jalali, 2011; Vahabi & Damba, 2013). Due to geographical proximity and cultural differences, food habits often differ from one country to the other, and are learned from childhood

(Naidu & Nzuza, 2013). It is therefore not surprising that previous studies conducted in South Africa indicated that food habits of Sub-Saharan immigrants differ significantly from South African eating habits (Njomo, 2012, 2013; Naidu & Nzuza, 2013). In this study the importance of ethnic foods and continued consumption of the same, was recognised by all participants. This is consistent with findings of other studies that have concluded that ethnic foods continue to be part of immigrants' dietary habits even after settlement in host countries (Vue *et al.*, 2011; Garnweidner *et al.*, 2012; Njomo, 2013). This could explain why unavailability of culturally appropriate food was identified as one of the main barriers to food security among Latin American immigrants living in Toronto (Vahabi & Damba, 2013). Previous research has demonstrated that immigrants often differentiate between original food culture and host country's food culture, using terms like "our food" when talking about their original food culture and "their food" when referring to host country's food culture (Garnweidner *et al.*, 2012).

Ethnic food markets and restaurants were the main source of ethnic foods for the majority (94.8%; n=183) of immigrant families in this study. This is consistent with earlier studies done in South Africa (Njomo, 2012, 2013). The main reason for this is that in South Africa, unlike in other high- income countries, mainstream supermarkets do not sell ethnic foods (Njomo, 2012). However, some researchers (Terragni *et al.*, 2014; Wilson & Renzaho, 2014) argue that even in countries where the large supermarkets do stock ethnic foods, the majority of immigrants still prefer to buy from the small ethnic retailers (Dharod *et al.*, 2013).

In this study, it was noted that the largest proportion of immigrants (39.2%; n=76) consumed ethnic foods three times a week, with only 7.2% (n=14) immigrants consuming their ethnic food during special occasions. These results are comparable to those of past studies that indicated that immigrants consumed their ethnic foods three times a week (Njomo, 2012, 2013). However, results reported here contradict the findings by Thomson & Mcfeeter (2016) in Australia where most immigrants (57%) ate ethnic food every day. The difference could be attributed to the fact that immigrants in the latter study were fairly new, with 65% of them having lived in Australia less than 2 years, whereas in the current study 62.9% had lived in South Africa for more than 4 years. Furthermore, the study by

Thomson & Mcfeeter (2016) included immigrants from various areas, with only 3% of them coming from Sub-Saharan countries, meaning that it is possible that availability of immigrant food could have been different.

The majority of the respondents of this study (77.3%; n=150) visited ethnic food markets more than once a month. This is indicative of the significant role that ethnic food markets play among the immigrant population. The tendency of immigrants to patronise ethnic food markets has been reported in the literature (Jacobus & Jalali, 2011; Dharod *et al.*, 2013; Njomo, 2013), and is due to cultural familiarity with these shops (Vahabi & Damba, 2013). Furthermore, to immigrants, ethnic food markets instil a feeling of home and act as social hub where they share cultural knowledge and experiences of the new country (Njomo, 2012).

Sub-Saharan immigrants in this study had diverse opinions on why maintaining their ethnic food was important to them, with the largest proportion (32%; n=62) suggesting that their food was part of their culture. These findings are comparable to what was observed in previous studies (Jacobus & Jalali, 2011; Vue *et al.*, 2011) where it was reported that cultural food reinforces cultural identity and traditions. This is attributed to the fact that food habits are learned from childhood as part of socialisation (Naidu & Nzuza, 2013). According to Njomo (2013), apart from the choice of food, culture also determines the choice of where immigrants shop for food, due to the atmosphere and manner in which products are displayed.

Similarly to what was observed in Norway where immigrants found the host country's food boring and tasteless (Garnweidner *et al.*, 2012), more than a quarter of respondents (25.8%; n=50) in this study felt that their food is tastier than the South African food. Garnweidner *et al.* (2012) argue that attacthment to traditional flavourings is even stronger than attachment to traditional staple foods. In the published literature, the differences in taste were associated with lack of spices, different preparation methods (Garnweidner *et al.*, 2012) and poor nutritional quality (Vahabi & Damba, 2013).

Another reason why immigrants continued with their traditional food was that participants (21.6%; n=42) felt that it reminded them of their home countries. Food is one of the

artefacts that immigrants use to remind them of their home (Naidu & Nzuza, 2013), as it reinforces connections to countries of origin (Jacobus & Jalali, 2011) by psychologically diminishing the distance between home and host country (Naidu & Nzuza, 2013).

The results of this study were also in line with studies where immigrants perceived ethnic foods to be healthier when compared to the host country's food (Vue *et al.*, 2011; Vahabi & Damba, 2013). For example, in the study by Vahabi & Damba (2013) Latin American immigrants living in Canada complained that Canadian food was high in fat, sugar, salt and spices and therefore considered a health hazard, especially for kids. This was due to lack of fresh ingredients such as herbs and vegetables (Vue *et al.*, 2011). A similar perception was shared by 20.6% (n=40) of the respondents in this study.

The findings that ethnic food markets provide other benefits, other than just being a source of ethnic foods, are corroborated by previous studies (Njomo, 2012; Naidu & Nzuza, 2013; Vahabi & Damba, 2013). According to literature, in addition to providing ethnic foods, ethnic food markets and restaurants provide non-food items such as traditional clothing and jewellery (Njomo, 2012), instil a feeling of being home due decor and music played (Naidu & Nzuza, 2013), and act as social hubs to meet friends and share knowledge (Njomo, 2012).

d) *Availability and accessibility of the ethnic foods available in ethnic food markets, and restaurants.*

Most of the respondents (67, 5%; n=131) in this study reported that their ethnic foods were not easily available in South Africa, with some (11, 3%; n=22) respondents revealing that they could hardly find what they needed. Unavailability of immigrants' traditional food in the host country is consistently reported in the literature (Dharod *et al.*, 2013; Njomo, 2013; Vahabi & Damba, 2013). For example, familiar fresh vegetables, fruit and meats were amongst the common items that were found to be unavailable according to Vahabi & Damba (2013) in a study that was conducted in Canada. Unavailability of ethnic foods has been attributed to the failure of the mainstream supermarkets to cater for the immigrant minority groups (Njomo, 2013). Furthermore, although there are a number of

ethnic food markets and restaurants it is reported that they are unable to stock sufficient amounts of ethnic foods (Njomo, 2013).

Studies show food prices to be a major predictor of food insecurity among immigrants (Deng *et al.*, 2013; Njomo, 2013; Popovic-Lipovac & Strasser, 2013). Although low income is undoubtedly an important factor, high prices of the immigrants' food in the host countries is also important. Moreover, unaffordability of ethnic foods was mentioned by 92.8% (n=180) in this study. This is similar to the results by Njomo (2013) where unaffordability of the traditional food ingredients was reported by 93% of the respondents interviewed. The high price of immigrants' traditional foods is attributed to lack of competition (Jacobus & Jalali, 2011), as well as high import prices (Jacobus & Jalali, 2011; Vahabi & Damba, 2013). Therefore, unaffordability of traditional food is expected to accelerate dietary acculturation, especially amongst the low-income immigrant families reported in this study.

Besides unavailability of ethnic foods being a barrier to the maintenance of immigrant food culture, a limited variety of food has been reported to lead to low dietary diversity and subsequent inadequate intake of micronutrients (Oldewage-Theron *et al.*, 2012; FAO, IFAD & WFP, 2013) which may subsequently result in an increase in healthcare costs over time (Oldewage-Theron *et al.*, 2012). The present study demonstrated that variety of immigrants' ethnic foods is limited, as shown by over half of the respondents (58.2 %; n=113) reporting that variety was limited.

The majority of respondents in this study indicated to varying degrees that they were not satisfied with the quality of their traditional foods as sold in South African ethnic markets. This problem was also observed in previous studies that described the quality of traditional food as being poor (Rudder, 2006; Njomo, 2012, 2013). Njomo (2013) went as far as suggesting that foods sourced from ethnic shops were sometimes rotten, smelly and had a bad taste. This could be due to ethnic food retailers in South Africa lacking the resources and skills to preserve food, and thus being unable to comply with acceptable food safety standards (Rudder, 2006; Njomo, 2013; Harris *et al.*, 2015). Poor quality of food has been linked to foodborne illnesses and is reportedly responsible for 2.2 million deaths annually (WHO 2013). Furthermore, the effects of foodborne illnesses do not only

threaten the life of the individuals concerned, but also have adverse economic consequences on communities, businesses and countries because foodborne illness negatively affect healthcare systems, tourism, productivity and livelihood (WHO, 2013; Grace *et al.*, 2015).

Findings reported here suggest that immigrants have to travel long distances to access shops selling their traditional foods. This is consistent with studies done elsewhere that have indicated that the accessibility of shops that sell culturally appropriate food is often a problem (Jacobus & Jalali, 2011; Vahabi & Damba, 2013). Research indicates that the accessibility of shops has a significant impact on food purchasing habits (Thomson & Mcfeeter, 2016). Apart from increased unwanted transportation costs, inaccessibility of shops can impact negatively on food choices. Therefore, viewed in conjunction with low incomes and the unaffordability of traditional food reported in this study, high transportation costs can negatively affect the food security and nutritional status of immigrants (Jacobus & Jalali, 2011).

As in previous studies of immigrant populations (Renzaho & Burns, 2006; Jacobus & Jalali, 2011; Holmboe-Ottesen & Wandel, 2012); respondents in this study struggled to locate familiar traditional food items. According to Alakaam *et al.* (2015), food availability is dependent on the area, which would therefore explain why unavailability can vary between households. In this study, immigrants struggled mainly with availability of staple foods, vegetables and protein products. Unavailability of traditional food items often leads to menu and recipe adaptation (Renzaho & Burns, 2006; Garnweidner *et al.*, 2012), which could have negative nutritional implications for diets (Renzaho & Burns, 2006; Jacobus & Jalali, 2011). In previous research, staple foods were replaced with highly processed foods (Renzaho & Burns, 2006; Holmboe-Ottesen & Wandel, 2012) such as pizza, French fries and burgers (Holmboe-Ottesen & Wandel, 2012), resulting in decreased intake of fibre (Renzaho & Burns, 2006). Typical examples of recipe adaptation include replacement of Atta flour with white flour among South Asians living in Europe (Holmboe-Ottesen & Wandel, 2012), and cassava flour with potato flour (Renzaho & Burns, 2006). Reduced intake of fibre-rich foods is associated with weight gain and obesity, and lower consumption of fruits and vegetables is linked to diabetes (Holmboe-Ottesen & Wandel,

2012). According to Renzaho & Burns (2006) unavailability of traditional sources of protein such as insects, fish, and goat and camel meat are often replaced with lamb, resulting in higher intake of dietary fat.

e) *Coping strategies adopted by immigrants when faced with shortage of their traditional foods or ingredients in South Africa*

Coping strategies are classified into five categories: dietary changes, rationing strategies, short-term availability of food, decreasing the number of people present in the households, and irreversible strategies (Gupta *et al.*, 2015). In this study, immigrants made use of three categories of coping namely; dietary changes, rationing and short-term availability of food.

Among the study sample, dietary changes were the most used coping strategy, by one in every three households. This included relying on less preferred food (38.7%; n=75) and replacing unavailable ingredients with similar ingredients (37.6%; n=73%). Use of ingredients that are similar to original food culture as the strategy to cope with unavailability of traditional food ingredients has also been observed among other immigrants (Garnweidner *et al.*, 2012; Holmboe-Ottesen & Wandel, 2012). Previous research has shown that relying on less preferred food is strongly associated with cheaper and lower-quality food (Vahabi & Damba, 2013; Gupta *et al.*, 2015) that are high in calories. Replacing of ingredients is linked to switching to highly processed foods (Holmboe-Ottesen & Wandel, 2012). Contrary to previous studies (Garnweidner *et al.*, 2012) where spices were commonly used to make new products culturally appropriate, use of spices to obtain a desired taste was one of the least (15.5%; n=30) used coping strategies by respondents in the present study.

Although use of rationing strategies was observed in less than 20% of the respondents, it is a cause for concern as it has been significantly associated with food insecurity (Gupta *et al.*, 2015). The two rationing strategies used in this study were skipping a meal (17, 5%; n=34) and limiting portion sizes (15, 5%; n=30). Limiting portion sizes is commonly used by families to protect children against the effects of food insecurity, and seems to be a common practice amongst immigrant families experiencing food insecurity

(Anderson *et al.*, 2014; Ngidi & Hendriks, 2014). However, even though the use of rationing strategies is associated with food insecurity, they are not drastic and are, easily reversible (Gupta *et al.*, 2015). However, it should be noted that adopting coping strategies does not necessarily imply food insecurity but could also be an indication that the family is running out of traditional food items.

Increasing short-term availability of food by borrowing food from relatives was only utilised by 11, 9 % (n= 23) participants in the study. Reliance on friends and relatives for food as a coping strategy to minimise the impacts of food shortages has also been reported in the literature (Vahabi & Damba, 2013; Anderson *et al.*, 2014). However, this strategy is not sustainable over a long period (Gupta *et al.*, 2015). This notwithstanding, Terragni *et al.* (2014) argue that friends and relatives can act as social support for newly-resettled immigrants by introducing them to shops that sell ethnic foods, products and new ways of eating.

f) Factors associated with adoption of South African food culture.

In this study, the results (Table 4.10) indicate that as the budget allocated for food increases, immigrants are more likely to adopt South African food. Adoption of South African food amongst immigrants who indicated that they spent above R2500 on food was expected. Given the fact that this group (spending >2500) was the middle group in terms of the food budget, it suggests that the money budgeted for food was not high enough to allow immigrants to eat only their ethnic foods. However, such a budget allows flexibility to enable them maintain certain aspects of their traditional diets while supplementing them with local South African foods that are readily available. Furthermore, the author is of the view that with this budget immigrants could afford to eat out more often, thus exposing them to different types of South African cuisines. This view is supported by Dharod *et al*. (2011) who suggested that high income allows immigrants to spend on luxury items such as snacks and sugar-sweetened beverages. This could explain the increased consumption of fast foods observed in this study.

The higher odds of adopting South African food culture found amongst immigrants that had been residing in South Africa for 3 to 6 years was consistent with the findings of

Dharod *et al.* (2011), who reported higher acculturation amongst Somali refugees that had been residing in the USA for over 3 years. As indicated in section C of the discussion, the greater the length of residence the more immigrants become familiar with local foods.

Previous research has shown that cooking traditional food is time-consuming (Vue *et al.*, 2011; Okafor *et al.*, 2014). Furthermore, according to Okafor *et al.* (2014) African immigrants are more likely to hold multiple jobs. Therefore, due to the instability associated with temporary employment, the author is of the view that temporarily-employed immigrants are more likely to take multiple jobs than their South African counterparts, thus restricting the time available to prepare traditional family meals. This could be the reason for the observation that part-time or temporary employees had higher odds of adoption of South African culture as compared to those that were unemployed or students.

The other factor that was significantly associated with the adoption of South African foods was the income, with results showing that high-income earners were less likely to adopt South African food. This was expected, given the reported high cost of immigrants' food in host countries (Deng *et al.*, 2013; Njomo, 2013; Popovic-Lipovac & Strasser, 2015). In previous studies, higher acculturation was due to high prices of ethnic foods, which makes them inaccessible to low- income earners, but not a problem for higher-income earners (Garnweidner *et al.*, 2012; Deng *et al.*, 2013).

Surprisingly, in this study the multivariable analysis did not find age to be statistically associated with adoption of South African food. This is contrary to the previous studies that reported a significant association between adoption and younger age of immigrants (Deng *et al.*, 2013; Perkins *et al.*, 2016), as a result of environmental factors such as media and peer pressure (Vue *et al.*, 2011). The researcher is of the view that this is due to the different characteristics of the immigrants who participated in these studies. The study by Deng *et al.* (2013) included Chinese immigrants, while Perkins' study consisted of Samoan immigrants living in Australia. This suggests that findings on immigrants should not be generalised as there could differences that occur by virtue of their originating from different areas.

4.2.9 Conclusion and recommendations

This study was able to establish that although Sub-Saharan immigrants are generally young. Although highly educated they are characterised by low incomes and high unemployment. The author is therefore of the view that tailored welfare and resettlement programmes are required to help equip immigrants with skills to be able to adjust to the new country and minimise the negative impact of low socio-economic status on their diets. Instead of blanket policies aimed at creating jobs, targeted programmes aimed at integrating immigrants into the South African economy should be considered.

An important finding of this study is that traditional food features very prominently in the dietary patterns of Sub-Saharan immigrants. However, owing to unavailability, high prices, poor quality of the available food, and lack of variety of traditional ingredients, involuntary dietary acculturation takes place, forcing immigrants into bicultural eating patterns. High prices and unavailability of traditional ingredients make immigrants vulnerable to food insecurity. Overall, although ethnic food markets are making a considerable contribution towards the household food security of immigrants, their contribution is limited by the above factors. Therefore, further studies to identify similar-tasting, nutritious food items from the South African food culture to serve as substitutes for unavailable traditional ingredients might be useful in preventing food rejection and informing culture-specific nutrition education programmes, which could contribute to positive nutritional transitions.

Although ethnic food markets and restaurants are the main source of ethnic foods for Sub-Saharan immigrants, they are unable to meet the expectations of the immigrants. There is a need to investigate methods that could assist entrepreneurs to improve the availability, affordability and variety of culturally appropriate food for immigrants. Studies to investigate the challenges encountered by entrepreneurs are thus required to devise appropriate measures to overcome these problems.

Furthermore, these findings confirm that when dietary acculturation occurs, immigrant populations tend to adopt less healthy dietary patterns. In the long run, these unhealthy eating patterns could have negative implications, not only for the health of the immigrants

themselves, but also for the health system in South Africa. This implies that there is a need to design targeted food security and culture-appropriate nutrition education programmes. Further studies to improve understanding of the severity and implications of unhealthy eating patterns among Sub-Saharan immigrants in South Africa could help to inform policy and programmes aimed at improving the resettlement of immigrants.

In the bivariable analysis, only duration of residence was observed to be a significant driver of adoption of the South African food culture. However, the multivariable analysis identified four socio-economic factors (spending a lot of money on food, duration of residence in South Africa between 3-6 years, low income level and working partime/temporary jobs) that were significantly associated with adoption. Therefore, based on these findings , the null hypothesis that there are no factors that drive adoption (H1 in section 1.5) was rejected.

4.3 Section B: Results of the demographic characteristics and hygiene practices of vendors of ethnic foods

Results and discussions of the quantitative investigation into the demographic characteristics and hygiene practices of the entrepreneurs are presented and discussed in this section under the following headings:

- Socio-demographic profile of the food vendors
- Hygiene facilities and equipment
- Personal hygiene: food handling practices and personal hygiene
- Product assortment

4.3.1 Socio-demographic profile of the food vendors

The demographic characteristics of the respondents investigated using a structured questionnaire are described in terms of age, educational profile (formal education and certification in food handling and hygiene practices), business profile, English language proficiency, region of origin, nature of the business, predominant customers, and number of health inspections.

4.3.1.1 Age of the food vendors

As shown in Figure 4.10, out of the 40 respondents, most (53.0%; n=21) were 30-39 years of age, followed by 35.0% (n=14) who were between 40-49 years of age and 7.0 % (n=3) were between 20-29 years of age. Very few respondents (5.0%; n=2) who were between 50-59 years of age.

