Food Environment as a Determinant of Vegetable Availability and Intake among Resettled African Refugees in Southeast Queensland, Australia

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ABSTRACT

Background: African humanitarian immigrants arriving in Australia encounter a new living environment, which includes the food environment that differs considerably from what they experienced in their home countries and countries of transition. Adapting to this new environment and how this adaptation to the food environment is done influences their home food availability and their dietary habits. Environments influence behaviour while at the same time individuals also influence their environment. The study was guided by the socio-ecological model and examined how the layers within the environment (interpersonal, intrapersonal, institutional, community and public policy) affected the resettled refugees vegetable intake and home vegetable availability. The main aim of this research was to investigate the food environments of Burundian, Congolese and Rwandan refugees resettled in Southeast Queensland in order to understand the factors within these food environments that influence their home vegetable availability and vegetable consumption.

Methods: This investigation used a cross sectional sequential explanatory mixed method design. The study was conducted among primary food preparers and shoppers from 71 households of Burundian, Congolese and Rwandan resettled refugees residing in Southeast Queensland. Participants were purposively recruited from African churches, ethnic organisations and during community events. To be eligible participants had to be from Burundi, the Democratic Republic of Congo and Rwanda, have children aged 18 years and below, and speak either English or Swahili. The study was divided into two phases: quantitative and qualitative. Quantitative data was collected first and the findings used to inform the interview schedules that were developed and used to collect the qualitative data. Quantitative data was analysed with SPSS version 20 and descriptive statistics were used to describe the sample. Inferential statistics were used to determine associations between study variables. Thematic analysis was used to analyse the qualitative data.

Results: A total of 71 household primary food preparers and shoppers from 71 households participated in the study. The 71 households comprised of 383 household members of which 255 (66.6%) were children aged 18 years and below. The average household size was 5.39 (±2.23). The sample had a mean age of 34.04 (±8.5) and was predominately
female (88.7%), from Burundi (74.6%), unemployed (67.6%), and had an annual household income of <$30000 (66.2%). Food insecurity was reported among the participants and was associated with low education and lack of social support. Home vegetable availability was associated with age, household income, employment status, having a vegetable garden and having a supermarket in the neighbourhood. Participants from homes with a low vegetable availability were less likely to consume the recommended vegetable servings daily. Although food insecurity was not significantly associated with vegetable intake, individuals from households with adult food insecurity had a lower vegetable intake while those from households with child food insecurity had a higher vegetable intake. Vegetable gardens greatly contributed towards household food provision by making cultural preferred foods available, accessible as well as affordable. Participants’ perception on the availability and access of healthy foods in their neighbourhood food environment was high. However they conducted majority of their food shopping in food outlets outside their neighbourhood as they perceived them to be cheaper, stocked traditional foods and better quality foods. Lack of understanding of the local language and food labels, lack of traditional vegetables in the neighbourhood food and lack of transport, and small garden size were barriers encountered when accessing food in the food environment.

**Conclusion**: Taken together, findings from this study provide evidence that both individual and food environment characteristics play a role in the access and availability of food and vegetable consumption of Burundian, Congolese and Rwandan resettled refugees. Consumption of traditional foods among the resettled refugees continues post resettlement and they should be encouraged to consume these foods as they are more nutritious than the processed foods refugees encounter in resettlement. Food insecurity is still prevalent among the refugees post resettlement which has health implications. Limited availability and access to healthy food options especially cultural preferred food may expose resettled refugees to unhealthy food options and food insecurity. Participants reported travelling beyond their local environment to source for food, suggesting that they do not only rely on their local neighbourhood for their food needs. This implies that when looking at resettled refugees’ food environments, attention should not only be paid to the local neighbourhoods but also other neighbourhoods visited, as this is what constitutes their food environment.
STATEMENT OF ORIGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

(Signed)
Gichunge Catherine Nkirote
This thesis is dedicated to my parents, Lucy and Lawrence Gichunge. 
For their love, support, prayers and believing in me.
ACKNOWLEDGEMENTS

If the Lord had not been on our side-let Israel say (Psalms 124:1).

The Lord has been on my side and I will say so. The journey has been long, tiring, filled with frustrations, doubts and tears but God has seen me through. He has been with me every step of the way and I would not have made it on my own. Thank you Lord!

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Ni kweli Mungu halali na ni mkuu!
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<tr>
<td>ABS</td>
<td>Australia Bureau of Statistics</td>
</tr>
<tr>
<td>ACT</td>
<td>Australian Capital Territory</td>
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<tr>
<td>ANZSIC</td>
<td>Australia and New Zealand Standard Industrial Classification</td>
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<td>AU</td>
<td>African Union</td>
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<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
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<td>DIAC</td>
<td>Department of Immigration and Citizenship</td>
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<td>DRC</td>
<td>Democratic Republic of Congo</td>
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<tr>
<td>FFQ</td>
<td>Food Frequency Questionnaire</td>
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<td>FMO</td>
<td>Forced Migration Organisation</td>
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<td>GIS</td>
<td>Geographic Information Systems</td>
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<td>HFI</td>
<td>Household Food Inventory</td>
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<td>HFSM</td>
<td>Household Food Security Measurement</td>
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<tr>
<td>IBIS</td>
<td>Institute for British-Irish Studies</td>
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<tr>
<td>IDPS</td>
<td>Internally Displaced Persons</td>
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<tr>
<td>IGLRC</td>
<td>International Great Lakes Region Conference</td>
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<tr>
<td>MetS</td>
<td>Metabolic Syndrome</td>
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<td>NSW</td>
<td>New South Wales</td>
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<tr>
<td>NT</td>
<td>Northern Territory</td>
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<tr>
<td>OAU</td>
<td>Organization of African Union</td>
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<td>QACC</td>
<td>Queensland African Communities Council</td>
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<td>QLD</td>
<td>Queensland</td>
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<tr>
<td>QPASTT</td>
<td>Queensland Program of Assistance to Survivors of Trauma</td>
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<tr>
<td>RFP</td>
<td>Rwanda Patriotic Front</td>
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<td>SA</td>
<td>South Australia</td>
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<tr>
<td>SEM</td>
<td>Socio-ecological Model</td>
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<td>SEQ</td>
<td>Southeast Queensland</td>
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<tr>
<td>SHP</td>
<td>Special Humanitarian Program</td>
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<tr>
<td>T2DM</td>
<td>Type 2 Diabetes Mellitus</td>
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<tr>
<td>TAS</td>
<td>Tasmania</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>Acronym</td>
<td>Full Name</td>
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<tr>
<td>UNHCR</td>
<td>United Nations High Commission for Refugees</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
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<tr>
<td>VIC</td>
<td>Victoria</td>
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<td>WA</td>
<td>Western Australia</td>
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<tr>
<td>WFP</td>
<td>World Food Program</td>
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<td>WHO</td>
<td>World Health Organization</td>
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PUBLICATIONS AND PRESENTATIONS IN SUPPORT OF THIS THESIS