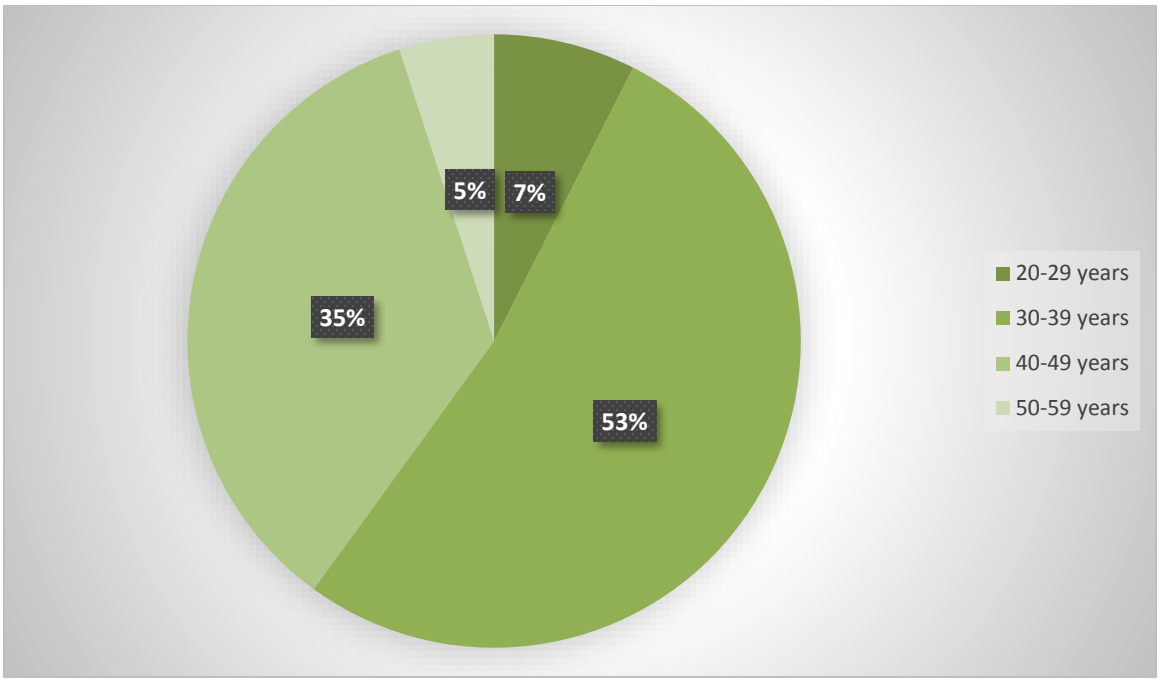

Figure 4. 10: Age of the food vendors

4.3.1.2 Educational profile of the food vendors

Just over a third of the food vendors (35.0 %; n=14) had received high school education, followed by 22.5% (n=9) who had diplomas (Table 4.11). Very few respondents (12.5%; n=5) had no formal education and those with only primary education (10%, n=4).

Table 4. 11:Education profile of the food vendors (n=40)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Qualification	No formal education	5	12.5
	Primary education	4	10.0
	Completed high school	14	35.0
	Diploma	9	22.5
	University degree	8	20.0
Total		40	100
English proficiency	Can read	34	85.0
	Cannot read	6	15.0
Total		40	100
Certificate in food handling and hygiene practices	Yes	06	15.0
	No	34	85.0
Total		40	100

Analysis of the English proficiency revealed that 15 % (n=6) respondents could not read and write in English. The results also revealed that only 15% (n=6) of respondents were in possession of a certificate in food handling and hygiene practices.

4.3.1.3 Assessing the business profile

As shown in Table 4.12, out of the 40 entrepreneurs interviewed, the majority (70.0%; n=28) were West Africans. The greater portion of businesses (42.5%; n=17) had been operational for less than 3 years, with only 15.0% (n=6) indicating that they had been in business for over 10 years.

Table 4. 12:Business profiles of the respondents (n=40)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Region of origin	Southern Africa	1	2.5
	West Africa	28	70.0
	Central Africa	7	17.5
	East Africa	4	10.5
Total		40	100
Age of the business	Below 3 years	17	42.5
	4-6 years	10	25.0
	7-9 years	7	17.5
	10-12 years	3	7.5
	13-15 years	2	5.0
	Over 15 years	1	2.5
Total		40	100
Type of the business	Chain	0	0
	Independent	40	100.00
Total		40	100
Predominant customers	East Africans	1	2.5
	West Africans	2	5.0
	Central	3	7.5
	All of the above (including South Africans)	34	85.0
Total		40	100

Results also indicated that all the business visited were independent or family-run businesses. In assessing the predominant customers for each business, the results showed that very few (15.0%; n=6) businesses were exclusive in terms of their clientele, with the majority (85.0%; n=34) servicing diverse clientele, including South Africans.

4.3.1.4 Visits by health inspectors

The majority of the ethnic shops (82.5%; n=33) had been visited by health inspectors. However, the frequency of visits varied (Table 4.13). In assessing the number of visits in the past year, most food vendors (25.0%; n=10) indicated that they had been visited four times. This was followed by 20.0% (n=8) who had been visited twice. There was also a small number of food vendors (17.5%; n=7) who had never been visited by health inspectors.

Table 4. 13: Assessing the level of health inspection of business premises (n=40)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Visits by health inspectors	Yes	33	82.5
	No	7	17.5
Total		40	100
Frequency of inspection	Weekly	1	2.5
	Every other week	2	5.0
	Monthly	7	17.5
	6 times a year	3	7.5
	4 times a year	10	25.0
	Twice a year	8	20.0
	Once a year	2	5.0
	Never	7	17.7
Total		40	100

4.3.2 Hygiene facilities and equipment at different ethnic food shops

The hygiene facilities and equipment were assessed using the checklist (Annexure II). Hygiene facilities that were assessed included structure where the business is run, floor types, condition of the ceiling, ventilation, and condition of the walls. The equipment

included possession of a working refrigerator, freezer, thermometer, water source, toilet and washing facilities.

4.3.2.1 Hygiene Facilities

The vast majority of the businesses (95.0%; n=38) that were investigated in the study were run in permanent structures, with only 20% (n=2) being run in temporary structures (Figure 4.11). Except for 20% (n=20) entrepreneurs, food was prepared and sold from the shops. These entrepreneurs prepared food at home and sold it from the boot of their cars. For this particular entrepreneur the observation was done at home (where the food was prepared) and inspection of the car and containers that were used to store food was also carried out.

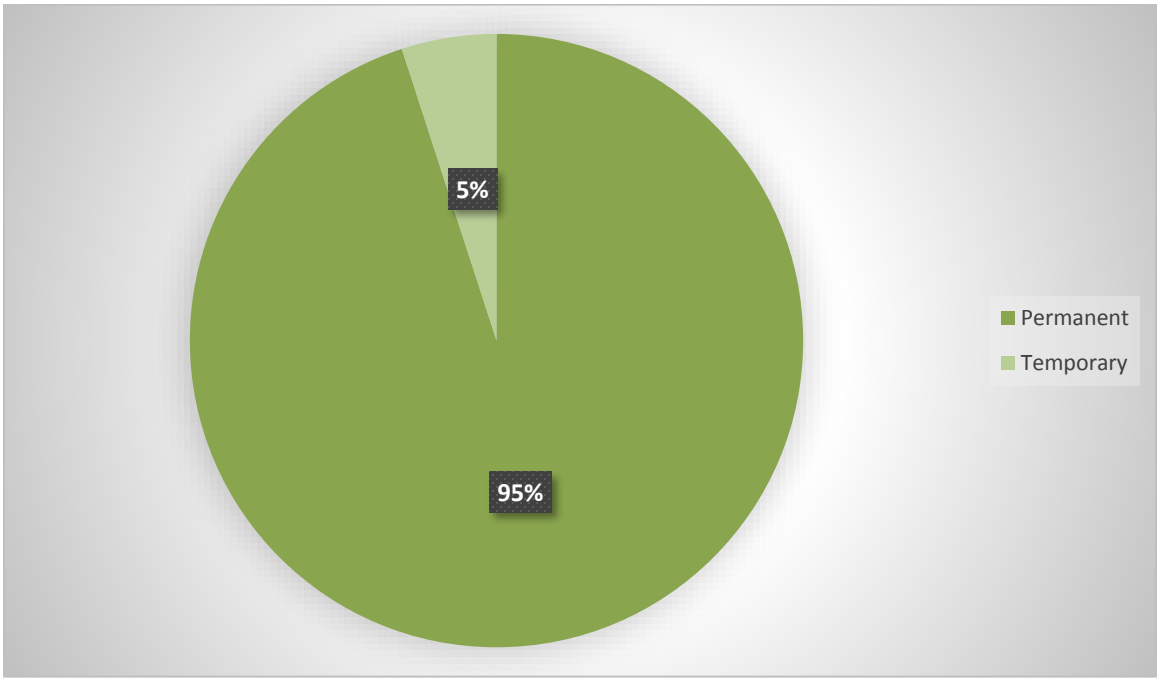

Figure 4. 11:Premises where the business is run

With regards to type of floors, the results showed that there were three types of flooring (Figure 4.12) and these were:

- Wooden floor
- Tiled floor
- Cemented floor

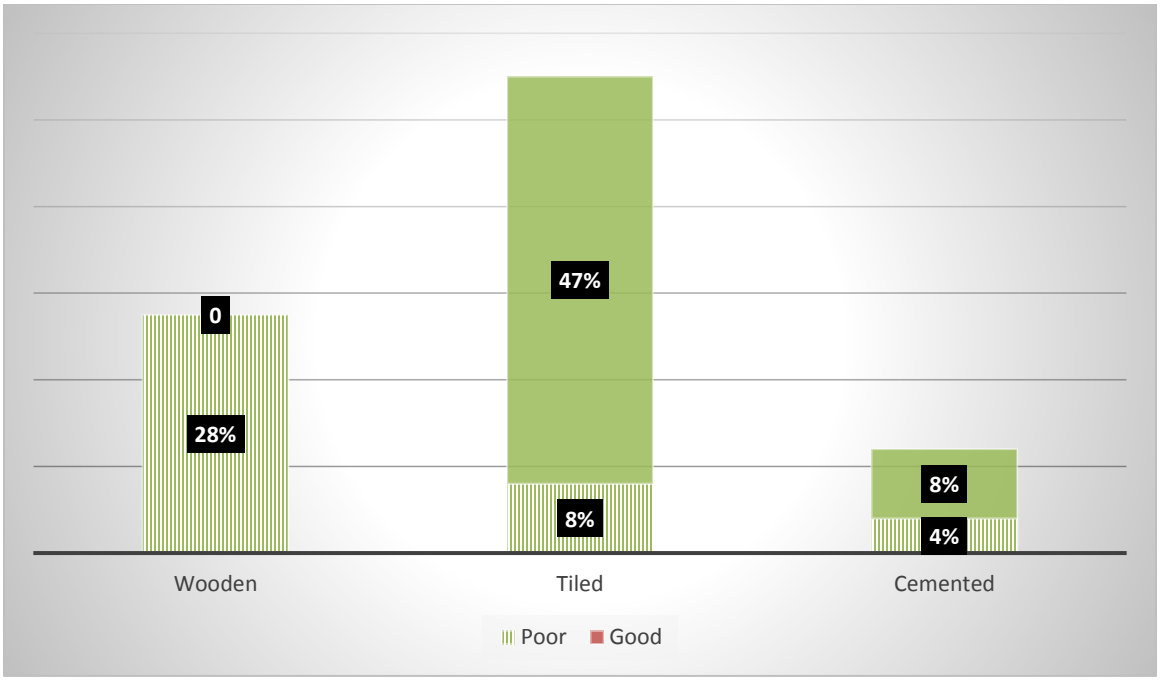

Figure 4. 12: Floor types observed at ethnic restaurants

Out of 95.0% (n=38) ethnic restaurants that were operating in permanent structures (excluding the two that ran their businesses from the boots of their cars), 55.0% (n=22) had tiled floors. This was followed by those who had wooden floors (28.0%; n=11) and then those that had cemented floors (12.0%; n=5).

Of the 55.0% with tiled floors, 47.0% were in good condition while 8.0% were in poor condition characterised by dirt and broken tiles. All the wooden floors were in a poor state of repair and had dirt in between the wood and were broken in some places. Of the cemented floors, 8.0% were in good condition while 4.0% were in a poor state.

The majority of the ethnic restaurants had walls (75.0%; n=30) that were in good condition with only 20.0% (n=8) that were dirty with peeling paint (Table 5.4).

As shown in Table 5.4 the ceilings at the majority (72.5%, n=29) of the vending sites were in good condition. However, 12.5% shops had no ceiling, while 10.0% of the shops visited had ceilings that were broken**.**

Table 4. 14: Walls and ceilings condition observed at the ethnic restaurants (n=40)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Walls	Good	30	75.0
	Poor	8	20.0
	Not applicable	2	5.0
Total		40	100
Ceiling	Good	29	72.5
	Poor	4	10.0
	No ceiling	5	12.5
	Not applicable	2	5.0
Total		40	100
Windows	Yes	22	55.0
	No	16	40.0
	Not applicable	2	5.0
Total		40	100

Of the 38 ethnic restaurants which were operating in permanent structures, 55.0% (n=22) had windows while 40.0% (n=16) had no windows (Table 4.14).

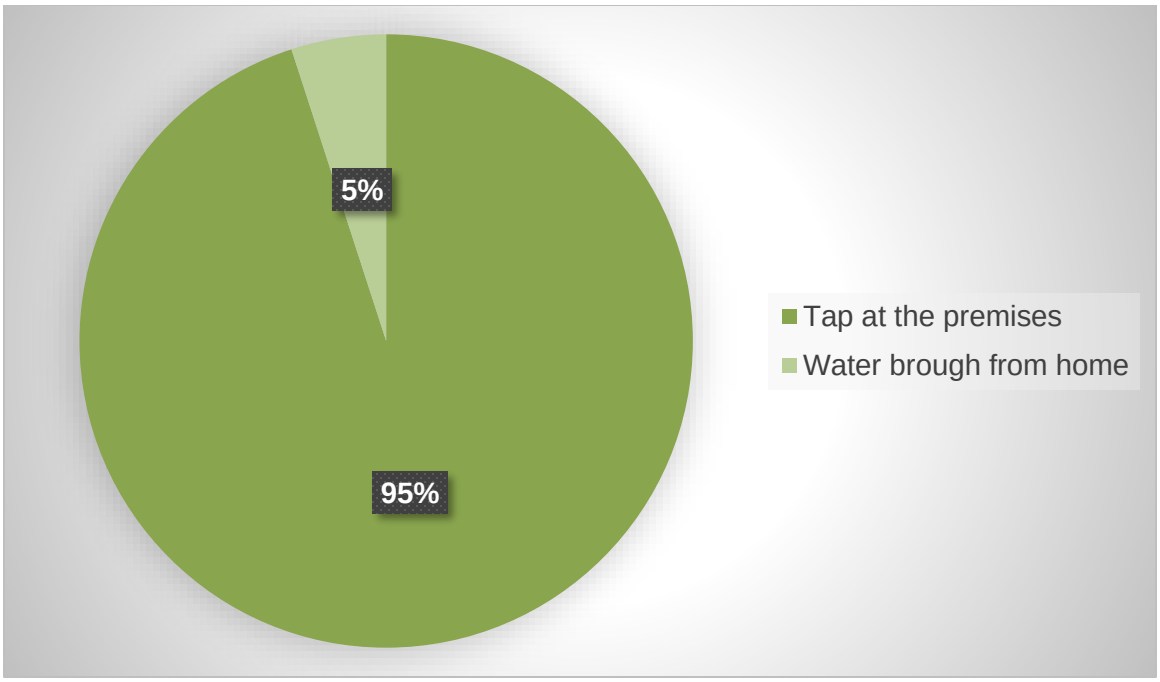

Figure 4. 13: Sources of water used at different ethnic food premises

As shown in Figure 4.13, results revealed that the majority of the shops (95.0%) had tap water at the premises. Only the (20%; n=2) entrepreneurs operating their businesses from the boot of their cars had no access to tap water. Instead, they brought water from home to the vending site.

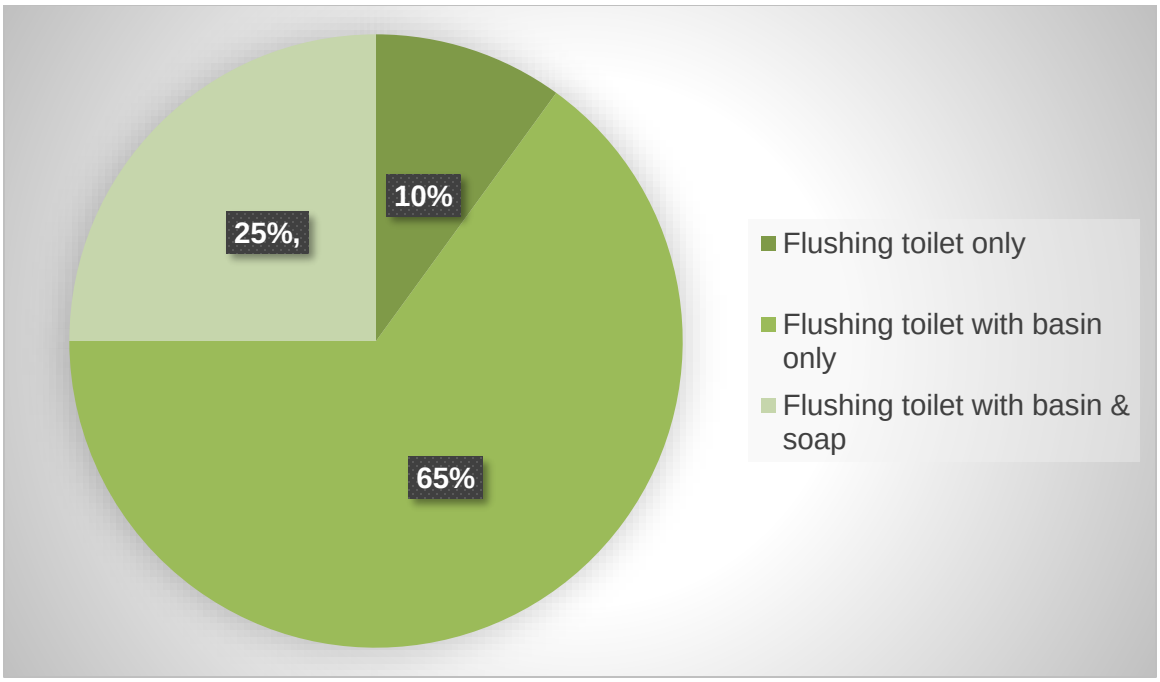

Figure 4. 14: Toilet facilities observed at ethnic restaurants

The results regarding the toilet facilities for the ethnic restaurants visited are presented in Figure 4.14. All the shops had access to flushing toilets. The results showed that although the majority of the shops (90.0%; n=36) had toilets with a basin, only 25.0% of these also had hand washing soap.

As shown in Figure 4.15, regarding waste disposal, half of the ethnic restaurants (50.0%; n=20) kept uncovered rubbish bins at the food preparation area while 35.0% (n=14) kept them outside.