Four original research manuscripts have been produced from this research and they are included in this thesis. Two of the original research manuscripts are currently under review while the other two have been accepted for publication. All four manuscripts have been co-authored with other researchers. The contribution of the research candidate to each manuscript is outlined at the front of the relevant chapter. The details of these manuscripts are listed in order as they appear in the thesis:

**Manuscripts under Review**

1. Chapter 6: Using a household food inventory to assess the availability of traditional vegetables among resettled African refugees
2. Chapter 7: Exploring perceptions of healthy food availability and access of resettled African refugees in Australia

**Manuscripts accepted for Publication**


In addition, findings from the research were presented at a national conference.

1. BACKGROUND OF THE STUDY

1.0 Significance of the study

The association between the consumption of fruits and vegetables with the risk of cardiovascular diseases (CVD) and co-morbidities such as hypertension, diabetes and obesity is well documented [1, 2]. Studies have identified both the neighbourhood and home food environments as determinants of food choice and dietary pattern as they play a significant role in promoting or hindering healthy eating [3-5]. Healthy eating involves eating the right amount and types of food recommended in the dietary guidelines to promote health and a healthy weight [6]. These environments, though external to the individual, are the context in which dietary intake decisions are made.

Changes in one’s environment may contribute to behaviour change and this is of concern especially among African refugees resettled in developed countries. In Australia, African humanitarian immigrants are a recent entrant to Australia as the majority of them have arrived over the past 20 to 30 years. On moving to Australia these refugees encounter a new living environment which includes the physical, economic and social environments. They encounter a new and different food environment from what they experienced in their home or transition countries [7]. Their behaviour in their new environment is a product of their interaction with and adaptation to their environment, which may also be referred to as the person-environment fit (P-E fit). The concept of P-E fit identifies that a person’s behaviour, attitudes and other outcomes are a result of the interaction and relationship between the person and the environment [8]. For instance resettled refugees encounter a new food environment often very different from what they have experienced in their home or transition countries [7]. In this situation, the concept of P-E fit is useful as a broad framework for examining how they navigate, interact and adapt to this new food environment.

These changes in the resettled refugees’ environment and more so their food environment have led to an increase in the consumption of processed foods and meats [9, 10] and a decrease in the intake of fruits and vegetables [11] among resettled African refugees. As a result of these changes in dietary habits, as a population resettled African refugees have a high body mass index (BMI) despite having a low BMI on arrival [10, 12]. Recent research
on specific resettled African refugee populations has identified this as a very serious issue. For example 60% Somali refugee women who had lived in Australia for two years had a BMI >25 [13] indicating that they are overweight, while 71.4% of those in New Zealand were also found to have a BMI>25 and 42% had a waist hip ratio (WHR) >0.8 [14]. The prevalence of obesity and overweight for Sudanese refugees who had lived in Australia for an average of 3.2 years was 20.1% and 30.9% respectively [15]. Similarly, the prevalence of diabetes (6.4%) and hypertension (12.4%) risk factors for cardiovascular diseases (CVD) have also been found to be high among resettled Sudanese refugees in Australia [15].

Other than the food environment, the health literacy of resettled refugees may also affect their health related choices increasing their risk factors of CVD and other lifestyle related diseases. Health literacy refers to a person’s capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions [16]. Health literacy affects people’s ability to navigate the healthcare system, as well as engage in self-care and chronic disease management and poor health literacy has been associated with poor access and utilization of care [17], poor clinical outcomes [18] and mortality [19]. Limited health literacy is associated with higher rates of chronic disease, increased rates of hospitalization, poorer health outcomes and decreased use of preventive services [20]. In addition, health literacy has been reported to be a stronger predictor of health than age, income, education, employment and race [21, 22] and is important in the management of diet related diseases such as diabetes, hypertension and CVD. Resettled refugees in Australia have reported difficulties accessing healthcare due to language barriers [23-25], lack of awareness of availability of interpreter services [26], poor understanding of Australia’s health system [23, 24], and cultural barriers [25-28]. All these interfere with refugees’ health literacy and therefore increasing their health literacy is vital to improving their health outcomes.

Health literacy skills have also been associated with nutrition skills such as understanding of nutrition labels [29] as well as seeking and trusting sources of information relating to nutrition [30]. Individuals with limited health literacy have been found to have poor dietary and nutrition habits such as not consuming the recommended servings of fruits and vegetables [31], high intake of sugar sweetened beverages [32] and not reading food
nutrition labels [33]. Few studies have looked at the health literacy of immigrants including resettled refugees. In Canada, chronic diseases like diabetes are correlated with healthy literacy and immigrant status [34]. While in the Netherlands, African migrants were unaware that obesity is a risk factor for hypertension [35]. Health literacy encompasses several skills: reading, writing, numeracy, and oral and communication skills [36]. As most resettled refugees in Australia have low education and English proficiency [37] this may affect their understanding of food labels, following instructions from such sources as recommended dietary guidelines, making healthy food choices when shopping and navigating their food environment. All these may ultimately worsen their health.

This study investigated the influence of the food environment on the vegetable consumption of refugees from Burundi, the Democratic Republic of Congo and Rwanda resettled in South East Queensland Australia. There is a paucity of data in this area as only one study has assessed the food environment of resettled African refugees and its interaction with their diet intake [38]. This study will therefore contribute to this area of research.

1.1 Study Aim and Objectives
The main aim of this investigation was to explore the food environment (home and neighbourhood) of Burundian, Congolese and Rwandan refugees, in order to understand the factors within these food environments that influence their vegetable consumption. The specific objectives of this study were:

1. To examine links between home vegetable availability and consumption of African traditional vegetables among Burundian, Congolese and Rwandan refugees.
2. To explore perceptions of healthy food availability and access of resettled African refugees.
3. To explore the role of the vegetable garden as a component of the resettled refugees food environment.
4. To assess the interaction of food insecurity and vegetable consumption among Burundian, Congolese and Rwandan refugees.
1.2 Theoretical Framework

Environments have been identified as influencing individual behaviours while at the same time individuals also influence their environments [39]. Ecological models have been used to show these interactions as they recognise the interlaced relationships between individuals and their environment. Ecological models are formalized conceptualizations of the individual and environmental determinants of health behaviours and public health outcomes [40]. These ecological models include the physical and social environments which are the contexts in which people make decisions about their lifestyle behaviour [41]. It is important to understand the context in which the decisions are made in order to achieve or understand individual behaviour change. Hence, ecological models view behaviour as being influenced by family, work, community and government. The socio-ecological model (SEM) is one such ecological model.

The SEM proposes an integrative approach to examine the ways in which biological, socio-cultural, socio-economic and physical environments affect health and health behaviour. The SEM has identified five factors or layers within the environment that influence health behaviours [28, 29] and these factors can promote as well as damage health. These factors are:

- **Intrapersonal factors**- characteristics of the individual such as knowledge, attitudes, behaviour, self-concept, and skills. This includes the developmental history of the individual;
- **Interpersonal factors**- processes and primary groups-formal and informal social network and social support systems, including the family, work group, and friendship networks;
- **Institutional factors**- social institutions with organizational characteristics, and formal (and informal) rules and regulations for operation;
- **Community factors**- relationships among organizations, institutions, informal networks within defined boundaries, community resources, social and health services;
- **Public policy**- local, state, and national laws and policies
Within this systems based approach to understanding behaviour and health, the physical environment includes the natural environment (weather, green spaces) and the built environment (buildings). Green spaces include parks, forests, playing fields and river corridors [42]. Green spaces promote physical activity [43, 44]. The built environment is manmade and made for people’s use. It includes land use, buildings and transportation systems [45]. These features of the physical environment may affect an individual’s health. For instance lack of healthy food outlets has been associated with poor diets [46, 47] while poor land use such as urban sprawl, unsafe roads and poor street connectivity have been associated with lack of physical activity [48-52] which is detrimental to one’s health. The social environment consists of an individual’s social relations (such as family, friends, and extended family) and socio economic characteristics (such as education and employment). These physical and social environments influence each other and affect an individual’s health. For instance people with inadequate education have been found to have low income, live in cheap and at times poor housing conditions, have poor access to supermarkets selling healthy affordable foods, live in food deserts, and live in unsafe neighbourhoods that discourage physical activity [53].

Some of the limitations of the SEM are the difficulty to design comprehensive interventions (on all the five identified layers of the environment), to test in the multiple layers and not specifying where or when to intervene. It provides a framework to identify what needs to be changed in the environment although not how the change may be encouraged [54]. Despite these limitations in socio ecological perspectives, environments can also be characterized in terms of their objective (actual) or subjective (perceived) qualities as well as their scale or immediacy to individuals and groups (proximal vs distal) [55]. Participants can also be studied as either individuals, small or large groups, large organisations or populations using diverse methodologies [55]. The SEM not only recognizes that the relationship between an individual and his/her environment is important as it influences the individual’s health but also allows the examination of the connection between the individual and their environment [56]. It also shows how the different aspects of the environment, physical and social, shape an individual’s behaviour and health. Thus, it is not only individual characteristics that influences a persons health, but the broader environment of which they are a part of [57]. Additionally the model emphasizes interrelatedness of health problems as they incorporate
two or more analytical levels (layers of the environment) that allows the examination of both individual and aggregate manifestations of health problems and impacts of community interventions [58].

The socio-ecological model (SEM) is proposed as the guiding theoretical framework for this study as it will provide a framework to examine the African humanitarian immigrants’ food environment through multiple layers as well as barriers and facilitators that influence their vegetable consumption. The conceptual framework that was developed for this study is shown in Figure 1.0. At the intrapersonal level this study will examine factors such as age, education level, language, and income. Interpersonal factors provide identity and a sense of belonging such as employment status, household size, number of children, marital status, country of origin, and years lived in Australia will be examined. Availability of food outlets, food in the home and growing own vegetables will be examined at the institutional and community levels. While at the public policy level, compliance with the dietary guidelines will be examined together with strategies associated with settlement assistance. The SEM has been applied to other food/diet habits/nutrition based studies [29, 32-34].

1.3 Structure of the thesis
This thesis is organised into nine chapters, with four chapters presented as manuscripts that were developed from this study. Chapter 1 has presented the significance of the study, as well as outlined the paucity of studies on the interaction between African resettled refugees’ food environment and their vegetable consumption. The theoretical framework used to guide the study is also discussed.

Chapter 2 provides a discussion on refugee migration including the refugee situation in Burundi, the Democratic Republic of Congo and Rwanda, as this will provide a background to the study participants who are all refugees from these countries. It also discusses refugee resettlement in Australia and especially Queensland as this is the state where the study was conducted.