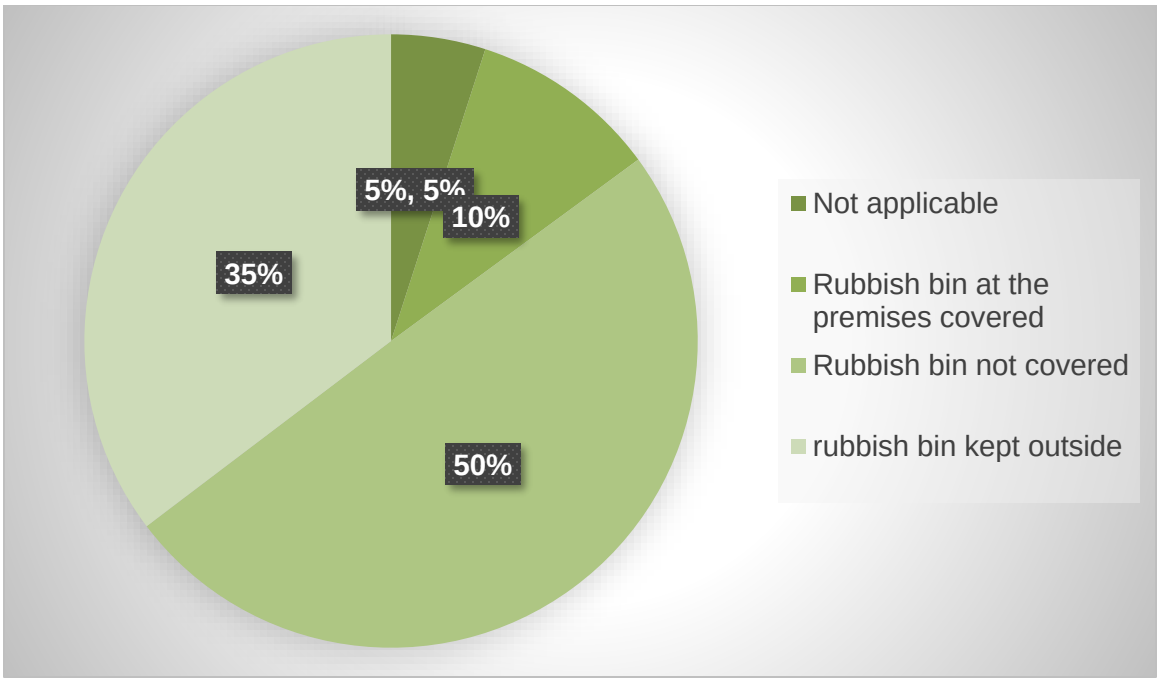

Figure 4. 15: Waste disposal

Generally, the number of ethnic restaurants who kept their bins covered was the low (10.0%, n=4).

4.3.2.2 Equipment owned by different ethnic shops

The majority of the restaurants (75.0%; n=30) studied owned a refrigerator (Figure 4.16). This was followed by 55.0% (n=22) who owned a microwave. 37.5% (n=15) owned freezers, while none of them had a thermometer.

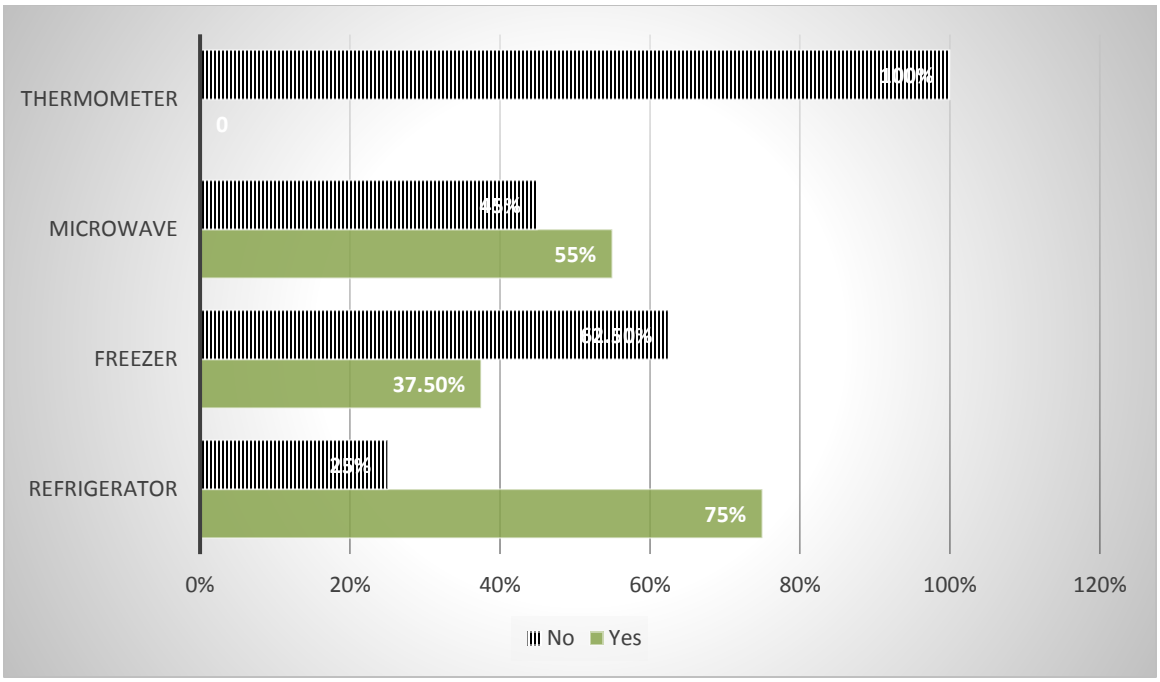

Figure 4. 16: Equipment owned by different ethnic shops

4.3.3 Personal hygiene: Food handling practices and personal hygiene

This section presents results of the handling and personal hygiene practices assessed in this study. The assessment of the handling and personal hygiene practices was done using a checklist as described in chapter 3 under section 6.2.

Use of the same containers to wash hands and utensils was common practice amongst the food vendors. This practice was observed in 92.5% (n=37) of food vendors as opposed to only 7.5% (n=3) that had separate containers for washing hands and utensils (Figure 4.17).

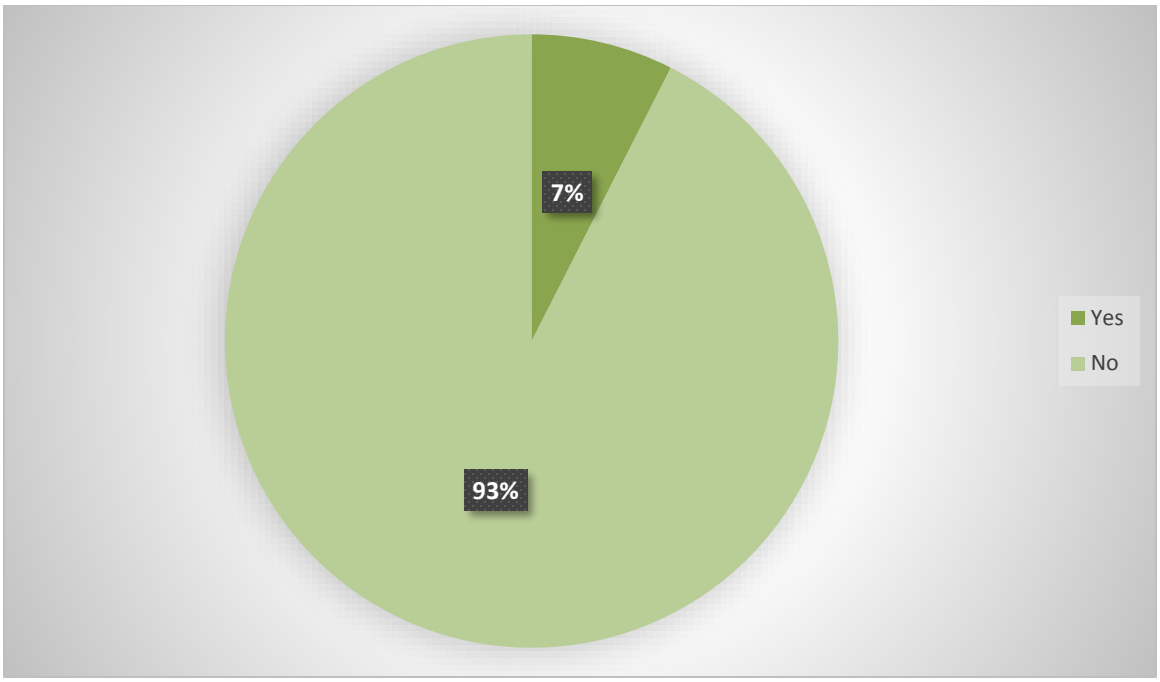

Figure 4. 17: Use of different containers when washing hands and utensils

With regard to washing of hands (Figure 4.18), only 7.5% (n=3) food vendors washed their hands during the observation. Of these, 3 % (n=1) food handlers used soap while the other 5% (n=2) did not.

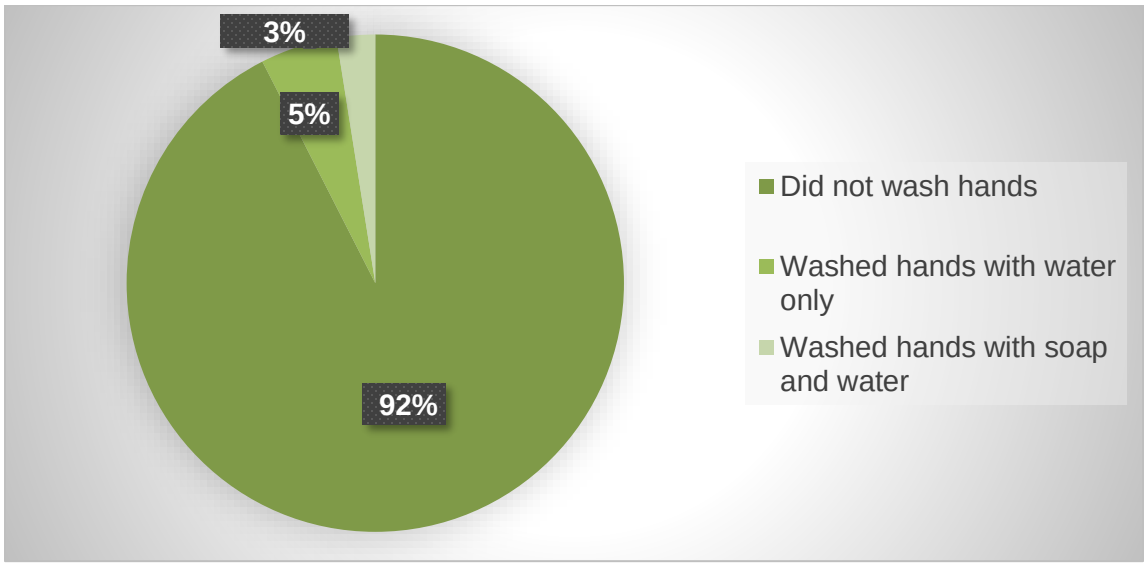

Figure 4. 18: The proportion of vendors that were observed washing hands during food handling

Several food-handling practices employed by food vendors to prevent cross-contamination between raw and RTE foods were assessed and are presented in Figure 4.19.

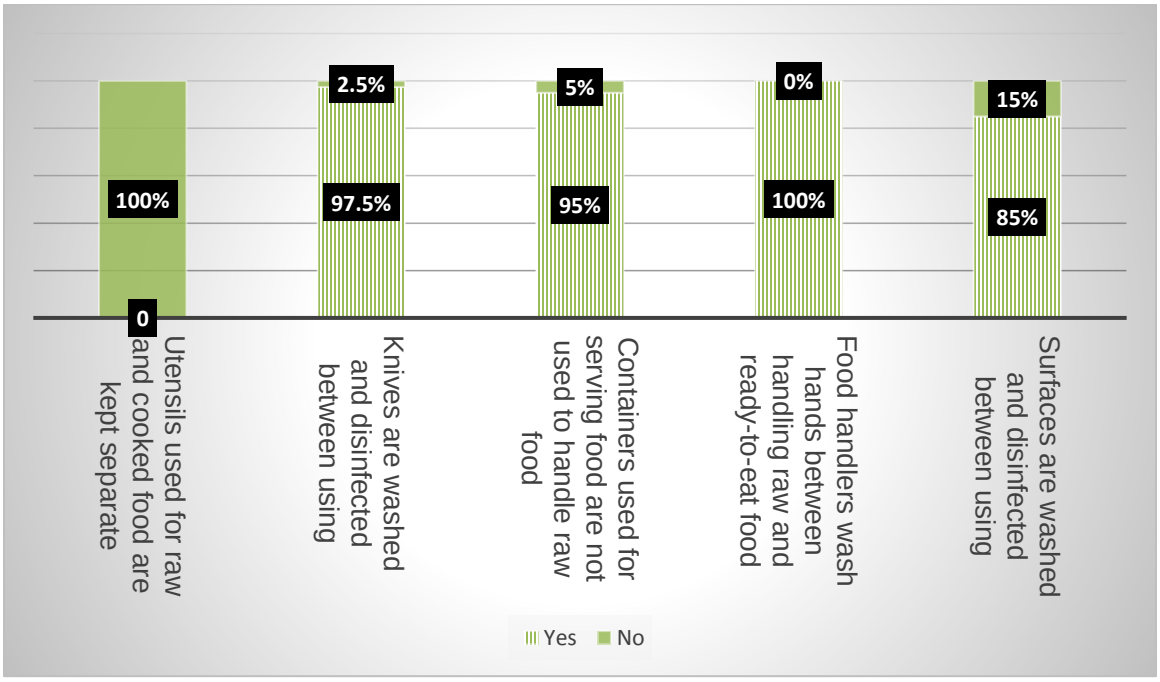

Figure 4. 19: Proportion of vendors who adopted hygiene practices with potential to prevent cross contamination between raw and cooked food

As shown in Figure 4.19, none of the participants kept utensils for raw and cooked food separate. However, there was high compliance with regards to washing and disinfecting surfaces (85.0%; n=34) and knives in between using (97.5%; n=39). Using different containers for serving and handling raw food was also commonly observed (95.0%; n=38) in the study.

Generally, it was observed that there was high non-compliance with regards to the wearing of protective clothing by food vendors. Out of the 40 food vendors, most (62.5%, n=25) did not wear an apron or a cap (60.0%; n=24) while preparing and serving food. None of the food vendors wore gloves (Figure 4.19).

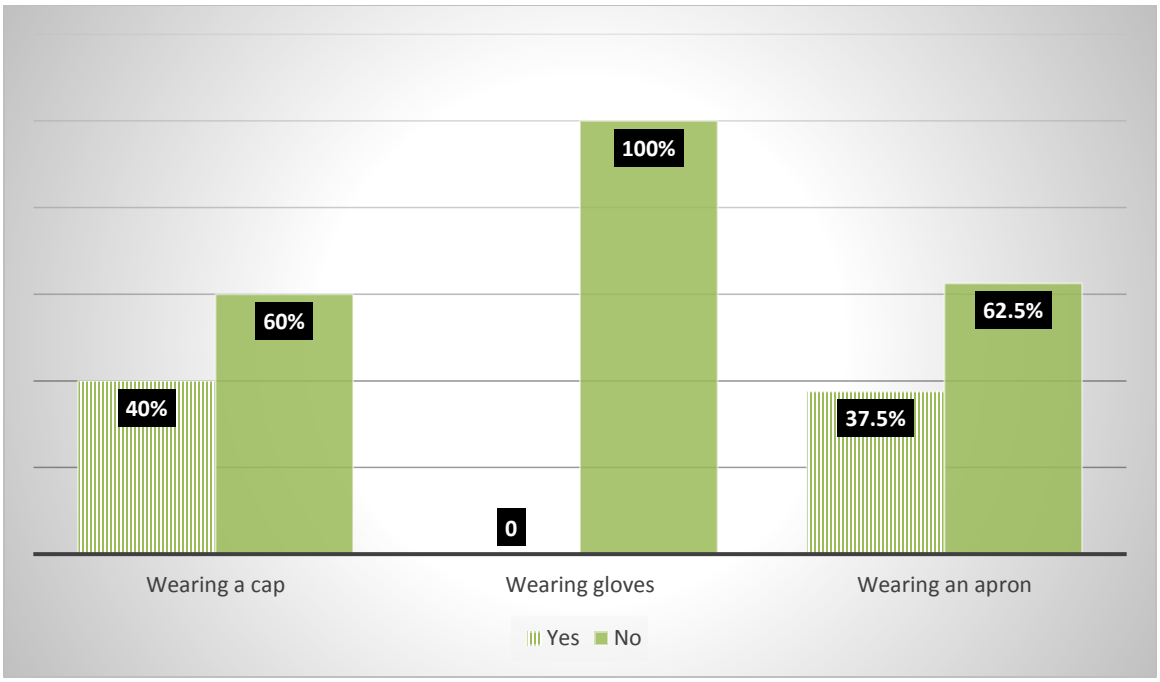

Figure 4. 20: Proportion of food vendors wearing protective clothing

Measures employed by food vendors to minimise food contamination are presented in Table 4.15. The majority of the food vendors (87.5%; n=35) were observed handling both the food and the money. Moreover, out of the 35 food vendors that handled both money and food, only 2.5% (n=1) washed hands in between. The results also revealed that none of the food vendors washed hands in between serving each customer (n=40).

Table 4. 15:Proportion of food vendors who adopted measures to minimise food contamination when serving (n=40)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Food vendors observed handling money	Yes	35	87.5
	No	5	12.5
Total		40	100
Handler who washed hands between handling money	Yes	1	2.5
	No	34	85.0
	Not applicable	5	12.5
Total		40	100
Food vendors who washed hands between serving each customer	Yes	0	0
	No	40	100.0
Total		40	100

In the absence of thermometers, RTE food in warmers that had burning flames at the time of observation were considered to have holding temperatures of >65˚C. Analysis of the holding temperatures (Table 4.16) of RTE food at different ethnic shops showed that the majority (72.5%; n=29) kept it above 65 ˚C. Results also showed that 45.0% (n=18) reheated food before serving. Furthermore, out of the 18 food vendors that reheated food, 35.0% (n=14) reheated the whole pot while 10.0% (n=4) reheated per serving. With regards to covering of the RTE food, most food vendors (62.5%: n=25) observed complied with this requirement and kept the food covered at all times after serving customers.

Table 4. 16: Assessing holding temperatures and general hygiene handling of RTE food (n=40)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Temperature at which food is kept	> 65˚C	11	27.5
	<65˚C	29	72.5
Reheating of RTE food before serving	Yes	18	45.0
	No	22	55.0
Manner in which RTE food is reheated	Per serving	4	10.0
	Whole pot	14	35.0
	Not reheating	22	55.0
Covering of RTE food	Yes	25	62.5
	No	15	37.5
Total		40	100

Assessment of the covering of raw food (65%; n=26) showed that in most ethnic shops raw food was left uncovered (Table 4.17).

Table 4. 17: Assessing general hygiene food handling practices at ethnic food shops (n=40)

Variable	Frequency	Number of respondents (n)	Percentage (%)
Raw food covered	Yes	14	35.0
	No	26	65.0
Raw and RTE food kept separate	Yes	30	75.0
	No	10	25.0
Food preparation	All day's food prepared at one go	34	85.0
	Not all food is prepared at one go	6	15.0
Total		40	100

With regards to food preparation (Table 4.17) the majority of ethnic shops (85.0%; n=35) prepared food for sale for the whole day at one go. Food was mostly prepared in the morning to be sold for lunch and supper.