Chapter 3 summarises the food environment, both the neighbourhood and home environments, and how they influence food intake. Measures of the two food environments
are discussed. The connection between the food environment and food security is also discussed.

Chapter 4 discusses the research methodology used. Both quantitative and qualitative methods are considered as well as the tools used for data collection. Participant recruitment is also outlined in this chapter.

Chapter 5 presents ‘Manuscript One’ which assessed the links between home availability and consumption of traditional vegetables among resettled African refugees. This manuscript identified the factors that were associated with home vegetable availability as well as the barriers faced by the food preparers and shoppers when sourcing for these vegetables in the food environment.

Chapter 6 and its associated ‘Manuscript Two’ examined the resettled refugees’ perceptions on the availability and accessibility to healthy foods in their neighborhoods and is presented in Chapter 6. Further exploration of food environment perceptions was conducted.

Chapter 7 contains ‘Manuscript Three’ which examined the role of the vegetable garden as a component of resettled African refugees’ food environment. This was a qualitative study and thematic analysis of the interviews revealed specific themes surrounding food provision.

Chapter 8 includes the final ‘Manuscript Four’ which examined the prevalence of food insecurity among the study participants. The secondary objectives of this manuscript were to identify the predictors of food insecurity and to assess the relationship between food security, social support and vegetable intake.

Chapter 9 is the concluding chapter of this thesis and presents a summary and discussion of the findings from each of the associated manuscripts. The study limitations are also presented, along with recommendations for future studies.
Figure 1.1: Conceptual Framework

Participants Characteristics (Interpersonal and Intrapersonal)
- Income
- Employment status
- Education
- Cultural beliefs
- Household size
- Language
- Country of origin
- Years spent in Australia
- Number of children
- Age
- Nutrition knowledge
- Health literacy

Local Food Environment (Institutional, Community and Public Policy)
- Availability of food outlets
- Types of food outlets
- Availability of food in the home
- Growing own food
- Dietary guidelines
- Settlement assistance
- Exposure to host culture

Outcome of Interest
- Food security
- Vegetable consumption

Vegetable consumption
2. REFUGEE MIGRATION

2.0 Introduction
The purpose of this chapter is to provide an overview of refugee migration internationally and in Australia. This chapter will provide a discussion on refugee migration and how it is positioned in the international migration literature. Australia’s refugee program and its evolution as well as services provided for resettled refugees will also be discussed. This chapter will provide a background of the African refugee food environment, which is the objective of this research.

2.1 International Migration
The number of people moving within and between countries is increasing and migrant populations are continuously growing in both developing and industrialised countries. It is estimated that in 2013 there are 232 million international migrants worldwide [59]. This migrant population consists of those who have been forcibly driven away from their homes, those fleeing persecution and those who have voluntarily moved in search of better jobs, education or life in other countries. Forced migration refers to the movements of refugees and internally displaced persons as well as people displaced by natural or environmental disasters, famine or development projects. Forced migrants include refugees, asylum seekers, internally displaced persons (IDPs), development, environment and disaster displacees, smuggled and trafficked people [60]. Groups of migrants, forced and voluntary, encounter push and pull factors that lead to their migration. Forced migrants, however, are largely affected by push rather than pull factors.

Ravenstein’s conceptualisation of Migration Laws proposes that migrants only move within short distances [61, 62]. Ravenstein only investigated internal migration that is migration within a country’s borders. Migration however involves people travelling short as well as long distances across several countries and continents. Stouffer [63] advanced this thinking with a theory of intervening opportunities that related mobility to distance. The number of people going in a given direction is directly proportional to opportunities in that direction. Voluntary migrants move where there are opportunities which include (but are not limited to) economic, social, and political. These opportunities were referred to as push and pull factors by Lee [64]. Pull factors are at the destination while push factors are at origin.
Nonetheless, intervening obstacles act as barriers to migration [64]. The more difficult the intervening obstacle, the more positive the migrant selection, since only those with particular capabilities can migrate. For instance, if migrating is costly, then it is only those who can meet this cost that can migrate. In addition, strict immigration laws in some countries also act as intervening obstacles as restrictions are placed on who can enter the country thus making borders also a barrier to movement [65].

In contrast, forced migrants encounter more push than pull factors as they are driven from their place of origin. This movement is mostly instigated by political factors. Political conflicts may lead to internal conflicts or decolonization, or formation of new states which lead to this displacement and movement [66]. Petersen [67] in his typology of migration identified forced migration as one of five broad classes of migration. He further divided this class into two groups, impelled migration where the migrants retained some power to decide whether they wanted to move or not and forced migration whereby the migrants had no choice but to move. Refugees, internally displaced persons (IDPS), and asylum seekers fall under the second category of forced migrants. A significant factor in the creation of refugee flows is violence in their country of origin from which they flee and seek sanctuary in neighbouring countries to avoid persecution. When exit is denied from the country of origin or entry into a neighbouring country is blocked, persecution and even death may result such as the case of Jews in Europe and Biafrans in Nigeria [65]. The right to entry is largely dependent on the receiving nation, hence the creation of the United Nation High Commission for Refugees (UNHCR) that is mandated to guide and assist governments in the management and protection of refugees [68].

For both voluntary and forced migrants, the decisions to migrate are a result of a combination of economic, political, ethnoreligious, and social factors [69]. Decisions to migrate are made based on the autonomy of the participants involved and can either be proactive or reactive. Proactive migrants seek to maximize net advantage and this group includes professionals and retirees, as well as spies and defectors. Reactive migrants on the other hand often have little autonomy in their decision to migrate. This group includes refugees, stateless persons, displaced persons and exiles [69, 70].
2.2 Refugee Migration

The refugee is distinguished from other voluntary migrants due to his/her “reluctance to uproot oneself, and the absence of positive original motives to settle elsewhere” [71]. The UNHCR defines a refugee as someone who

“owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it” (UNHCR, 1992, p.8) [72].