The assessment of the presence of flies at different ethnic shops is presented in Figure 5.21. Out of the shops that were inspected, most (65.0%; n=26) had between 1 to10 flies, while 22.5% (n=9) had more than 10 flies. Flies were not observed at very few ethnic shops (12.5%; n=5).

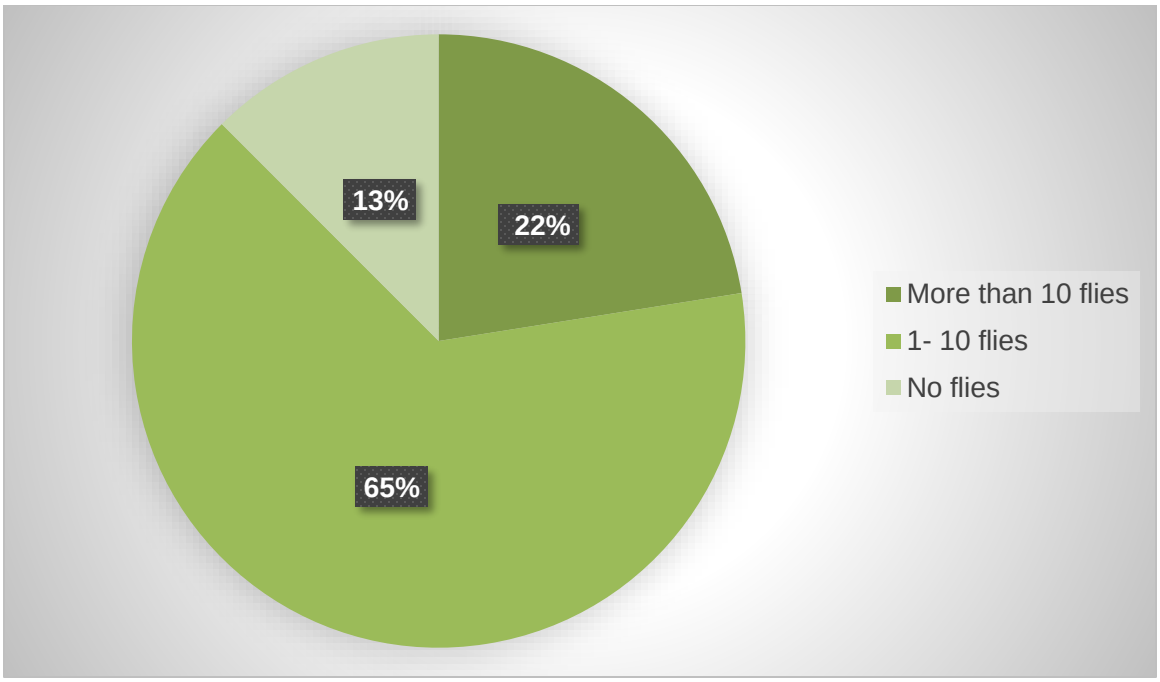

Figure 4. 21: Population of flies at different ethnic shops

Half of the food vendors (50.0 %; n=20) did not wear jewellery when preparing food. The most common jewellery worn by food vendors were rings, watches and bangles (Figure 4.22).

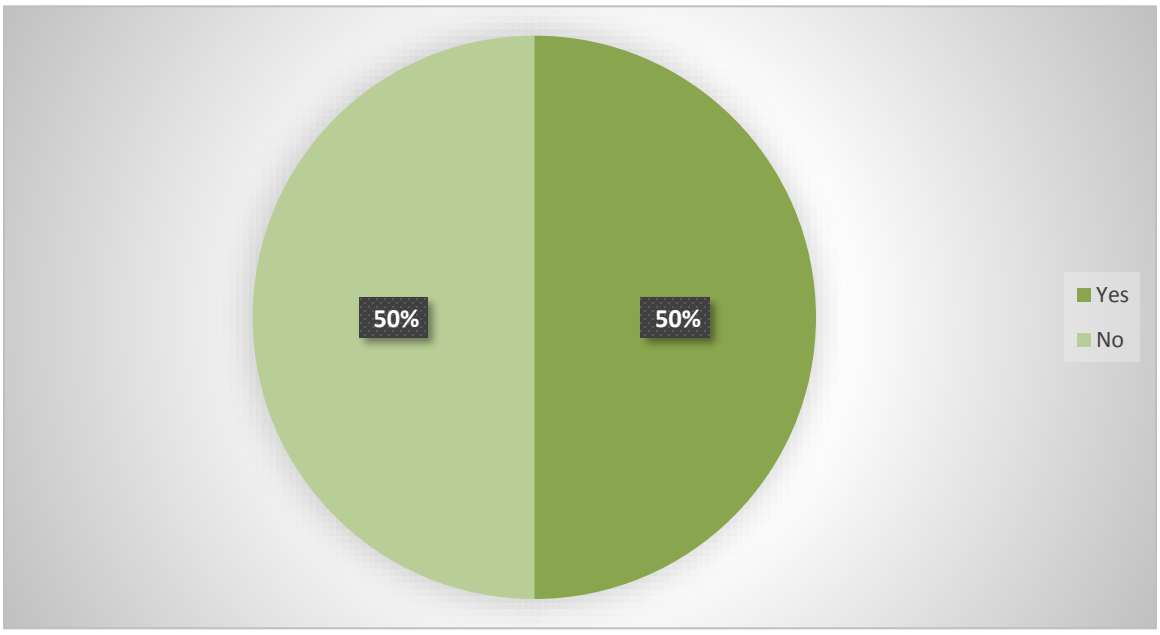

Figure 4. 22: Proportion of food vendors wearing jewellery while preparing food

The fingernails for the food vendors that participated in this study were also inspected, and results are presented in Table 4.18. Out of the 40 food vendors inspected, the majority had long nails.

Table 4. 18: Assessing the length and cleanliness of finger nails of the vendors (n=40)

Variable		Number of respondents (n)	Percentage (%)
Length of finger nails	Short	10	25.0
	Long	30	75.0
Total		40	100
Cleanliness of finger nails	Clean	9	22.5
	Not clean with visible grime	31	77.5
Total		40	100

4.3.3 Discussion of the results on demographic characteristics and hygiene practices of vendors of ethnic foods

a) Demographic characteristics

The demographic profile of the participants of this study revealed that just over half (53.0%; n=21) belonged to the 30-39 year age group. This is comparable to findings of past studies which observed that food vendors in most restaurants are generally young (Pichler *et al*., 2014; Al-Shabib *et al*., 2016). These results, further confirms reports that food trade plays a major role in providing employment for young adults that struggle to find employment in the formal sector (Oguttu, 2014).This is supported by the fact that most respondents involved in the food trade were either a high school graduate (35.0%; n=14) or diploma graduate (22.5%; n=9). According to Fatoki (2016), most immigrants, due to difficulties in entering the labour markets in host countries, resort to small businesses that specialise in ethnic-orientated goods.

Although few participants (15.0%; n=6) in this study indicated that they were not proficient in English, it is worrying especially as far as food safety is concerned. This is because most communication regarding the safety standards and regulations in South Africa is written in English. This finding is consistent with what was observed by Harris (2016), who showed that some ethnic restaurant operators and employees were not conversant in English.

The majority of participants (85.0%; n=34) in this study did not have a certificate in food handling and hygiene practices, nor did they indicate receiving food safety training in the past. Lack of training in food handling and hygiene practices is of great concern. This low exposure to food hygiene training is similar to the results found in another South African study, which indicated that only 31.6% of informal food vendors had received training in food hygiene (Oguttu *et al.,* 2014). These results are also in agreement with the Nigerian study of Onyeneho & Hedberg (2013) that was conducted among restaurants managers, and which revealed that 57.0% had no food hygiene training. Previous literature suggests that by virtue of being authentic ethnic such restaurants are predisposed to poor food handling practices. Often this is due to cultural handling practices and equipment that are

in contravention of the food safety guidelines and regulations (Harris, 2016). Previous research has indicated that training in food handling and hygiene practices is essential in cultivating critical food handling practices (Onyeneho & Hedberg, 2013; Oguttu *et al.*, 2014; Sibanyoni *et al.*, 2017). Sibanyoni *et al.*(2017) and Akabanda *et al.* (2017) further emphasise the importance of providing continuous food safety training to maintain hygienic food handling practices as once-off training is usually not enough to inculcate strict food hygiene training practices.

However, there are instances where previous studies presented contrasting results to what is reported here. For instance, Liu *et al.* (2014) in their study conducted in the USA, reported that 69.0% of Chinese restaurateurs had received food safety training either from the local health department or National Restaurant Association. Similarly, in a study that was conducted in Australia by Pichler *et al*. (2014), 83.0% food vendors had participated in food safety training. In the latter study, training in food safety was provided by the employers, not government officials. In a meta-analysis study that was conducted by Soon *et al*. (2012), it was demonstrated that training in food safety improved knowledge, attitudes and food handling behaviours.

The differences between the findings of this study and those reported elsewhere, are attributed to variability in state programmes with regard food safety training. In South Africa, for example, the Regulations Governing General Requirements for Food Premises and Transport of Food (No. R. 918 of 1999) do not specifically mention training in food safety as a requirement for handling food. They only mention what needs to be done to ensure food safety within the different establishments (Republic of South Africa, 1999). However, in the USA and Austria food safety training is mandatory for all persons wanting to work as waiters or cooks in restaurants (Liu & Kwon, 2013; Pichler *et al.*, 2014). Pichler *et al.* (2014) go on to say that the law also requires yearly refresher training for food vendors in the European Union member states.

b) *Business profile*

The majority of the restaurants (70.0%; n=28) in this study were owned by West Africans. This was expected as the figures presented by Statistics South Africa suggest that West

Africans are the second largest immigrant population living in South Africa (Statistics South Africa, 2014a).

Most food outlets (42.0%; n=17) studied had been in existence for less than three years, followed by 25.0% (n=10) that had been in business for less than 7 years. This means that the majority of these ethnic restaurants are new ventures. The fact that South Africa only saw the influx of African immigrants after the end of the apartheid dispensation in 1994 (Statistics South Africa, 2014a), could explain this. Therefore, as the size of the ethnic population grows, the number of ethnic restaurants that have been in operation for a long time might increase.

In the present study, all the restaurants were independently owned. This is consistent with the findings that ethnic restaurants are usually small and independent (Agarwal & Dahm, 2015; Harris, 2016). Harris (2016) explained that apart from being independent, majority of ethnic restaurants are unique and usually staffed by family members. From available literature, in terms of characteristics it can be argued that ethnic vendors are similar to informal vendors as they are mostly independently owned, have limited resources and are run by family members (Oguttu, 2014; Agarwal & Dahm, 2015).

Contrary to what was expected, the patronage of majority of ethnic restaurants (85.0%; n=34) is very diverse and not only limited to the ethnic grouping of the vendors. The other interesting finding was the fact that South Africans also patronise these restaurants. This suggests that the local population is becoming aware and willing to try immigrants cuisine. This is consistent with previous findings on ethnic foods that show that although they start by claiming only ethnic-authentic patronage (Harris, 2016), with time they gain popularity amongst the locals and sometimes end up being part of the mainstream cuisine.

c) Visit by health inspectors

Health inspection of food premises in South Africa is regulated by the Department of Health and prescribed by Regulations Relating to the Powers and Duties of Inspectors and Analysts on Foodstuffs and at Food Premises No. R. 328 of 2007. In the present study, only 17.5% (n=7) food businesses in this study indicated that they had not been

visited by health inspectors. This number was lower than expected. Although Regulations Governing General Hygiene Requirements for Food Premises and Transport of Food clearly stipulate that premises should be inspected regularly by a qualified inspector (Republic of South Africa, 1999), ethnic food businesses are less structured therefore are not expected to play by the rules (Agarwal & Dahm, 2015). Therefore, it would be correct to conclude that as is the case with other informal food vendors, that these ethnic restaurants operate without food handling certificates or that there is lack of compliance on the level of monitoring and enforcement (Oguttu, 2014).

In this study inspection was frequent ranging between weekly to once a year, with most (25.0%; n=10) ethnic shops having received four visits in the past year. According to Kwon, Roberts, Shanklin, Liu & Yen (2010), the number of inspections are related to poor-performance during routine inspection which then warrants re-inspection. Although the required number of inspections is not specified in the South African guidelines and regulations, available literature (Allwood *et al*., 1999) indicates that the average frequency of health inspection is two times per year. According to Rudder (2006), in Manchester the frequency of inspection is determined by the risk rating of different premises provided in the Statutory Codes of Practices, with restaurants rated as high risks inspected once every six months while low risk premises receive one inspection every 5 years. Therefore, given the high frequency of inspection reported by some vendors in this study, it can be assumed that the authorities are aware of the risk posed by the ethnic food markets.

d) Hygiene facilities

The fact that majority of ethnic restaurants (95.0%; n=38) operated in permanent structures is commendable. According to Oguttu (2014), contamination is reduced substantially when food preparation is done in enclosed structures. The finding in the current study was unexpected as ethnic restaurants are usually under-resourced and small. In view of this, findings of the present study suggest that circumstances of ethnic food vendors are far better than those of the traditional street vendors. As a result, it is assumed that by virtue of having permanent business premises, the level of monitoring and enforcement is much easier for ethnic food vending sites.

Floors of the premises were either tiled (55.0%), wooden (28.0%) or cemented (12.0%). Due to the nature of these floors, it would be expected that they are easier to clean, as prescribed in the Regulations Governing General Hygiene Requirements for Food Premises and the Transport of Food (No. R. 918 of 1999) (Republic of South Africa, 1999). In terms of the condition of these floors the results also revealed that most (55.0%) were in compliance with the aforementioned regulations. Although there were fewer (45.0%) restaurants that did not comply with the regulations (the main problem being visible food debris, and cracked and broken tiles and wooden floors) set out in this document when compared to those that complied, this number is still high, especially when taking into consideration the implications that this violation may have for the level of food safety. This inability of ethnic food restaurants to meet the minimum requirements for floors is consistent with the findings of studies that reported that up to 48.0% participants had dirty floors (Quinlan (2013).

Violations in terms of requirements for ceilings and walls were 10.0% (n=4) and 20.0% (n=8) respectively. According to the Regulations Governing General Hygiene Requirements for Food Premises and the Transport of Food (No. R. 918 of 1999), walls and ceilings of food premises should not have open joints and seams as they are difficult to clean and likely to contribute to food contamination (Republic of South Africa, 1999).

Of the total premises assessed, 40.0% (n=16) of the were in critical violation of the minimum standards and requirements of food premises with regards to ventilation. Poor ventilation is associated with polluted air and increased temperatures within the food premises, which may be detrimental to hygienic food handling, and the extent to which air contaminants may contaminate food (Republic of South Africa, 1999). Problems with ventilation were also identified in a previous study on ethnic minority food retail businesses conducted in Greater Manchester in the UK (Rudder, 2006).

Although there were only 5.0% (n=2) of ethnic restaurants that did not have access to potable water in this study, this is still a cause for concern. This was identified as a critical risk factor in a study by Oguttu *et al.* (2014). This is because water is critical in ensuring good hygienic practices and prevention of contamination. The hygienic quality of some of the containers in the study was questionable. Furthermore, bringing water in containers

means the entrepreneur is at risk of running out of the same before the end of business day. This has the potential to compromise the hygiene of the vendor.

The majority of the restaurants (75.0%; n=30) in this study did not comply with the principle of ensuring that toilets were equipped with proper hand-washing facilities that have soap or cleaning agents. The study proves by the fact that 65.0% of ethnic restaurants did not have soap and 10.0% did not even have a hand-washing basin for employees and customers. Failure to wash hands properly after the use of latrines has been associated with poor personal hygiene and can result in high presence of *E. coli* on the hands of food vendors and result in the subsequent cross-contamination of food (Auzureen *et al*., 2017). The low adherence to the provision of proper hand washing facilities seen in this study is consistent with the results of a previous study done by Rudder (2006).

Half of the food premises (50.0%; n=20) had problems with inappropriate waste disposal methods, by keeping uncovered rubbish bins in the food preparation areas. These findings are similar to observations made by Rudder (2006), who concluded that most ethnic restaurants tend to have an unreasonable accumulation of waste at the food premises. This is a significant risk factor for the presence of flies, other insects and rodents at the vending site (Oguttu, 2014).

e) *Equipment*

Proper working equipment is essential in ensuring proper holding temperatures and storage of food to prevent proliferation of microbial hazards and subsequent development of foodborne illnesses. Possession of different equipment as required by the law, was poor among the food vendors that participated in this study.

The fact that there were food premises that did not have refrigerators (25.0%; n=10) and freezers (62.5%; n=25) raises questions about proper storage of perishable foods and holding temperatures of cooked food, especially the leftovers. Refrigerators help to slow down bacterial growth. Keeping RTE foods at inappropriate temperatures during holding has been associated with re-introduction of spore-forming bacteria such as *B. cereus* (Mosupye & von Holy, 2000). Even though it can be argued that such shops probably

throw away leftover food, the cost implications then becomes an issue, especially considering that most of them are under-resourced. Failure to own refrigerators and freezers was a problem among food vendors that participated in the study by Onyeneho & Hedberg (2013).

Not owing freezers could also increase running costs, as restaurateurs will be forced to buy in small quantities as opposed to buying in bulk. Buying in bulk was recommended as a strategy to reduce costs of immigrant cultural food by Jacobus & Jalali (2011). These high costs of raw ingredients get transferred to the consumers as restaurants are forced to increase prices to cover the costs incurred when buying the ingredients.

The failure to own thermometers by all food premises visited is in violation of minimum standards and requirements of food premises. These standards clearly stipulate that chilling, freezing, heating and display facilities should at all times have a thermometer which reflects temperature to ensure adherence to correct storage and holding temperatures (Republic of South Africa, 1999). However, due to their under-resourced nature and lack of training attributed to in the previous sections it was not surprising that there was not even a single vendor that had a thermometer to monitor temperatures. Lack of adherence to use of thermometer was also identified as a problem in a review of inspection data of independent ethnic restaurants in Kansas by Roberts *et al*. (2011). Similarly, failure to use thermometers by food vendors was observed in a study on the National School Feeding Programme in South Africa (Sibanyoni *et al*., 2017). This poor adherence by two different sectors in South Africa suggests poor monitoring of food service establishments by authorities.

f) Food handling and personal hygiene practices

In this study, there was low adherence (7.5%; n=3) to the principle of washing hands in different containers across all food premises visited. Using separate containers to wash hands and utensils is essential for preventing cross-contamination from hands to the containers used to prepare and serve food. Low adherence is consistent with findings of previous studies on ethnic restaurants (Kwon *et al.*, 2010; Roberts *et al.*, 2011).

Generally, raw food has higher bacterial counts than cooked food. For example, in a study that was conducted by Mosupye & von Holy (2000) raw samples were found to be carrying higher bacterial counts and potential food pathogens such as *E. coli*, *C. perfringens*, *B. cereus* and *St. aureus* compared to the cooked samples. This is because the high temperatures that most food is exposed to during cooking is able to lower the bacterial counts and kill some of the pathogens. Therefore, to prevent post-contamination of ready-to-eat food by raw food, it is always advisable to separate and sanitise utensils used for raw and cooked food. In the present study, although there were few food vendors who failed to observed basic principles such as disinfecting knives between using (2.5%), and disinfecting surfaces between handling raw and cooked food (15.0%), the results are still cause for concern because of the potential for cross-contamination. These results are in agreement with what was observed by Mosupye & von Holy (2000) who reported that informal vendors in their study used the same utensils for raw and cooked food.