However this definition has limitations as it excludes those refugees who are not able to show their fear of persecution on the grounds outlined in the UNHCR definition. This is limiting especially for people from Africa fleeing violence, natural disasters, foreign occupation, civil unrest and wars. The Organisation of African Union (OAU) recognised these limitations and at the 1969 OAU Convention added its definition to the UNHCR refugee definition. It states:

“the term “refugee” shall apply to every person who, owing to external aggression, occupation, foreign domination or events seriously disturbing public order in either part or the whole of his country of origin or nationality, is compelled to leave his place of habitual residence in order to seek refuge in another place outside his country of origin or nationality” (OAU, 1969, p.3) [73].

Kunz [71] developed the Kinetic Model of Refugee Movement that identified flight–arrival patterns among refugees. In this model he identified three categories of refugees: anticipatory; acute; and intermediate type refugees.

- **Anticipatory refugees** are those who leave their country before the local political or military situation has deteriorated. These refugees have clear knowledge of their destination and are often financially prepared to live in their destination country. These immigrants tend to be well informed, relatively wealthy and well educated [71]. These refugees are forced to move by push-permit factors and not pull factors.
The anticipatory refugee has no choice over destination country, but will go to any country that will permit them entry, hence the push permit factors.

- *Acute refugees* are those who flee en mass, as individuals or groups with the aim of reaching safely a neighbouring or near country which will grant them asylum. For this group the push factor to leave their country is higher as there is overwhelming pressure to exit and the pull factor is either lacking or absent [71]. Among these refugees, Kunz identified three forms of displacement among acute refugees: displacement by flight (mass flight, individual or group escape), displacement by force occurs when the people are forced outside the borders of their country of origin (prisoners-of-war, army in pursuit of flight, forced labour) and displacement by absence occurs to those who left their country of origin when it was peaceful (delegations, diplomats, travellers, tourists and students).

The majority of humanitarian immigrants fall in the category of acute refugees and make the bulk of the population in the refugee camps. These refugees move to the camps in bordering neighbour countries where they live and hope that one day all will be well and they will return to their home. This group had no plans to leave their country and mostly had to flee at a moment’s notice [74]. They generally have no plans for the future and their priority is to find a safe place. Once they reach the place of asylum they live in deprivation as they were not prepared for the move. Kunz refers to this situation as being in the “midway-to-nowhere” [71]. It is during this stage that the refugee is under pressure to leave the camp with offers of assisted passage to either return to the home country (push-pressure-return), or to stay in the country of asylum (push-pressure-stay) or to resettle in a third country (push-pressure-plunge). When offered resettlement they take the “plunge”, resulting to a push-pressure-plunge situation as the pull is lacking.

- *The intermediate type* of refugees epitomizes characteristics of both the anticipatory and acute refugee movements. These refugees start as anticipatory but end up as acute refugees.


2.3 Refugee Population.

The world refugee population has grown substantially over the past few decades. At the end of 2011 the United Nation High Commission for Refugees (UNHCR) was caring for 10.4 million refugees, of which 26% and 35% were in the Africa and Asia Pacific regions, respectively [75]. Excluding North Africa, there were a total of 2.6 million refugees in Africa at the end of 2011 [75]. Sixty percent of the African refugee population is from the East and Horn of Africa regions while 23% is from Central African and the Great Lakes regions. Not only are Somali, Sudan, the Democratic Republic of Congo and Burundi the top refugee producing countries in Africa, these were also listed among the top ten refugee producing countries in the world in 2011 [75]. Existing and renewed conflicts in these countries have greatly contributed to the growth of the region’s and the world’s refugee population. For example even after South Sudan gained independence from Sudan in 2011, the fighting still continues. This is forcing more people to flee their homes and in the process creating more IDPs and refugees [76, 77].

By the end of 2012 there were over 27 million from Central Africa and the Great Lakes region countries who had been internally displaced or forced to flee abroad [78]. Burundi, Democratic Republic of Congo, Republic of Congo, Rwanda, Tanzania and Uganda are the countries referred to as the Great Lakes Region. In 2000, the International Conference of Great Lakes Region (ICGLR) was founded as a non-governmental organisation to promote peace and development in the region [79]. It was founded in recognition that conflict in one of the member states creates instability in the region which often spills into neighbouring countries. Member states of the ICGLR comprise Angola, Burundi, the Central African Republic, the Democratic Republic of Congo, Kenya, the Republic of Congo, Rwanda, Sudan, Tanzania, Uganda and Zambia. A number of these ICGLR member states have had armed conflict: Angola, Burundi, the Central African Republic, the Democratic Republic of Congo, the Republic of Congo, Rwanda, Sudan and Uganda.

2.3.1 The refugee crisis in Burundi.

The Burundi refugee crisis which was and still is fuelled by ethnic tensions started even before the country gained independence from Belgium in 1962. The ethnic groups in Burundi (Hutu, Tutsi and the Twa) all speak the same language, Kirundi. Pre-colonial
Burundi was a kingdom, Kingdom of Burundi, ruled by a king referred to as a *mwani*, with the Tutsi being the royalty. The colonial government favoured the minority Tutsi over the majority Hutu making them dominant over the Hutu. Burundi has been embroiled in several post-independence wars that have left many especially those of Hutu origin dead, homeless and displaced. The 1965, 1969, 1972, 1988, 1993, 1994 wars were instigated by ethnic tensions between the Hutus who were the majority and the Tutsi who were the minority but had dominated the government and the military [80, 81]. Cohen [82] refers to the 1972 war as the “First Great Lakes Genocide” as many Hutu were killed by Tutsi who wanted to ensure that they stayed in power. Between 100,000-200,000 Hutu are reported to have been killed from April to November 1972 [83]. Many Hutu fled to neighbouring countries including to Rwanda. In 1994, the Burundi president Cyprien Ntaryamira who was a Hutu, together with his Rwandan counterpart Juvenal Habyarimana who was also a Hutu, were killed in a plane crash when their plane was shot down by an unknown party. This led to further violence and displacement that lasted for more than ten years.