Wearing protective clothing when handling food is a sign of good food safety practices and is actually a requirement for people handling food (Republic of South Africa, 1999). Compliance with this hygiene practice was generally low in this study, and varied across protective clothing items. It was observed that wearing a cap was practised by 40.0% (n=16) of the respondents and an apron by 37.5% (n=15) respondents. The low adherence observed in this study is consistent with the findings by Sibanyoni *et al.* (2017), in a study that was conducted among food handlers working for a school nutrition programe in Mpumalanga Province, South Africa. Failure to wear protective clothing was identified as a negative attitude that maximises the risk of food contamination in a study that was conducted amongst institutional food handlers in Ghana (Akabanda *et al.*, 2017).

Contrary to these findings, Al-Shabib et al. (2016), reported that 96.6% food vendors in the study conducted among food handlers employed at University of King Saudi in Saudi Arabia wore protective clothing. This difference could be due to the lack of exposure to training among ethnic food vendors of the current study as alluded to earlier. The author is of the view that because most ethnic restaurants are staffed by family members, in the absence of training, employees rely on cultural food preparation and handling methods which are handed down through generations. Previous studies have indicated that these

cultural methods are often in contradiction to official food safety standards and norms (Roberts *et al.*, 2011; Harris, 2016).

The results revealed that washing hands after handling money and food, and washing hands between serving each customer, was very low in this study. Handling money and RTE food without washing hands in between could induce cross-contamination as previous data indicates that money is a reservoir and vehicle for transmission of food pathogens such as *S. aureus, E. coli*, *P. aeruginosa, Shigella, as well as Enterobacter* and *Entero- coccus* (Michaels, 2002). These findings confirm the results by Kwon *et al*. (2012) who found that failure to control hands (by adequate hand sanitation or use of tongs) as a vehicle of contamination was amongst the top violations in a study that was conducted amongst ethnic restaurants in Kansas.

Temperature control and holding temperatures of RTE foods is a major determinant of multiplication of bacterial pathogens and subsequent development of foodborne illnesses (Pichler *et al.*, 2014). The majority of the food vendors (72.5%; n=29) in this study adhered to the temperature control requirements of keeping RTE foods at >65˚C. However, the holding time of RTE food was not investigated in this study. In the absence of thermometers, it is anticipated that monitoring of the appropriate temperatures during holding was a challenge. Similar results were reported by Kwon *et al.* (2012) and Pichler *et al.* (2014). For example, in a review study Kwon et al. (2012) it was reported that time and temperature control was a persistent problem on both ethnic and non-ethnic restaurants in Kansas. Even though practices were not assessed in a study by Pitchler et al. (2014), they found vast knowledge gaps concerning holding and storing of food.

Furthermore, although the majority in this study complied with the requirement for holding temperatures for food, this was not the case with reheating of ready-to eat-foods. The results revealed that of the 45% food vendors who re-heated food, 35.0% re-heated the whole pot as opposed to re-heating per serving. This demonstrated low knowledge and an important risk factor for food illnesses. In previous studies reheating has been linked to the outbreaks of *C. perfringens* and *B. cereus* (Bennett, Walsh & Gould, 2013; Kadariya, Smith & Thapaliya, 2014) due to insufficient time and temperature used.

The results of this study revealed that leaving raw food uncovered was a common practice amongst most food vendors (65.0%; n=26). Leaving raw food uncovered prior to cooking was also identified as a common problem among vendors selling RTE foods in South Africa. This practice exposes food to environmental contaminants such as bacterial cells and spores (Mosupye & Von Holy, 2000).

In most ethnic shops (70.0%; n=30) the principle of keeping raw and RTE foods separate was observed. These results are similar to those reported by Kwon et al. (2010) who observed a similar trend among the ethnic restaurants studied. Findings of this study are encouraging because of the potential to minimise the risk of cross-contamination.

The majority of the ethnic food shops (85.0%; n=34) studied prepared food for the whole day at one go. Unless the food was going to be sold-out within one hour (as specified in the standard and requirements for display, storage and temperature of food), this could compromise time and temperature control of food (Republic of South Africa, 1999). Poor time and temperature control has been linked to the proliferation of foodborne illnesses, hence the recommendation that ready-to eat food should not be kept at room temperature for more than two hours (Al-Shabib *et al.*, 2016).

The number of flies observed varied across all ethnic shops. This could be due to different garbage disposal methods and general hygiene employed by different ethnic shops as reported by Oguttu (2014), and as observed in this this study. Houseflies are known vectors of diseases and therefore their presence in the food preparation area is discouraged regardless of their number. Previous research has revealed that houseflies can transmit pathogens such as *Enterobacteriaceae*, *E. coli* 0157:H7, *S. aureus*, and *S. aureus* (Barreiro, Albano, Silva & Teixeira, 2013; Pava-Ripoll, Pearson, Miller & Ziobro, 2015). Therefore, it is expected that the higher the population of houseflies, the higher the risk of contamination.

Half of the food vendors (50.0%; n=20) in this study did not comply with the hygiene principle of not wearing jewellery during food preparation. This could be due to lack of hygiene training mentioned earlier. Non-compliance with this principle was also reported by Oguttu (2014) in his study of informal food vendors in South Africa. However, these

findings are contrary to the findings of a previous study by Al-Shabib *et* al. (2016) conducted among food handlers working in restaurants in Saudi Arabia. In the latter study, the researchers observed that food handlers in Saudi Arabia were aware of contamination risk associated with jewellery. What could explain this difference between the present study and that by Al-Shabib *et al.* (2016) is lack of training. In addition, the researcher is of the view that by virtue of the food handlers in the latter study working for university restaurants, hygiene standard could be higher due to access to resources.

Hands are the main culprits when it comes to cross-contamination, and fingernails are the most contaminated part (BC Center for Disease Control, 2005; Auzureen *et al.*, 2017). Investigation of the length and cleanliness of the fingernails in this study showed that the majority (75.0%; n=30) of the food vendors had long nails, while 77.5% (n= 31) of the respondents' fingernails were dirty with visible grime. Long fingernails harbour germs, are difficult to clean, and could be main vectors of pathogens. It is for this reason that several publications regulating employee hygiene and health recommend that they should be kept short and clean at all times (Republic of South Africa, 1999; BC Center for Disease Control, 2005; Department of Business and Professional Regulation, 2015).

4.3.4 Conclusion and recommendations

Ethnic food restaurants in South Africa are predominantly run by West African immigrants belonging to the economically active group. Given that the most (53.0%; n=21%) of vendors of ethnic foods belonged to the 30-39 age group, and that most (42.5%; n=17) had tertiary educational qualifications, it means that ethnic food restaurants offer the immigrants who have failed to secure employment an opportunity to earn a living.

English is an official language in South Africa, and is used in most communication and business training. The fact that the majority of food vendors in the study could read and speak English may help them to understand food safety regulations better and be able to participate in food hygiene trainings. Although there were fewer food vendors in the study who were literate in English, these results suggest that there is also a need for English literacy programmes for food vendors and immigrants in general to enable understanding and compliance with the rules and regulations

Given the low exposure of most food vendors to food handling and hygiene practices training in this study, vendors rely on their cultural knowledge with regard to food preparation techniques and handling practices. In the absence of formal training this poses a challenge to food safety.

Findings of this study suggest that South Africans are integrating the various ethnic foods into their cuisine. However, it is not clear the extent to which South Africans are patronising the ethnic restaurants, and reasons thereof. Therefore, further studies to establish and confirm these findings are required.

The fact that most businesses operated in permanent structures that have running water and cemented floors means that the food preparation areas can be cleaned with ease, thus reducing dirt and dust. This could positively influence the safety of ethnic foods.

Lack of facilities such as freezers, proper washing facilities, thermometers and proper ventilation, that are critical to food safety is typical of ethnic food restaurants confirms the under-resourced nature of the ethnic food industry. It is therefore recommended that these small businesses be formally registered in order to improve their chances of accessing funding. Cooperative buying of equipment could also be facilitated to enable small businesses to negotiate prices from the distributors.

The fact that there are food vendors in the study who have never seen environmental health officers indicates that there is room for improvement in monitoring and enforcement of the Regulations Governing General Hygiene Requirements for Food Premises and Transport of Food. Therefore, there is a need for proper registration of all ethnic businesses, increased routine visits to all ethnic shops to ensure compliance, possession of the required equipment, and adherence to proper handling practices.

The vendors who participated in the present study demonstrated an awareness of the need to limit cross-contamination risks. However, there is room for improvement, as evidenced by the several poor handling practices that could result in foodborne illnesses and put consumers at risk.

Given the uniqueness of the ethnic food restaurants and markets, despite the weaknesses in food handling and personal hygiene practices observed in this study, they play an important role in the food security of immigrants. Therefore, there is a need for tailored culturally appropriate food hygiene training to improve knowledge and food handling practices.

4.4 Section C : Results on microbial quality of the selected ethnic foods and predictors of contamination

Results and discussions of the microbial analysis of the selected ethnic foods sold at the ethnic food markets in South Africa are presented in this section. The samples were collected in accordance with the methodology described in chapter 3. The results are presented under the following sub-sections: -

Characteristics of the food samples

Contamination with Total Viable Counts

Contamination with Coliforms and *Escherichia Coli*

Contamination with *Salmonella spp*

Predictors of contamination

Discussions

4.4.1 Characteristics of the food samples collected

Only RTE food samples were collected. Out of the eighty (n=80) ethnic food samples (two food samples from each vendor) that were collected sixty one were stews, seven cooked vegetables dishes, six soups, one bean cake, one bread one porridge, and four raw ready-to eat meat dishes. All the food samples collected belong to category one based on the NSW Food Authority (2009) classification criteria and BC Centre for Disease Control (2011). Category one comprises entirely components that are ready for consumption without further processing at the point of sale (Department of Health Canada, 2010; Centre for Food Safety, 2014).

4.4.2 Contamination with Total Viable Counts

A total of 80 samples of RTE ethnic foods were assessed for total viable counts. Samples that had no growth of total viable counts were regarded as negative, while those that had growth were regarded as positive irrespective of the number or level of counts. The

majority (88%; n=70) were positive. A small number (12%; n=10) were negative (Figure 4.23).

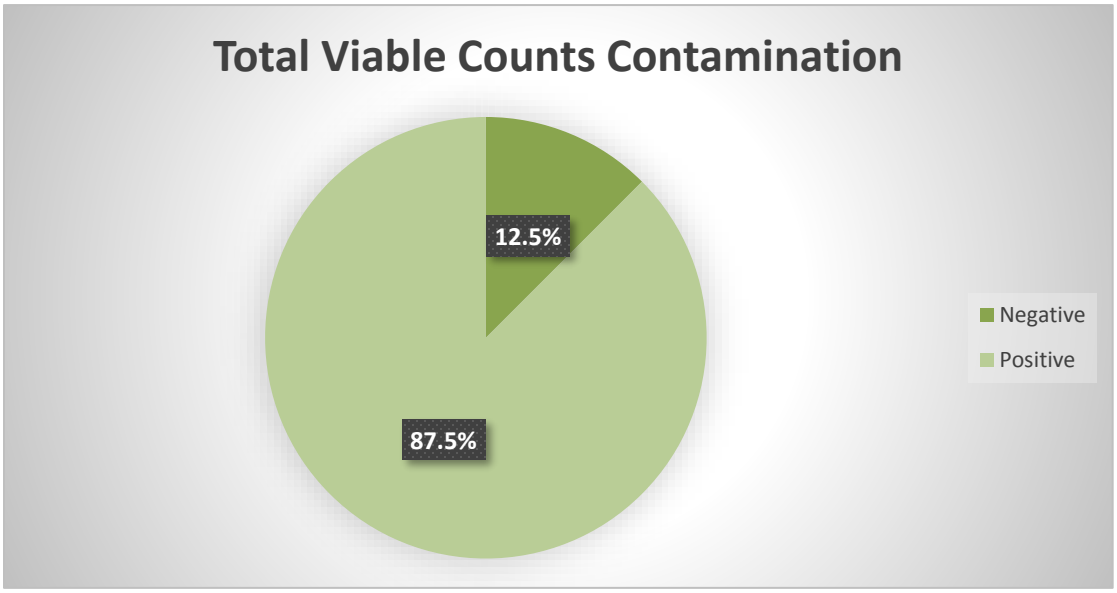

Figure 4. 23: Contamination with Total Viable Counts

Using the microbiological guidelines by British Colombia Centre for Disease Control (2011) criteria for RTE foods for total viable counts, samples were classified into three categories: satisfactory, cautionary, and unsatisfactory. Samples that had <10 ^{4} CFU/g were considered satisfactory, 10^4 to $<10^5$ CFU/g cautionary, while those that had > 10^5 were considered unsatisfactory (BC Centre for Disease Control, 2011). Based on this classification, in this study 28.8 % (n=23) of the food samples were classified as cautionary (10^4 to < 10^5 CFU/g) and 42.5% (n=34) that had ≥10^5CFU/g were classified as unsatisfactory (Figure 4.24).

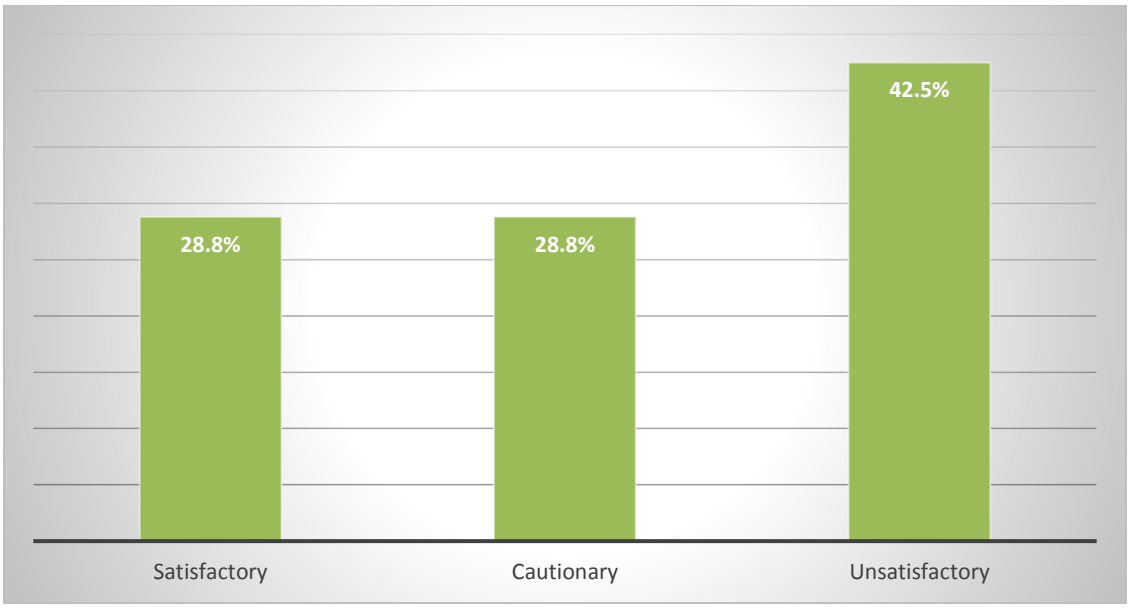

Figure 4. 24: Contamination with Total Viable Counts

4.4.3 Contamination with Coliforms and *Escherichia coli*

Microbiological analysis of the food samples, showed that 32.5% (n=26) were positive for coliforms and 17.5% (n=14) were positive for *E. coli* (Figure 4.25).

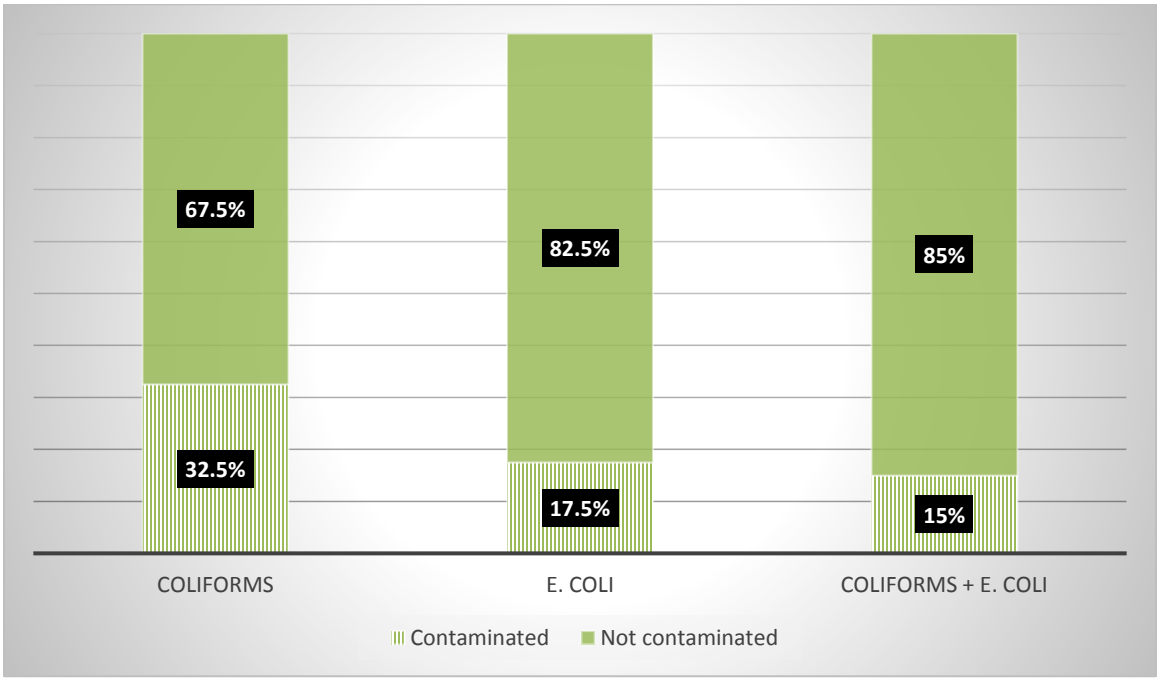

Figure 4. 25: Food samples contaminated with coliforms and *E. coli* (n=80)

There was a very low proportion of samples contaminated with coliforms (15%; n=12) that were also simultaneously contaminated with coliforms and *E. coli* (Figure 4.25).

The British Colombia Centre for Disease Control criteria for total coliforms were used to interpret the results for coliforms and *E. coli*. According to these criteria, RTE food containing $<10^2$ CFU/g for coliforms is considered satisfactory, while that containing $\geq 10^2$ to $<10^3$ CFU/g is cautionary, and that with $\geq 10^3$ CFU/g is unsatisfactory (BC Centre for Disease Control, 2011). This study revealed that of the 32.5% (n=26) samples that were positive for coliforms, 22.5% (n=18) had values of $>10^3$ CFU/g, and were thus classified as unsatisfactory (Table 4.19).

For *E. coli,* samples with < 3 CFU/g are considered satisfactory, while RTE food samples with >3 CFU/g are considered unsatisfactory (BC Centre for Disease Control, 2011). This study showed that all the samples that were positive for *E. coli* were unsatisfactory, with values of >3 CFU/g (Table 4.19).