### 2.3.2 The refugee crisis in Rwanda.

Rwanda is Burundi’s neighbour and like Burundi has the same ethnic groups (Hutu, Tutsi and the Twa) but speak the Kinyarwanda language. Rwanda gained independence from the Belgian government in 1962 and like Burundi, has had its share of ethnic wars. Before Rwanda gained independence, the Belgian government ruled Rwanda through the *mwani* king (who was a Tutsi) and favoured the Tutsis over the Hutu, but in the 1950’s switched their support to the Hutu [84]. In 1959 there was a revolution against the Tutsi by the Hutu that killed hundreds of Tutsi and many more fled the country [85, 86]. In the 1962 election Parmehutu, an anti-Tutsi party, won and many Tutsi fled the country. The Tutsi who had fled the country, regrouped and attacked the country in 1963 and over 12,000 Tutsi were killed, and over 150,000 Tutsi fled Rwanda.

In 1973 there was a coup and Juvenal Habyarimana a Hutu, became president. The Tutsi refugees in exile in Uganda continued attacking Rwanda and had by now organized themselves into a military army under the name Rwandan Patriotic Front (RPF). When the plane carrying the Rwandan and Burundian presidents was shot down in 1994, a war broke out in Rwanda and over 800,000 people mostly Tutsi were killed by the Hutu army and
citizens [82]. The RPF entered Rwanda and over 1.2 million Hutu and about 40,000 militia who were responsible for the genocide fled to Congo [87]. Although the killings stopped when the RPF took over the country, the Hutu military who together with Hutu citizens had fled to refugee camps in Zaire (now the Democratic Republic of Congo), controlled the refugee camps, forcibly recruited Hutu citizens and launched attacks into Rwanda. In 1996 the RPF together with Zaire anti-government rebels invaded and destroyed the Hutu refugee camps in Zaire which caused about 800,000 Hutu refugees to move back to Rwanda while 200,000 others fled deeper into Zaire with the Rwanda army in pursuit [82]. This however did not stop the attacks on Rwanda by Hutu militants based outside Rwanda and they are still ongoing.

2.3.3 The refugee crisis in the Democratic Republic of Congo.
The Democratic Republic of Congo which borders Burundi and Rwanda, was also colonised by the Belgian government but gained independence in 1960. It has valuable resources like coltan, diamonds and gold. Control of these resources has greatly contributed to the strife seen in this country spanning five decades. The country was in a state of civil unrest even after independence and during President Mobuto’s rule. The arrival of refugees from Burundi and Rwanda as a result of the wars did not help the situation in Congo. When the Rwandan army attacked the Hutu refugee camps in Congo in 1996, they were joined by Congolese rebels led by Laurent Kabila who were opposed to Mobutu’s rule. Some of these rebels were Congolese of Tutsi origin [87]. The rebels succeeded in toppling Mobutu’s government and Kabila became the president.

President Kabila soon fell out with his Rwandan and Ugandan supporters and in 1998 there was a breakout of fighting that involved seven African countries and ten rebel groups [88]. This has been referred to as Africa’s First World War and/or the Great African War. While Rwanda and Uganda were Kabila’s attackers, Angola, Chad, Namibia, Sudan and Zimbabwe joined the war to support him [89]. Many Congolese people were displaced and many more fled the county. Kabila was assassinated in 2001 and his son Joseph Kabila rose to power. Since 2002 the Congolese government has signed several peace deals with governments in the Great Lakes region as well as held peace talks with anti-government
rebels including the M23 rebels. Nevertheless peace seems elusive in this country as well as the region as more people continue to die and flee due to ongoing fighting.

2.4 Refugee Resettlement

When refugees flee their countries and seek refuge in neighbouring countries, the UNHCR and other agencies provide them with shelter and food as they wait for the situation in their counties to improve. However protracted situations such as the Somali civil war which has been going on since 1991 and the Great Lakes refugee crisis, leave the refugees in a state of despair. According to Crisp [90] a protracted situation is when refugees have lived in exile for more than five years with no immediate prospect of finding a durable solution. Due to insecurity many are not able to go back to their homeland (repatriation); the host nation may not be able to resettle them (integration) and may want them to leave; or thirdly they have no where to go as no third country has offered to resettle them (resettlement) [90].

Resettlement of refugees is done in either the first country of asylum or to a third country. These third countries of resettlement could be in neighbouring developing countries or further afield in developed countries. Resettlement of refugees is done to enable them to lead a “normal” life and offers them protection. It is done in countries that have signed the UN Convention on Refugees that was established in 1951 to protect the world’s stateless and persecuted. In the beginning, the Convention was limited to protecting European refugees but a 1967 Protocol expanded its scope as displacement had spread around the world. By 2007, 147 states had signed and were party to the 1951 Convention and/or the 1967 Protocol relating to the Status of Refugees [91]. Australia signed the Convention in 1954 and the Protocol Relating to Refugees in 1973 and has resettled refugees from both developed and developing countries.

2.4.1 Refugee resettlement in Australia

Over 700,000 refugees and those in humanitarian assistance have been resettled in Australia since the Second World War. The ethnic composition of the refugee intake has changed over time. In 1901 the White Australia Policy was created to ensure that only white English-speaking immigrants of predominately Anglo-Celtic origin would be admitted in Australia. The objective of the White Australia Policy was to create a
homogenous society as the Aboriginal population was expected to die out while those of a “mixed race” would assimilate and eventually become invisible [92]. After the Second World War however, many refugees from Europe who were non-English speakers were admitted to Australia. Between 1947 and 1970 Eastern European refugees displaced by the war and many others made to flee the 1956 Hungarian Uprising and the 1968 Czechoslovakian Uprising were resettled in Australia. These new non-Anglo-Celtic refugees were expected to do away with any elements of their culture that were not Australian and assimilate to the Australian culture and way of life. These non-Anglo-Celtic refugees were still predominately white thus the potential for assimilation was higher.

From the 1970s there has been change in the racial and ethnic composition of refugees who have been resettled in Australia. During the 1970s refugees fleeing the civil wars in Central and South America and South East Asia resettled in Australia. The first “boat people” from Vietnam arrived in Darwin in 1976 and the number has continued to increase, arriving in three distinct waves [93]. The first wave from 1976 to 1981; the second wave from 1989 to 1998 and the third wave from 1999 to the present [93]. African refugees of different racial groups have been arriving in Australia since 1980s as a result of the civil wars in Sudan, Somalia, Eritrea, Ethiopia, Burundi, Rwanda and the Democratic Republic of Congo [94]. This change in the ethnic composition of refugee populations led to a policy shift to multiculturalism as migrants did not want to give up their culture and hence were now able to retain their culture while embracing the Australian way of life.

To cater for this diverse refugee population, Australia developed a Humanitarian Program. Until 1981, all arrivals under the Humanitarian Program were refugees and the Special Humanitarian Program (SHP) was introduced around the same period to cater for those living in or outside their country and had suffered human rights violation and had family or community ties in Australia. The Australian Humanitarian Program has onshore and offshore components. The offshore component assists people outside Australia who have fled their country mostly due to violation of their rights and persecution. On the other hand, the onshore humanitarian program is for applicants already in Australia with or without a visa and are seeking asylum or to change their status [95].
Refugees in Australia are mostly settled in regional areas where they can find employment and access settlement services. In the past several years 20% of humanitarian migrants have been directly resettled in regional areas such as Albury, Coffs Harbour, Launceston, Mount Gambier, Shepparton, Toowoomba and Townsville [96]. Table 2.1 shows offshore African humanitarian entrants who have been resettled in different states of Australia between February 1991 and September 2013.

Table 2.1: Humanitarian Arrivals from Africa (excluding North Africa) by State from February 1st 1991 to September 4th, 2013

<table>
<thead>
<tr>
<th>Country of birth (world region)</th>
<th>ACT</th>
<th>NSW</th>
<th>NT</th>
<th>QLD</th>
<th>SA</th>
<th>TAS</th>
<th>VIC</th>
<th>WA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central and West Africa</td>
<td>171</td>
<td>3686</td>
<td>325</td>
<td>2338</td>
<td>2246</td>
<td>391</td>
<td>1876</td>
<td>2284</td>
<td>13317</td>
</tr>
<tr>
<td>Southern and East Africa</td>
<td>230</td>
<td>2940</td>
<td>217</td>
<td>4198</td>
<td>3022</td>
<td>540</td>
<td>8816</td>
<td>3919</td>
<td>23882</td>
</tr>
<tr>
<td>Total</td>
<td>401</td>
<td>6626</td>
<td>542</td>
<td>6536</td>
<td>5268</td>
<td>931</td>
<td>10692</td>
<td>6203</td>
<td>37199</td>
</tr>
</tbody>
</table>

Source: DIAC 2013 [97]

2.4.2 African refugees in Queensland

The largest groups of African refugees in Queensland are from Burundi, Eritrea, Ethiopia, Democratic Republic of Congo, Liberia, Rwanda, Sierra Leone, Somalia and Sudan [98]. A recent study found that the majority of the African humanitarian refugees in Queensland are concentrated in the Southeast Queensland suburbs of Annerley, Browns Plains, Kingston, Logan, Logan Central, Moorooka, Mt Gravatt, and Woodridge [98]. The majority of these humanitarian refugees had initially been resettled in different areas when they arrived in Australia, but they later moved to these suburbs as they wanted to be close to their community members in order to access ethnic and social networks [98]. Findings from this study are similar to other studies that have shown that immigrants live in relatively poor neighbourhoods with a high population of other immigrants [98-101]. Kunz in his exile and resettlement theory identified cultural compatibility which comprises language, traditions, religion, political views and food habits as being integral in accelerating integration of
refugees in their new country [102] and this could at least in part explain why these African refugees in Queensland seek out those who are similar.

2.5 Conclusion
This chapter has presented a background on refugee migration and resettlement. This review has shown that refugees are different from other migrants as their migration is largely influenced by push factors. Australia’s refugee policy and its evolution from taking in only persons of Anglo-Celtic background to accepting other non Anglo-Celtic refugees were presented. The refugee crisis in Burundi, Democratic Republic of Congo and Rwanda, how it has contributed and is still contributing to the growth in the world’s refugee population, was reviewed. This component also showed how the refugee crisis in these three countries is related at a regional level and served to provide a context to refugee migration, more so those from Africa in order to provide a background of this study’s population.
3.0 Introduction

There has been increased debate on the influences of the neighbourhood on health. Neighbourhoods have been analysed based on administrative boundaries such as zip-codes, census tracts or electoral wards [103]. However these administrative boundaries vary in size and larger lands may contain multiple neighbourhoods with varied levels of resources, and this could lead to misinterpretation as they are not often zoned or designed to represent demographic homogenous areas. Broadly defined the neighbourhood is the area around one’s place of residence [104]. According to Kearns and Parkinson [105] the neighbourhood is multilayered with three levels that have their own function. The home area which is a 5-10 minutes walk from one’s home provides psycho-social benefits such as identity and belonging; the locality which includes the residential activities and the urban district or region level which is the landscape of social and economic opportunities such as employment, leisure activities and networking. In summary it can be seen that the idea of ‘neighbourhood’ is complex with both social and spatial dimensions.