Table 4. 1:Classification of the RTE food samples that were positive with Coliforms and *E. coli.*

		Satisfactory	**Cautionary**	**Unsatisfactory**
	Coliforms positive samples %(n)	Coliforms positive samples with $<10^2$ %(n)	Coliforms positive samples with $<10^3$ %(n)	Coliforms positive samples with $>10^3$ %(n)
Frequency and % of samples contaminated with coliforms (n=26)	32.5 (26)	5.0 (4)	5.0 (4)	22.5 (n=18)
		Satisfactory	**Cautionary**	**Unsatisfactory**
	E. coli positive samples % (n)	*E. coli* positive samples with < 3 % (n)	N/A	*E. coli* positive samples with > 3 % (n)
Frequency and % of samples contaminated with E. coli (n=17)	17.5 (14)	0		17.5 (14)

4.4.4 Contamination with *Salmonella spp.*

Of the 80 food samples (n=80) that were analysed (Figure 4.26), only 3.8 % (n=3) were positive for *Salmonella spp*. Due to the low numbers of the isolates, the researcher decided not to do species identification.

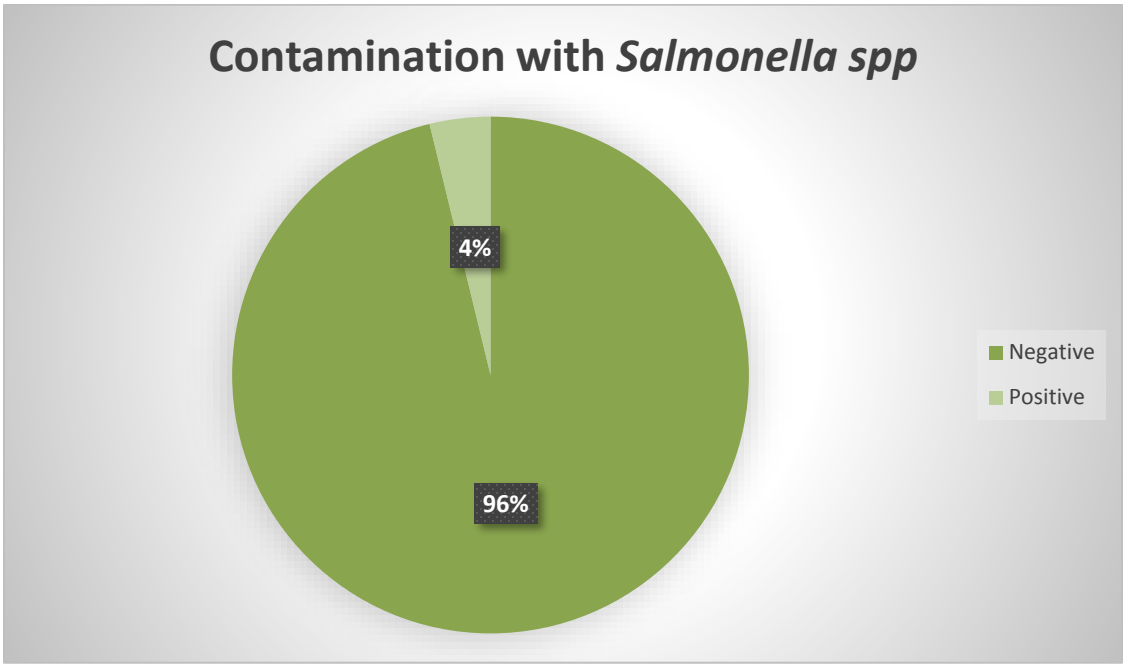

Figure 4. 26: Proportions of food samples positive for *Salmonella* spp

4.4.5 Predictors of contamination

As explained in chapter three (section 3.9.1, b, and ii) predictors of contamination for total viable counts were investigated by fitting a binary logistic regression model to the data. Using forward stepwise selection, the following variables were identified for inclusion in the final model (age of business, qualification, freezer, microwave, disinfecting surfaces between handling raw and cooked food, reheating of RTE food, manner in which food is reheated, temperature at which food is reheated, and ventilation at ethnic food premises). The model fit was tested using goodness of fit as described by Hosmer-Lemeshow (Hosmer & Lemeshow, 2000) and the results are presented in Table 4.20.

Table 4. 2: Hosmer and Lemeshow test

Step	Df	Significance
1	8	.990

Correlation between independent variables was tested, but no evidence of correlation was observed (Annexure VI). Results of the binary logistic regression model are presented in Table 4.21. Being in business for > 3 years proved to be protective against contamination (OR=0.010; p=.033) with total viable counts. Likewise, owning freezers marginally increased the risk of food contamination, with total viable counts (OR=133.653; p=.052) when compared to restaurants that did not own freezers. Owning a microwave was positively associated with decreased contamination, with total viable counts (OR=.013, p=**.**074), compared to when one did not own a microwave oven. The difference was however marginally significant (p=0.074). Lastly, reheating a whole pot proved to be protective against contamination (OR=.187; p=.048) when compared to reheating per serving.

Table 4. 3: Results of the binary logistic model

Variable	B	S.E.	Wald	df	Significance	Odds Ratio
Age of business *Reference point= < 3 years*						
	-4.633	2.177	4.528	1	**.033***	.010
Qualification *Reference point =below tertiary*						
	-.740	1.450	.261	1	.610	.477
Freezer *Reference point= not owning a freezer*						
	4.895	2.514	3.791	1	**.052***	133.653
Microwave *Reference point= not owning*						
	-4.373	2.448	3.191	1	**.074****	.013
Surfaces	*Reference point= not disinfecting surfaces*					
	-3.021	2.096	2.078	1	.149	.049
Reheat	*Reference point= no reheating*					
	.865	1.343	.415	1	.520	2.375
Reheating process	*Reference point= reheating per serving*					
	-1.677	.848	3.911	1	**.048***	.187
Temperature at which food is reheated *Reference point= <65 ℃*						
	-3.006	1.730	3.019	1	.082	.049
Ventilation *Reference point= no ventilation*						
	-2.644	1.649	2.569	1	.109	.071
Constant	9.884	3.858	6.565	1	.010	19610.738

- **Significant at p < 0.05*
- *** Marginally significant at p <0.05*

4.4.6 Discussion

a) Contamination with microorganisms

Food safety is an important component of food security, human nutrition and sustainable development; it contributes to fewer illnesses, and increased productivity, exports and income (WHO, 2013). In this study, (88%; n=70) carried total viable counts, but it is the elevated numbers that are worrisome not the actual presence. The finding of 42.5% food samples that were unsatisfactory because they had a microbial count of $\geq 10^5$ CFU/g (BC Centre for Disease Control, 2011), implies that these food samples were not safe for human consumption as they presented some microbial risk to the consumer. This is because RTE foods with counts of $\geq 10^5$ are potentially hazardous for human consumption (Centre for Food Safety, 2014). Although the presence of low microbial counts is normal in food products, high counts in cooked food are indicative of poor sanitation, processing and hygiene practices (BC Centre for Disease Control, 2011). While suggested action for samples classified as cautionary include review of hygiene procedures, remedial action for unsatisfactory results includes immediate withdrawal of the food from sale, investigation of the causes, and adoption of the measures to improve the situation (Centre for Food Safety, 2014). These results are similar to other studies conducted in Nigeria that showed that ethnic foods contained high bacterial loads (Ire & Imuh, 2016). Ire & Imuh (2016) attributed the high bacterial counts in these foods to poor personal hygiene and non-compliance with Hazard analysis and critical control points during food preparation, packaging and serving. The findings of the present study are also consistent with findings of other studies that showed that RTE foods sold by small-scale informal vendors in South Africa are susceptible to poor microbiological quality (Nyenje *et al*.,2012; Oguttu *et al.*, 2014).

Contamination with coliforms and *E. coli* was observed in 32.5% (n=26) and 17.5% (n=14) food samples respectively. This is similar to findings by other authors who reported the presence of coliforms and *E. coli* in ethnic foods (Madueke, Awe & Jonah, 2014; Ire & Imuh, 2016). Both coliforms and *E. coli* have also been observed in other informally traded foods like street-vended RTE foods sold in South Africa (Lues, Rasephei, Venter & Theron, 2006; Oguttu, 2014). However, Nyenje *et al*. (2012) in their case study conducted

in Alice, South Africa did not isolate *E. coli*, which is contrary to what is reported here. Sighting of houseflies, vendors located >30m from the toilet, infrequent washing of hands, and maintaining food at <70˚C were identified as drivers of contamination with *E.coli* in a study by Oguttu (2014). Of these factors, it is only sighting of house flies that was a common problem in the current study. Therefore, moderate prevalence of *E. coli* could be linked to the better performance of the current study's participants on the other three factors. According to Barreiro *et al.* (2013), house flies that are found in kitchens usually have lower counts than those that are in open spaces, so this could have also minimized the risk of *E. coli* in this study. This positive result is probably associated with the high numbers of entrepreneurs that had access to flushed toilets, water, and physical structures such as permanent structures, floors, ceilings and walls. However, their isolation, although moderate, is still a cause for concern as they are indicative of inadequate processing and post-processing contamination that could have resulted from failure to wear protective clothing, failure to wash hands after touching money, faecal contamination which could result from improper handwashing processes, and poor sanitation (BC Centre for Disease Control, 2011).

Although exposure to coliforms does not necessarily result in illness, their presence in food in high numbers is associated with symptoms like nausea, vomiting, retching, abdominal cramp, diarrhoea and prostration (Ire & Imuh, 2016). Similarly, high bacterial loads in food are a cause for concern as they are associated with diarrheal diseases (Baylis *et al.*, 2011; Madueke *et al.*, 2014) like haemorrhagic colitis, haemolytic uraemic syndrome, and thrombotic thrombocytopenic purpura (Madueke *et al.*, 2014).

Consistent with previous studies on RTE food sold on the informal market (Oguttu, 2014), the results of this study showed that there was also a higher prevalence of food samples contaminated with coliforms than with *E. coli*. The presence of coliforms in ethnic foods points to environmental contamination, while the presence of *E. coli* implies direct or indirect faecal contamination (Centre for Food Safety, 2014; Ire & Imuh, 2016). Therefore, these results suggest that the source of contamination was related more to the environment than to personal hygiene. As was observed to a certain extent in the present study, available research suggests that most ethnic food restaurants operate from poorly

resourced premises that are characterised by poor ventilation, dirty and broken floors, and damaged equipment (Rudder, 2006; Harris *et al.*, 2015), which are risk factors for environmental contamination.

The low prevalence of *E. coli* (17.5%; n=14) that was observed in this study is contrary to the findings by Ire & Imuh (2016), who reported that *E. coli* was present in 100% of the food samples they tested. The low prevalence of *E. coli* in the present study could be due to the fact that unlike in the latter study where food was street-vended, the majority of vendors in this study were located in areas that had access to water and toilet facilities.

Although few (3.8%; n=3) food samples tested positive for *Salmonella spp.* in this study, the occurrence of *Salmonella spp* in food samples in the present study corroborate findings of Ire & Imuh (2016) where *Salmonella* was found in RTE foods. *Salmonella* is one of the most common foodborne pathogens (Baylis *et al.*, 2011; Ire & Imuh, 2016), and its presence in cooked food is linked to inadequate sanitation, poor personal hygiene, and inadequate refrigeration (Lues *et al.*, 2006). It is responsible for food poisoning and illnesses such as diarrhoea, fever and abdominal cramps (Baylis *et al.*, 2011). However, *Salmonella* organisms are not always isolated from informally traded RTE foods. For example, Nyenge *et al.* (2012) did not find *Salmonella spp* in RTE foods that were sampled. The observed difference could be attributed to different vendor characteristics. Previous studies have indicated that ethnic operated restaurants have high odds of violating food safety regulations when compared to non-ethnic operated restaurants (Roberts *et al.*, 2011; Harris *et al.*, 2015). The non-compliance has been associated with language barriers which limit the ability of the ethnic food operators to comprehend government regulations (Roberts *et al.*, 2011; Harris *et al.*, 2015) and poor resources (Njomo, 2013).

b) Predictors of contamination

The results of this study revealed that the older the age of the business the lower the risk of contamination with total viable counts. This was expected, as businesses with less experience might not have familiarised themselves with food safety guidelines and regulations, especially when this is combined with the low exposure to food safety training

observed in this study. Previous studies have shown that generally more experience improves knowledge and practices in food hygiene (Al Suwaidi, Hussein, Al Faisal, El Sawaf & Wasfy, 2015; Sibanyoni *et al.*, 2017). This can be attributed to the fact that food vendors improve on their skill and knowledge of safe food handling over time (Sibanyoni *et al.*, 2017). Agarwal & Dahm (2015) go on to suggest in their study on the success factors of independent ethnic restaurants in the USA that previous experience is more important that formal hospitality education.

Owning a freezer was also found to be associated with increased odds of contamination with total viable counts in this study. This could be due to inadequate knowledge on temperature controls or malfunctioning of the freezers. Considering the under-resourced nature of the ethnic food vendors it is possible some had bought second-hand freezers that are not efficient at freezing food. Although the actual knowledge on appropriate temperatures for freezers in this study was not investigated, a previous study revealed that most restaurant manager of small food establishments lacked knowledge in this regard, with most of them leaving food at room temperature for extended periods of time before storing it in refrigerators / freezers (Onyeneho & Hedberg, 2013). Furthermore, inappropriate storage techniques such as refreezing defrosted food, and failure to check temperatures of the refrigerators / freezers were mentioned as some of the high-risk factors among food handlers in a study conducted in Ghana (Akabanda *et al*., 2017). This could be attributed to the fact that even though refrigeration slows down the growth of microorganisms, organisms can still grow in refrigerator (WHO, 2006). Lastly, the fact that none of the restaurants in this study owned thermometers makes it impossible to monitor appropriate temperatures for fridges / freezers.

In this study, owning a microwave turned out to be a protective against contamination with total viable counts (OR=.013,p=**.**074).This is justified by the literature, which confirms the convenience of microwaves oven for defrosting, and reheating and / or cooking food safely when safe temperatures are adhered to (WHO, 2006; United States Department of Agriculture, 2011).

Reaheating the whole pot of food was associated with less risk of contamination in this study when compared to reheating per serving. According to Minnesota Department of

Health (2015), RTE foods should be reheated rapidly until the internal temperature reaches 165˚C and served immediately. Based on these results it is apparent that the vendors who were studied employed the correct reheating process to limit bacterial growth.

4.4.7 Conclusion and recommendations

To the best of my knowledge, the current study is the first of its kind to investigate the microbiological quality of ethnic foods sold in South Africa. An important finding of this study is that food quality concerns raised by consumers in chapter 4 of this study are valid.

Even though the presence of total viable counts is not a measure of food spoilage, unsatisfactory counts found in 40% of the samples in this study are indicative of poor sanitation, maintenance, food handling and/or food storage practices. Based on these findings, it is recommended that sanitation, food handling and hygiene practices be reviewed at these establishments. This could include assessing the food safety knowledge, food handling practices and hygiene practices, something which was outside the scope of this study.

The environmental related food contamination concerns raised in this study calls for further attention. There is a need to look into the cleanliness of walls, and ventilation to minimize the role of the environment in rendering the food unsuitable for consumption.

The fact that the occurrence of indicators and pathogenic organisms was low suggests that the RTE ethnic foods analysed sold in ethnic restaurants in the study area pose a minimal to low risk to the consumers, meaning that ethnic food entrepreneurs operating in the study area are capable of producing food of acceptable microbial quality. This highlights the importance of the ethnic food entrepreneurs to the household food security of the immigrant population living in South Africa.

Although there was very low occurrence of pathogenic microorganisms, their isolation points to the need for improvement on the following areas: sanitation, food handling and hygiene practices. Furthermore, the current study only focused on isolation of a few

microorganisms that are problematic in foodborne illnesses, therefore studies to analyse the presence of other common foodborne pathogens are required.

The four factors that were significantly associated with total viable counts in this study (younger age of business, owning a freezer, not owning a microwave, and reheating the whole pot) suggest lack of, or poor facilities, poor monitoring of appropriate temperatures for food and equipment, and inadequate knowledge on the appropriate temperature for refrigerators and correct reheating processes. The association of younger businesses with total viable counts indicates high vulnerability of these businesses to poor handling and food hygiene practices due to lack of experience. The importance of owning calibrated thermometers and freezers thus needs to be promoted amongst all ethnic vendors. Lastly, the four factors should form the main focus of continuous training programmes designed for ethnic vendors.

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Recap of the aim and objectives of the study

The aim of this study was to assess the availability and accessibility of Sub-Saharan African Immigrants' traditional food from ethnic food markets, shops and restaurants, establish immigrants' perceptions towards South African's food culture, and determine predictors of contamination of selected cooked food sold in the ethnic food markets and restaurants. From this aim, seven objectives were formulated as follows: (i) investigate immigrants' perceptions towards South Africa's food culture, (ii) determine the contribution of ethnic food markets to the dietary patterns of immigrants, (iii) investigate the availability, and accessibility of ethnic foods, (iv) document coping strategies adopted by immigrants when faced with shortage of their traditional foods or ingredients in South Africa, (v) identify socio-demographic factors (region of origin, age, marital status, qualification, employment, household income, duration of stay) that are associated with adoption of South African foods, (vi) investigate the microbiological quality of selected cooked foods found in ethnic food markets, and restaurants; and (vii) identify predictors of contamination of ethnic foods bought from restaurants and markets.

5.2 Overview of the conclusions of the study

A general overview of the conclusions is presented in this section, using the research objectives of the study as headings.

5.2.1 Conclusion about immigrants' perceptions towards South Africa's food culture.

The study is the first to present a quantitative assessment of Sub-Saharan immigrants' perceptions towards South African food culture. Results of this study showed that immigrants have adopted quite a number of South African foods, although the results indicate that the initial stages of adoption process are involuntary, mainly due to high prices and unavailability of their traditional foods. Negative perceptions towards the South

African food culture per se were not identified in this study as being a significant factor. This is supported by the fact that few immigrants (17%; n=33) found tasting different as being an issue, and even fewer (1.5%; n=3) believed that South African food culture is unhealthy.

Apart from the fact that most foods that have been adopted by immigrants in this study are mainly energy-dense, and highly processed there are only a few authentic South African foods that appear among foods that the immigrants adopted. Therefore, it can be concluded that immigrants do not have adequate knowledge of the South African food culture and could be at risk of food insecurity due to inability to make healthy dietary changes. This is supported by their inability to distinguish between South African food and fast foods.

5.2.2 Conclusion about the contribution of ethnic foods and ethnic markets to dietary patterns of Sub-Saharan immigrants.

Ethnic food markets play a major role in the upkeep and continuation of ethnic food culture and the household food security of these immigrants. In the absence of immigrants' ethnic foods from the mainstream supermarkets, ethnic food markets remain the major source of ethnic foods for the majority of immigrants 94, 8% (n= n=183) in this study. Despite the adoption of South African foods, ethnic foods still form a major part of the immigrants' dietary patterns, with a significant number of immigrants (39.2%; n=76) indicating that they consume their ethnic foods three times a week while some (21.6%; n=42) consume it every day. It can also be concluded that the majority of the immigrants who were studied (78.8 %; n=152) follow bicultural eating patterns and that they are at risk of adopting unhealthy eating patterns, as suggested by previous studies.

Despite the diverse reasons given for continuing with their original food culture, the findings of this study confirm the theory that culture plays a significant role in shaping and reinforcing people's identity, with the highest number of respondents (32%; n=62) mentioning culture as the main reason why they continue with their traditional food culture. Although, food availability and accessibility determines the actual food intake, culture serves as a guideline for which food should be eaten or not eaten (den Hartog *et*

al., 2006). This is where the strength of ethnic food markets lies. With their deeper understanding of the cultural beliefs ethnic food markets are in a better position to cater for ethnic food needs, not only by their unique food preparation methods, but through food styling, decor, and the music they play (Njomo, 2011). This cultural uniqueness together with the benefits that immigrants cited for visiting ethnic shops suggest that ethnic food markets are expected to continue playing a crucial role as main sources of ethnic foods even if it becomes available in the mainstream supermarkets (Jacobus & Jalali, 2011; Dharod *et al.*, 2013).

5.2.3 Conclusion about the availability and accessibility of ethnic foods.

Only one third of immigrants studied (32.3% (n=63/194) were satisfied in terms of the ease with which the food can be accessed, and likewise a very small number (only 7%; n=14/194) were satisfied with the affordability of the ethnic foods. In view of this, the immigrants under study are at risk of accelerated dietary acculturation and adoption of unhealthy eating habits, especially given the financial burden they carry. Although in his study Njomo (2012) advocates for the mainstream supermarkets to stock ethnic foods to improve on the availability and affordability of ethnic foods, the author is of the view that this would not solve the problem, due to lack of cultural familiarity. Furthermore, this advocacy for mainstream supermarkets to introduce ethnic foods could jeopardise job opportunities for ethnic entrepreneurs who are already marginalised in the formal sector by virtue of being foreign nationals. This could worsen the unemployment rate in South African which is currently at 27.7% (Statistics South Africa, 2017).

The other problems that were highlighted were lack of variety (76.0%; n=147), inadequate quality of ethnic foods (88.0%; n=170), and inaccessibility of ethnic shops (62.3%; n=121). All these factors have a negative bearing on the continuation with original food culture. The varying degrees to which these factors were highlighted is linked to the distance of the households from the shops. Ethnic shops and restaurants are likely to be found in parts of cities where the majority of the immigrants are located. Therefore, it is the immigrants who are located away from such areas that would experience high levels of inaccessibility and lack of variety of ethnic foods.

Given the number of unavailable ethnic foods (staple foods, meat and meat products, vegetables and fruits) menu and recipe adaptation seems unavoidable. This therefore means that even the meals and dishes that are regarded as ethnic are likely to have undergone some level of adaptation, making it difficult to conclude that they are purely ethnic / traditional. This is an area that warrants research. However, the lack of knowledge on healthy South African foods observed in this study, and evidence of studies done elsewhere showing that these adaptations and / or replacements are usually unhealthy (Renzaho & Burns, 2006; Holmboe-Ottesen & Wandel, 2012), suggest that immigrants could be at risk of suffering from adoption of unhealthy dishes and menus.

Therefore, although ethnic food markets and restaurants contribute significantly towards household food security, unavailability, inaccessibility and lack of variety pose a limitation.

5.2.4 Conclusion about the coping strategies.

This is the first time that the coping strategies utilised by immigrants when faced with shortage of their ethnic foods have been investigated in South Africa. Two main categories of coping strategies were identified, namely, relying on less-preferred food (38.7%; n=75), and replacing unavailable ingredients with similar ingredients (37.6%; n=73%). The use of relying on the less-preferred food coping strategy confirmed the findings that indicated that dietary acculturation is indeed taking, while the use of replacing unavailable ingredients with similar ingredients confirmed that recipe adaptation is taking place. The two strategies are classified as dietary changes (Gupta *et al.*, 2015).

Although not widespread, there are indications that immigrants studied here are at risk of food insecurity. Some immigrant households make use of rationing strategies such as skipping a meal and limiting portion sizes to cope with failure to access their ethnic foods.

In conclusion, immigrants in the study area have found ways to cope with unavailability of their food ingredients. The fact that immigrants have not adopted drastic strategies like selling household items suggests that the problem with unavailability of ethnic foods is not severe. By contributing to the understanding of these coping strategies the present study provides baseline information to develop informed interventions to address the unavailability.

5.2.5 Conclusion about the factors associated with adoption of South African food culture.

The study identified the following factors as predictors of adoption of South African food culture:

- Spending a lot of money on food.
- Duration of residence in South Africa of between 3-6 years.
- Low level of income.
- Working part-time/temporary jobs.

5.2.6 Conclusion about the link between demographic profile and hygiene practices of the ethnic food vendors.

This is the first study to assess the link between characteristics and hygiene practices by ethnic food entrepreneurs operating in South Africa. The majority of ethnic food vendors were of West African descent and belonged mainly to the economically active group (30-49 years). The fact that young people dominated this sector suggests that ethnic food markets contribute positively towards provision of employment for immigrants.

A positive finding, probably linked to the understanding and interpretation of food safety regulations, was that the majority of the immigrants were conversant in English, which happens to be the official language in which most policies and regulations are written. This makes it feasible to implement training of such policies and regulations among immigrants who enter the informal food market.

The present study revealed a low level of food safety training among the food vendors, something which has been observed among other informal food vendors in South Africa (Oguttu *et al.*, 2014) and in other parts of Africa (Onyeneho & Hedberg, 2013). In South Africa, this is attributed to the fact that food safety training of food vendors is not made mandatory in the Regulations Governing General Requirements for Food Premises and Transport of Food (No. R. 918 of 1999).

Furthermore, the study showed that ethnic food shops are mainly independently owned, confirming previous literature from the USA (Agarwal & Dahm, 2015; Harris, 2016), that they are usually small, independently owned, and are family- oriented business enterprises. These characteristics predispose ethnic restaurants and shops to inadequate physical resources, difficulty in accessing capital, and employing inexperienced personnel (Agarwal & Dahm, 2015).

There was a high level of adherence (over 50% for each) to the acceptable standards with regard to the ethnic shops and restaurants operating in formal permanent structures with floors, ceilings and walls of acceptable standards. In view of this, the environment they work in mitigates against the risks associated with environmental contamination.

Access to water, which is generally linked to personal hygiene and prevention of food contamination, was generally high in this study. However, there was low compliance in providing toilets with soap to ensure proper hand washing, a risk factor for *E. coli*.

Furthermore, there was a high level of adherence to the food handling and hygiene practices that are protective against, and enhance prevention of, cross-contamination and multiplication of bacteria, such as disinfecting knives and surfaces between using, separating raw and cooked food, and adhering to recommended temperature control and holding temperatures.

The low compliance with the wearing of protective clothing such as caps and gloves was problematic, and could further compromise the quality of food sold by ethnic food vendors by increasing cross-contamination.

Failure to own thermometers, low ownership of freezers (37.5%, n=15) and microwave ovens (55%, n=22) by ethnic vendors in this study is indicative of poor resources and there could be inadequacies in adhering to the proper cooking and temperature control standards needed for food. The manner in which RTE food was reheated could easily result in improper temperatures and time required to prevent multiplication of bacteria, especially considering that none of the vendors owned thermometers. The fact that preparation of a whole day's food was done at one go by the majority of the entrepreneurs was another poor food handling practice that was identified in this study. Although this is

not a problem when food is sold within one hour of preparation, failure to observe this time and monitoring of temperature suggests that there is significant potential for the microbial quality of food to be compromised. This is related to poor knowledge and compliance amongst food vendors.

The majority of the food vendors had long fingernails and half of them wore jewellery. This is a clear indication that poor knowledge about the potential risk that these factors can have with regard to food is prevalent among the food vendors.

In this study there was evidence of ethnic food being integrated into South African cuisine. This was confirmed by reports from the ethnic vendors that South Africans also form part of their clientele. In view of this, there is likely to be an increase in the demand for ethnic foods. Therefore, when taking into consideration the food safety concerns raised here, monitoring and enforcement strategies need to be intensified.

Overall, if left unattended the food handling concerns raised in this study could adversely affect the quality of food, food safety, and consequently food security due to high contamination levels, and the incidence of food loses, foodborne illnesses, and loss of life.

5.2.7 Conclusion about the microbiological quality of selected cooked foods found in the ethnic food markets, and predictors of contamination.

The findings reported here demonstrated that the RTE samples carried microorganisms. The finding that 28.8% (n=23) were classified as cautionary and 42.5% (n=34) as unsatisfactory confirms the belief held by the majority (87.6%, n=170) of the immigrant households in this study, that the quality of ethnic foods in South Africa is poor.

Although isolation of coliforms and *E. coli* was moderate in this study, there is a need for improvement especially in the areas of wearing protective clothing, proper handwashing and proper sanitation after touching is warranted before the problem escalates.

Salmonella spp was only identified in 3.8% (n=3) of RTE food samples in this study. Notwithstanding this low isolation, these results mean that the food hygiene concerns raised in chapter 5 have the potential to result in unsafe food.

Taking into consideration the recommended remedial actions especially for the unsatisfactory samples (total viable counts, coliforms, *E coli*), and the implications of these results as evidenced by the literature, these results could have a negative implication not only for the concerned vendors but also for the consumers of the food as well. Firstly, withdrawal of the food would translate into loss of income by ethnic vendors. Secondly, it could deny immigrants reliable access to their preferred food. Lastly, when ingested it could result in foodborne illnesses and reduced productivity, which could have a negative impact on the livelihoods of immigrants, especially taking into consideration that most immigrants in this study are self-employed. Ultimately, this could have devastating results for the food security of the immigrants in this study, something which is already compromised by unavailability, high prices, lack of variety, and adoption of unhealthy food choices.

The factors driving contamination of RTE ethnic food samples with total viable counts include:

- Being new in business;
- Owing a freezer;
- Not owning a microwave; and
- Reheating the per serving.

These four factors should form part of monitoring and by-law enforcement to reduce the rate of contamination. The problem with freezers and reheating calls for emphasis on KEY 5, “Keep food at safe temperatures” of the WHO’s five keys to safer food (WHO, 2006).

5.3 Recommendations

Based on the evident dietary acculturation and poor dietary choices observed in this study, targeted nutrition education programmes aimed at educating Sub-Saharan immigrants about healthy South African food choices are required. The programmes could include design and distribution of pamphlets containing healthy South African food choices at supermarkets located in areas where majority of immigrant population are found. The said pamphlets can also be distributed at immigration offices and foreign

embassies. To ensure cultural familiarity with these food choices, authorities could form partnerships with the already existing ethnic food entrepreneurs to identify similar healthy food ingredients. In South African mainstream supermarkets it has become the norm to find demonstrators of various food products and cooking methods during busy market days. Authorities working hand in hand with the concerned food companies could introduce customised demonstrations for supermarkets that are located in immigrant-dense locations.

The fact that ethnic food entrepreneurs struggle to provide sufficient, affordable, and varied ethnic foods is suggestive of low buying and negotiating power. Therefore, strategies to facilitate formation of co-operatives by the ethnic food entrepreneurs should be investigated and facilitated. Formation of co-operatives would not only ensure buying and negotiating power when dealing with suppliers but might also enable them to identify and solve other problems facing this sector in order to increase availability, affordability and variety of ethnic foods. The formation of such cooperatives could be facilitated by embassy offices working with local officials.

Coping strategies adopted by immigrants in this study revealed that recipe and menu adaptation are taking place. Studies to investigate the exact ingredients that are used to replace unavailable ethnic food ingredients are thus required, so that healthy, affordable and widely available options can be recommended.

The four factors identified as predictors for contamination should serve as guidelines on which immigrants should be targeted for educational programmes about healthy South African food options, to ensure that dietary acculturation is not detrimental to their health.

To address the shortfalls in food handling and hygiene practices identified in this study, food safety training programmes are required and should be made mandatory in South Africa for persons working within food establishments. In addition, tailored training programmes to address the unique challenges faced by all small food entrepreneurs entering the market are also a necessity. These should be provided by the officials as small entrepreneurs might not be able to afford to outsource the services of private companies. These training programmes, for example could incorporate the principles of

the Five Keys to Food Safer Food developed by the WHO (2006), as they are comprehensive and easy to understand. The training programmes should also emphasise the importance of wearing protective clothing.

There is a need for strengthening monitoring and enforcing regulations in this sector. This will not only improve compliance but will assist in identifying potential problems that may develop over time. For example, the inspection of all premises before businesses become operational needs to be intensified. Routine monitoring of food enterprises needs to be defined, and specified in the regulations to give guidelines to the authorities on how often businesses like ethnic food markets and restaurants should be monitored. Specifications that classify business enterprises according to the level of risk as mentioned by Kwon *et al,* (2010) are good examples of strategies that can be adopted in South Africa.

Since low levels of ownership of resources such as thermometers, freezers / fridges, and microwaves were also identified as major problems within this sector and thus indicative of the under-resourced nature of the ethnic food markets and resources, there is a need for remedial measures to be implemented. These problems could be rectified by emphasis on these appliances in the training programmes and monitoring to ensure compliance. To assist ethnic entrepreneurs to move from the informal under-resourced sector there is a need to assist them with proper registration of their businesses and with skills in writing business plans and bookkeeping. Apart from refining business ideas, well-written business plans will improve access to bank loans, thus providing much needed start-up capital. The foregoing have been identified as problematic issues responsible for underperformance and consequent failure of ethnic food restaurants (Leung, 2010; Agarwal & Dahm, 2015).

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ANNEXURE I: QUESTIONNAIRE FOR HOUSEHOLDS

Section A: Bibliographic information

Questionnaire reference number.....

A1. Marital status.

Married	
Unmarried, not staying with a man	
Divorced	
Widowed	
Separated	

A2. Age at last birthday

Below 20years	
20-29 years	
30-39 years	
40-49 years	
50-59 years	
60-69 years	
Over 70 years	

A3. Please state your highest qualification

☐ No formal schooling ☐ Primary education ☐ Secondary education ☐ High school education ☐ Tertiary education diploma ☐ Tertiary education degree and above

A4. Employment status

Code	Reason	
1	Full-time position	
2	Part-time position	
3	Temporary assignments	
4	Self employed	
5	Student	
6	Unemployed	
7	Other (specify)	

A5. What is the total income of your household per month?

Under R5000	
R5 000-R10 000	
R11 000-R15 000	
R16 000-R20 000	
R21 000-R25 000	
R26 000-R30 000	
Above R30 000	
Would rather not say	

A6. How much do you spend on food per month?

1	Under R500	
2	R500-R999	
3	R1 000-R1499	
4	R1500-R1999	
5	R2000-R2499	
6	R2500-R2999	
7	R3000-R3499	
8	R4000-R4499	
9	Abovw R5000	

A7. Please state your country of birth.

.....

A8.How long have you been residing in South Africa?

.....
.....

Section B: Continuity with their traditional food culture

B1. How often do you eat your traditional food?

Code	Description	
1	Everyday	
2	Three times a week	
3	Once a week	
4	During special occasions	
5	Never	
6	Other (specify)	

B2 How often would you like to eat your traditional food?

.

Code	Description	
1	Everyday	
2	Three times a week	
3	Once a week	
4	During special occasions	
5	Never	
6	Other (specify)	

B3. Is it important to you and your family to preserve your traditional food culture?

Yes		
No		

B4. If you answered yes to question B3 please give a reason to your answer.

Code	Reason	
1	It is part of my culture	
2	It is healthy	
3	It reminds me of my country and family back home	
4	Its is tasty	
5	Other (specify)	

B5. If you answered “No” to question B3, please give a reason for your answer.

……

……

……

B6. What challenges have you experienced regarding retaining your traditional food culture?

Code	Reason	
1	It is expensive	
2	It is unavailable	
3	Shops that sell my traditional food are far	
4	Quality of the traditional food sold in the local shops is poor.	
5	It take time to cook my traditional food	
6.	Other (specify)	

Section C: Perceptions towards South Africa’s food culture.

C1.Have you adopted South Africa’s food culture?

Yes		
No		

C2. If you answered yes to C1, how would you describe your adoption of the country’s food culture with regards to dietary patterns?

Code	Description	
1	Strictly South African food at all meal times (only eating my traditional food during special events)	
2	Limited adoption of South African food (only eating South African food	

	in combination with my our traditional food)	
3	Very little adoption of South African food (only eating South African food when visiting friends or dining out)	
4	Other (specify)	

C3. What was the reason for adopting it?

Code	Reason	
1	Because I like the food here	
2	Unavailability of my original food from the markets	
3	Price of my original food is too high	
4	My kids prefer it	
5	Other (specify)	

C4. If you answered 'No' to question C1, what is the reason for not adopting South Africa's food culture? (Please explain.)

Code	Reason	
1	Taste is unfamiliar	
2	I do not know how to cook South African food.	
3	South African food is unhealthy	
4	Religious reasons	
5	Other (specify)	

Section D: Availability of immigrants' traditional foods in South Africa

D1.How available is your traditional food in South Africa?

Code	Food availability	
1	Available (I always find what I am looking for)	
2	Scarce (I sometimes do not find what I am looking for)	
3	Very scarce (I hardly find what I am looking for)	
4	Other (specify)	

D2.If it is not available give reasons for your answer.

Code	Reason	
1	It is expensive	
2	It is unavailable	
3	Shops that sell my traditional food are far	
4	Quality of the food is poor	
4	Other (specify)	

D3.How do you normally obtain your traditional food here South Africa?

Code	Food source	
1	I buy it from the supermarkets	
2	I buy it from the ethnic food markets and restaurants	
3	I get it from relatives and friends	
4	My family back home ship it to me	
5	Other (specify)	

D4. On average how much do you spend on your traditional food per month?

Code	Amount spent on traditional food per month	
1	R0-R300	
2	R301-R600	
3	R601-R900	
4	R901-R1200	
5	Above R1200	

D5. What do you personally suggest can be done to improve the availability and accessibility of your traditional food in South Africa?

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

D6 List the food items that you and your family have adopted and are now part of your daily diet since your arrival in South Africa.

.....
.....

.....
.....

.....
.....

.....
.....

SECTION E: Availability and accessibility of immigrants' traditional foods, ethnic food markets, shops and restaurants.

E1. List the kind of food you obtain from the ethnic markets

.....
.....

.....
.....

.....
.....

E2. List the food that you enjoyed back home, but have not been able to find here.

……
…

……
..

……
.

……

E3. What is your opinion in terms of food variety at the ethnic food markets?

Code	Variety of food	
1	Wide variety	
2	Limited variety (variety slightly more limited than variety back home)	
3	Very limited variety	

4	Other (specify)	

E4. In terms of price, how affordable is the food at these markets?

Code	Affordability	
1	Very affordable	
2	Slightly unaffordable (price slightly higher than the prices back home)	
3	Very unaffordable (prices too high)	

E5.In terms of quality, how would you rank the standard of food at these markets?

Code	Quality of food	
1	Excellent quality	
2	Average quality	
3	Poor quality	
4	Very poor quality	

E6.Besides being the source of food, are there any other benefits that you derive from visiting the ethnic food markets and restaurants?

Yes	
No	

E7.If you answered 'Yes' to E6, please select a reason.

Code	Other benefits of going to the ethnic food markets, shops and restaurants.	
1	I get to meet friends	
2	I get to hear about news back home	
3	I send messages and goods back home	
4	I share information about illnesses, deaths, and celebrations	
5	Other (specify)	

E9. How often do you visit these ethnic food markets, restaurants and shops per month?

Code	Number of times you visit the ethnic food markets, restaurants and shops	
1	Once a month	
2	Twice a month	
3	Three times a month	
4	Four times a month	
5	More than four times a month	
6	Other (specify)	

E10.In terms of accessibility of these markets from your place of residence, how accessible are they?

Code	Accessibility of markets	
1	Very accessible (within a walking distance)	
2	Slightly inaccessible	
3	Very inaccessible	

SECTION F: Coping strategies

F1. If there were times when you did not find your preferred traditional food in South Africa, how did you cope?

1	Rely on less preferred food (replace with host country's food)	
2	Replace with similar ingredients	
3	Rely on similar food found in the market	
4	Borrow the traditional food from friends or relatives	
5	Limit portion sizes of the traditional food	
6	Use spices to acquire the desired taste	
7	Skip a meal	
8	Other (specify)	

F2. What do you personally suggest can be done to improve the availability and accessibility of your traditional food in South Africa?

.....
.....

.....
.....

.....
.....

SECTION G. Assessing dietary patterns 3-day food recall

(List the food you consumed in the past three days-from breakfast to supper)

Day 1	Morning	N	E	Food Origin
Day 2				
Day 3				

ANNEXURE II: CHECKLIST

1.1 Age

Below 20years	
20-29 years	
30-39 years	
40-49 years	
50-59 years	
60-69 years	
Over 70 years	

1.2 Age of the business

Below 3 years	
4-6 years	
7-9 years	
10-12 years	
13-15 years	
Over 16 years	

1.3 Educational level

Code	Reason	
1	No formal schooling	
2	Primary education	
3	Completed matric	
4	Self employed	
5	Diploma	
6	University degree	
7	Postgraduate degree	

8	Other (specify)	

1.4 English proficiency

Cannot read	
Can read a little	
Can read	

1.5 Which of the following best describes the region of birth of the vendor?

Southern Africa	
West Africa	
Central Africa	
East Africa	
Other (specify)	

1.6 Which of the following best describe the nature of the business?

Shop	
Independent restaurant	
Chain restaurant	
Market	
Other (specify)	

1.7 Which of these best describe your customers?

Southern Africans	
East Africans	
West Africans	
Central Africans	
All of the above	
Other	

1.8 Which of these best describe the number of health inspections?

Weekly	
Every other week	
Monthly	
Every other month	
Once in 3 months	
Once in 6 months	
Once a year	
Never	
Other (specify)	

1.9. Certificate in food handling and hygiene practices?

Yes (give details)	
No	

CHECKLIST FOR THE ASSESSMENT OF HYGIENE

Checklist for the food vendors at ethnic food markets, shops and restaurants.

Ref No:

A Hygiene: facilities

2.1 Structure of where the ethnic food is sold

Permanent structure	
Temporary structure	
Other (explain)	

2.2 Condition of the structure

Ventilation	Good	Poor(explain)
Floors		
Ceiling		
Equipment		

Walls		
Other		

2.3 Facilities (Tick)

Refrigerator	
Freezer	
Thermometer	
Microwave	
Other	

2.4 Water source

Tap available at the premises	
Water collected in containers from municipal taps	
Entrepreneur brings water from home	
Entrepreneur buys water from someone who delivers it to the premises	
Other	

2.5 Waste disposal

Rubbish bin at the premises	
Rubbish bin covered	
Rubbish bin overflowing with rubbish	
Other	

2.6 Nature of the toilet and washing facilities available at the premises

Portable toilet only	
Portable toilet with tap close by (±20m)	

Portable toilet with tap ±100m away	
Long drop toilets only	
Long drop toilets with tap close by (±20m)	
Long drop toilets with tap ±100m away	
Flushing toilets with no hand washing basin	
Flushing toilets with hand washing basin	
Flushing toilets with hand washing basin with soap	
Flushing toilets with hand washing basin but no soap	
Other	

2.7 Which these best describes the toilets used by the staff at the ethnic shops, markets and restaurants?

Exclusively used by the staff	
Constructed by the municipality for a number of different entrepreneurs	
Use of toilets at petrol station	
Use of toilets at the mall/shopping centre	
Other	

B Personal hygiene: Food handling practices and personal hygiene

3.1 Washing of hands is carried out in different containers at the shop

Yes	
No	

3.2 Measures employed by food handlers to avoid cross-contamination of food?

Utensils used for raw food and cooked are kept separate	
Knives are washed and disinfected between using	
Containers used for serving food are not used to handle raw food	
Food vendors wash hands between handling raw and ready to eat food	
Surfaces are washed and disinfected between using	
Other	

3.3 Protective clothes worn while preparing and serving food

Cap	
Apron	
gloves	
Other	

3.4 Does the food handler wash hands between serving and handling money?

Yes	
No	

3.5 Does the food handler wash hands between serving each customer?

Yes	
No	

3.6 Ready to eat food reheated before serving?

Yes	
No	

3.7 Which these best describes the manner in which food is reheated?

Food reheated per serving?	
Whole pot of food reheated?	
Other	

3.8 Temperature at which cooked food is kept?

≥ 65°C	

≤65°C	

3.9 Is ready to eat food covered to protect from dust and flies?

Yes	
No	

3.10 Rate the fly population at the premises / site

> 10 flies	
1-10 flies	
Not even one fly observed	

3.11 Is raw food covered to protect from dust and flies?

Yes	
No	

3.12 Is raw food and ready-to-eat food stored separately?

Yes	
No	

3.13Which of the following describes the preparation of food?

All the day's food prepared at one time	
Not all food is cooked at one go	

3.14 Length of food handler's finger nails?

Short	
Long	

3.15 Are the food handler's finger nails clean?

Yes (no grime visible)	
No (grime visible)	

3.16 Is the food handler wearing jewellery /bangles?

Yes	
No	

3.17 How often did the food handler wash hands during the time of observation?

Frequently after every serving	
Once in a while during observation	
Not at all during time of observation	

3.18 If the food handler washed hands, did he/she use running water?

Yes	
No	

3.19 If the food handler washed hands, did he/she use soap?

Yes	
No	

3.20 If the food handler wore gloves, did he/she change them when handling different food?

Yes	
No	

D Product assortment

4.1Which of the following best describe the food products sold by the entrepreneur?

Raw products	
Cooked products	
Both	

ANNEXURE III: ETHICS APPROVAL

UNISA university of south africa

CAES RESEARCH ETHICS REVIEW COMMITTEE

Date: 03/09/2014

Ref #: **2014/CAES/113**
Name of applicant: **TP Dweba**
Student #: **36404500**

Dear Ms Dweba,

Decision: Ethics Approval

Supervisor: Prof L Maliwichi

Proposal: Contribution of the ethnic food markets and restaurants to household food security of sub-Saharan immigrants living in Gauteng Province in South Africa

Qualification: Postgraduate degree

Thank you for the application for research ethics clearance by the CAES Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the project.

The resubmitted documentation was reviewed in compliance with the Unisa Policy on Research Ethics by the CAES Research Ethics Review Committee on 03 September 2014.

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the CAES Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*
3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392, UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Note:
The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the CAES RERC.

Kind regards,

Signature
CAES RERC Chair: Prof EL Kempen

Signature
CAES Executive Dean: Prof MJ Linington

University of South Africa
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ANNEXURE IV: CONSENT FORM

TITLE OF RESEARCH PROJECT

_____

_____

THE CONTRIBUTION OF ETHNIC FOOD MARKETS TO HOUSEHOLD FOOD SECURITY OF SUB SAHARAN IMMIGRANT LIVING IN SOUTH AFRICA.

_____

_____

Dear Mr/Mrs/Miss/Ms _____ Date...../...../20...

NATURE AND PURPOSE OF THE STUDY

The purpose of this study is to explore availability of Sub–Saharan ethnic foods in South Africa; the contribution of the ethnic food markets and restaurants to household food security of Sub-Saharan immigrants living in Gauteng Province in South Africa.

RESEARCH PROCESS

The study requires your participation in the following manner:

1. Total of 200 voluntary households and 60 entrepreneurs who will be recruited from different study areas.
2. Respondents maybe representative of Northern, Eastern, Western and Southern immigrants of Sub Saharan Africa.
3. An individual consent form is requested from each participant.
4. Basic demographic information such as age, sex, occupation, educational level and eating habits will be required.
5. The duration of the research project is two years, two separate data collection periods (one for household and one for entrepreneurs) with a maximum duration of 4 weeks per data collection period).
6. Structured questionnaire will be used to collect data.
7. Basic demographic information will be required from you such as age, cell number, educational level, and occupation.

8. Information from 120 ethnic food entrepreneurs is also required (a separate interview schedule).
9. Food samples from the ethnic food entrepreneurs are also required to assess their microbial quality.

10. Feedback sessions will be arranged in a form of a meeting in all study areas. Respondents will be informed of such a meeting through a letter that will be posted to all the participants.

CONFIDENTIALITY

Your ratings and assessments of any of the research instruments as well as your opinions are viewed as strictly confidential, and only members of the research team will have access to the information.

No data published in dissertations and journals will contain any information by means of which you may be identified. Your anonymity is therefore ensured.

WITHDRAWAL CLAUSE

I understand that I may withdraw from the interview at any time. I therefore participate voluntarily until such time as I request otherwise.

POTENTIAL BENEFITS OF THE STUDY

In light of the purpose of this study, consumers who are interested in ethnic foods, this documentation of ethnic foods that are available in South Africa will assist in providing information with regards to different ethnic foods that are available. Furthermore, it is envisaged that documenting this knowledge might also help to provide South African population with alternative food sources that might assist in alleviating some of South African food insecurity problems. Lastly; information gathered may assist nutritionist and interested groups to design tailor made programmes that will cater for the needs of this growing group of people.

INFORMATION (contact information of your supervisor)

If I have any question concerning the study, I may contact the supervisors, Dr Mbajiourgu at the Department of Agriculture and Animal Health, University of South Africa at 011-4713590 or Dr O Oguttu at 011 4713353.

CONSENT

I, the undersigned, ……..… (full name) have read the above information relating to the project and have also heard the verbal version, and declare that I understand it. I have been afforded the opportunity to discuss relevant aspects of the project with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that I may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person or reputation that may be incurred as a result of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received a signed copy of this consent form.

Signature of participant: .....

Signed at …… on ……

WITNESSES

1 .....

2 .....

ANNEXURE V: GOODNESS OF FIT TEST RESULTS

Models	Observation	AIC	BIC	Goodness-of-fit test P-values
*A	194-101.3525	196.297	238.779	0.06
B	194-101.3525	198-328	247.347	0.06
C	194-101.3525	199.943	248.962	0.01
*Final model				

ANNEXURE VI: BINARY LOGISTIC MODEL OUTPUT

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	40	46.0
	Missing Cases	47	54.0
	Total	87	100.0
Unselected Cases		0	.0
Total		87	100.0

a. If weight is in effect, see classification table for the total number of cases.

Classification Table[a,b]

			Predicted		
			Foodsmp		
	Observed		0	1	Percentage Correct
Step 0	Foodsmp	0	0	8	.0
		1	0	32	100.0
	Overall Percentage				80.0

a. Constant is included in the model.

b. The cut off value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	1.386	.395	12.300	1	.000	4.000

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	19.678	9	.020
	Block	19.678	9	.020
	Model	19.678	9	.020

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	20.354[a]	.389	.614

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.657	8	.990

Contingency Table for Hosmer and Lemeshow Test

	Foodsmp = 0		Foodsmp = 1		
	Observed	Expected	Observed	Expected	Total

Step 1	1	3	3.375	1	.625	4
	2	2	2.263	2	1.737	4
	3	2	1.437	2	2.563	4
	4	1	.510	3	3.490	4
	5	0	.278	5	4.722	5
	6	0	.089	4	3.911	4
	7	0	.035	4	3.965	4
	8	0	.009	4	3.991	4
	9	0	.004	4	3.996	4
	10	0	.000	3	3.000	3

Classification Table[a]

			Predicted		
			Foodsmp		
	Observed		0	1	Percentage Correct
Step 1	Foodsmp	0	4	4	50.0
		1	3	29	90.6
	Overall Percentage				82.5

a. The cut off value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age business	-4.633	2.177	4.528	1	.033	.010
	Qualification	-.740	1.450	.261	1	.610	.477
	Freezer	4.895	2.514	3.791	1	.052	133.653

	Microwave	-4.373	2.448	3.191	1	.074	.013
	Surfaces	-3.021	2.096	2.078	1	.149	.049
	Reheat	.865	1.343	.415	1	.520	2.375
	R Process	-1.677	.848	3.911	1	.048	.187
	Temp food	-3.006	1.730	3.019	1	.082	.049
	Ventilation	-2.644	1.649	2.569	1	.109	.071
	Constant	9.884	3.858	6.565	1	.010	19610.738

a. Variable(s) entered on step 1: Age business, Qualification, Freezer, Microwave, Surfaces , Reheat, R Process, Temp food , Ventilation.

Correlation Matrix

		Constant	Age business	Qualification	Freezer	Microwave	Surfaces	Reheat	R Process	Temp food	Ventilatio
Step 1	Constant	1.000	-.778	-.123	.520	-.711	-.585	.070	-.783	-.603	-.346
	Age business	-.778	1.000	-.124	-.577	.655	.541	-.142	.499	.378	.116
	Qualification	-.123	-.124	1.000	-.176	.318	.057	-.016	.008	-.150	.059
	Freezer	.520	-.577	-.176	1.000	-.761	-.701	.463	-.324	-.518	-.442
	Microwave	-.711	.655	.318	-.761	1.000	.599	-.282	.441	.354	.120
	Surfaces	-.585	.541	.057	-.701	.599	1.000	-.255	.368	.499	.275
	Reheat	.070	-.142	-.016	.463	-.282	-.255	1.000	-.092	-.366	-.386
	R Process	-.783	.499	.008	-.324	.441	.368	-.092	1.000	.403	.275
	Temp food	-.603	.378	-.150	-.518	.354	.499	-.366	.403	1.000	.572
	Ventilation	-.346	.116	.059	-.442	.120	.275	-.386	.275	.572	1.000

ANNEXURE VII: PUBLICATION IN THE JOURNAL OF CONSUMER SCIENCES

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ASSESSMENT OF DIETARY CHALLENGES FACED BY SUB-SAHARAN IMMIGRANTS RESIDING IN THE GAUTENG PROVINCE: A PILOT STUDY

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ABSTRACT

Migration poses a unique food challenge that has led to immigrant households failing to maintain their traditional food diets. Despite the growing number of Sub-Saharan immigrants living in South Africa, information regarding their dietary challenges and habits upon settlement in South Africa is limited. A descriptive study involving immigrant households (n=34) was primarily used to pre-test a questionnaire that was undertaken by immigrants to assess the challenges they face with regard to their ability to continue with and maintain their traditional diets. Data relating to socio-demographic characteristics, such as continuity with ethnic food culture and the problems faced by Sub-Saharan immigrants with regard to them retaining their traditional food culture was collected. All the respondents indicated that they treasured and maintained their traditional food culture, albeit to varying degrees. Overall, high prices (64,6%), limited variety (64,5%), the quality of food (71%), the unavailability of traditional foods (58,7%) and a lack of shops selling traditional food (76,5%) were identified as major barriers to them retaining their traditional food culture. This is the first study to assess the challenges faced by immigrants living in South Africa with regard to them accessing their traditional foods and maintaining their traditional diets. The findings of the study suggest that Sub-Saharan immigrants living in South Africa find it difficult to access their traditional foods and that this lack of access could predispose them to adopt poor eating habits, however, there is still a need for a larger study with more respondents to test these findings. The findings of the study also revealed that there were lot of similarities between the eating patterns of South Africans and those of immigrants from Southern African countries.

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INTRODUCTION AND BACKGROUND

The number of immigrants in South Africa has increased dramatically since 1994 (Statistics South Africa 2014b). For example, the 2011 census revealed that 5,7% of the South African population are foreign born (Statistics South Africa 2013). This figure is corroborated by the

ANNEXURE VIII: ONLINE PUBLICATION IN APPLIED ECOLOGY AND ENVIRONMENTAL RESEARCH

FOOD CONSUMPTION PATTERNS OF SUB-SAHARAN AFRICAN IMMIGRANTS RESIDING IN GAUTENG PROVINCE, SOUTH AFRICA

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Abstract. Migration often leads to the loss of what is known as the "healthy immigrant effect" due to the adoption of unhealthy eating habits upon resettlement in host countries. A descriptive study was conducted to assess the current food practices of sub-Saharan immigrants residing in Gauteng Province, South Africa. Questionnaires were administered to 194 female participants residing in Gauteng. Data relating to socioeconomic factors, the adoption of South African food culture in general and specific food items that have been adopted were collected. The association between food adoption and socioeconomic factors was tested. Among the households polled, 78.4% had adopted South African food to varying degrees. Four adoption patterns emerged: strict continuity with traditional food; very limited adoption; limited adoption; and complete adoption of South African food culture. With regard to the association between food adoption and factors tested, the region of origin ($p<0.000$) was highly significant, while money spent on food was marginally significant ($p<0.077$). Dietary acculturation was characterised by a high intake of energy-dense, high-fat and low-micronutrient foods. Culturally appropriate nutrition education studies are required. Future studies should assess the impact of these dietary patterns on health outcomes among immigrants living in South Africa.
Keywords: *dietary acculturation, dietary patterns, food culture, food adoption patterns*

Introduction and background

Recent immigration trends indicate that 70% of all international migration is interregional and takes place within the African continent (Adepoju, 2008). Consequently, ever since the apartheid dispensation ended in 1994, South Africa has seen an increase in the number of sub-Saharan immigrants due to unstable economic conditions, soaring ethnic conflicts, volatile political situations and drought situations in most African countries (Njomo, 2013; Statistics South Africa, 2014a). However, research has shown that immigrants undergo dietary acculturation upon settlement in new countries (Garnweidner et al., 2012; Njomo, 2013) due to unavailability and inaccessibility of their traditional ingredients in the host countries (Garnweidner et al., 2012; Deng et al., 2013). Dietary acculturation is defined as the process by which immigrant minority groups adopt the dietary habits of the host society (Deng et al., 2013).

Dietary acculturation often results in the adoption of unhealthy eating habits (Okafor et al., 2014; Terragni et al., 2014) and subsequent loss of what is known as the "healthy immigrant effect" (HIE) (Sanou et al., 2014). HIE is defined as a situation whereby immigrants are usually healthier than native-born population when they first arrive in host countries due to medical screening they are subjected to as part of the selection

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ANNEXURE IX: PAPER ACCEPTED IN APPLIED ECOLOGY AND ENVIRONMENTAL RESEARCH

FACTORS INFLUENCING DIETARY CHOICES OF IMMIGRANTS UPON RESETTLEMENT IN HOST COUNTRIES-A REVIEW

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Running title: CHALLENGES TO ACCESSIBILITY AND FOOD SAFETY OF ETHNIC FOODS FACED BY IMMIGRANTS

Abstract

Accessing healthy, culturally appropriate food is essential for achieving food security and overall health. The adverse effects of migration on eating habits are well documented. However, less is known about the factors that affect dietary choices post-immigration. This scoping review assesses current findings regarding factors determining dietary choices. Electronic databases of papers published between 2005 and 2015 were used to retrieve and review papers for this review. Titles were reviewed by three reviews to select papers that met the inclusion criterion set for this paper. A total of 45 papers were then selected and included in the review. From work that has been done in South Africa and internationally, factors that affect dietary choices of immigrants include: socio economic status of immigrants, difficulty in navigating the new shopping environment, immigrant's perceptions towards host country's food, language barriers, failure to access traditional ingredients, safety of food sold in the ethnic markets, pressure from children to adopt host country's food and role of religion in determining immigrant's food choices in host countries The results of the search reveal that there are major research gaps on dietary patterns of Sub-Saharan African immigrants, especially those migrating intra-regionally. Gaps in literature, implications and research priorities are discussed.

Key words: Ethnic food markets, traditional food ingredients, food safety, food insecurity, food accessibility