Neighbourhoods may affect health and contribute to social and race/ethnic inequalities in health [106] since residential segregation and inequalities in distribution of resources have been associated with morbidity and mortality [107-109]. MacIntyre and colleagues [110] identified five features within the neighbourhood that might influence health:

- Physical features of the environment shared by all residents within the locality;
- Availability of healthy environments at home and at work;
- Services provided publicly or privately to support people in their daily lives;
- Socio-cultural features of a neighbourhood and
- Reputation of an area.

The authors conceptualized the first three features as “opportunity structures” that may promote or damage health either directly or indirectly through the possibilities they provide for people to live healthy lives. The last two features relate to the collective social functioning and practices such as people’s use of their local area and perceived social cohesion. The interaction of these features hence influence the health of the residents.
Features within a neighbourhood may act as barriers or facilitators to adopting healthy behaviours or lifestyle such as engaging in physical activity and selecting healthier food options. Barriers may include lack of healthy food outlets [9-12], high crime [48], unsafe roads [49, 50], urban sprawl [51, 52], and low-walkability areas [111, 112]. Low-walkability areas have poorly connected streets that make walking to destinations difficult [111]. Facilitators may include presence of healthy food outlets like supermarkets and farmers’ markets [46, 47], availability of recreational facilities, parks and open green spaces [113-115] and high-walkability areas [116-118]. Although these facilitators may be present, Macintyre [119] points out that residents may choose to use facilities outside their neighbourhood and also that some facilities target people from other neighbourhoods.

Macintyre [119] found that not all poor areas have poor resources needed to promote healthy diet and physical activities. This finding was supported by researchers in New Zealand who found that the most deprived areas had the best access to community resources [120]. Additionally research on the effect of neighbourhood features on health has been conducted among minority groups but none has been published on resettled African refugees. The majority of African refugees spend a considerable amount of time in crowded refugee camps which lack resources that may not have enabled them to engage in healthy behaviours and lifestyle. In resettlement their engagement in activities that promote a healthy lifestyle may be hampered, but research needs to be done in order to provide conclusive evidence.

3.1 Dietary Acculturation

Migration whether local or international, invariably leads to a change of environment. When people migrate they encounter a new social, cultural and physical environment to which they have to adapt and how this is done may impact upon their health positively or negatively. Migration has been associated with dietary changes and migrants from developing countries have been reported to change their food habits when they move to developed countries [121, 122]. For many migrants, dietary changes have been identified as an integral part of the acculturation process. Refugees unlike other migrants are forced out of their country and the majority spend years in refugee camps before being offered resettlement. While at the camps their diets consist of the food rations provided by
organizations such as the World Food Program (WFP). This leads to changes in dietary intake as they no longer have access to their traditional foods but the food rations that consist of maize, flour (fortified), legumes, and fortified vegetable oil [123]. Many refugees however sell or barter the food rations in order to buy preferred cultural foods [124].

Acculturation has been defined [125] as: “the process by which immigrants adopt the attitudes, values, customs, beliefs and behaviours of a new culture”. When a new immigrant comes into contact with the new culture, he or she can either choose to retain their culture, integrate it with the new culture or abandon it for the new culture. Berry [126] identified four acculturation strategies that the immigrant might employ when dealing with the new culture: integration, separation, assimilation and marginalization. Integration occurs when an individual wants to retain some aspects of his/her culture as well as adopt the new host culture; separation occurs when an individual wants to retain his/her culture and does not want to interact with the new host culture; assimilation is said to occur when an individual abandons his/her culture and embraces the new host culture; and lastly marginalization occurs when an individual has no interest in other cultures as well as his/her own. These strategies may be applied in all aspects of the immigrant’s life: work, education, relationships and even diet.

In other research on the topic, Luque and his colleagues [127] in their studied African immigrants in Spain. They found that while the immigrants had adopted different acculturation strategies (real situation) they also had their own preferred acculturation attitudes, that is the extent to which they would like to keep their own culture or adopt the host culture (ideal situation). The authors found that if the immigrants had a choice they would choose separation in the areas of family relations, beliefs, customs, principles and values; assimilation in the areas of work and political system and government areas; and integration in social relations, friendships and economy. Acculturation strategies that are adopted in the real situation or preferred (ideal situation) may affect the health of immigrants, but further research needs to be done to show how the relationship of these two, acculturation attitudes and strategies, affects their health.

Dietary acculturation occurs when a person or people from a minority group are exposed to the “alien” or new food culture of the host country leading to changes in their dietary habits
The process of dietary acculturation has been described as multidimensional, dynamic and complex [122]. Three of the acculturation strategies described above can be applied to dietary acculturation where one may incorporate some of the new foods into their diet (integration), does not consume the new food and retains their traditional diet (separation), or discards their traditional diet and only consumes the new foods (assimilation). Renzaho and Burns [129] in their study among African migrants and refugees in Australia, found that dietary acculturation was characterized by three processes: substitution (replaces traditional food for the new food), addition (addition of new foods to traditional foods) and retention (maintenance of traditional foods). Researchers have identified several reasons that lead to dietary acculturation among migrants. In Australia, many of the foods adopted by resettled refugees are not healthy but they view these foods as a status symbol, where consuming these foods is seen as a move up the social and economic ladder as one is eating like a “white person” [130]. Hmong refugees in the USA changed their dietary habits as they felt there was an abundance of food [131], similarly in Switzerland, African refugees reported having a wider variety of foods to choose from [132]. The high cost and lack of availability of traditional foods has also contributed to the consumption of the new foods encountered in resettlement [10, 14-17]

Dietary acculturation has been measured among migrants using different proxy variables that include age on arrival to new country, time of residence in new country, spoken language at home, and place of birth. Among African migrants and refugees, acculturation has been associated with decreased intake of fruits and vegetables and an increased intake in processed foods and sugar [10, 18-23]. Unlike older migrants and refugees [133-136] children of refugees and immigrants often prefer the new foods that they encounter in their new country [21, 27, 28]. The children learn of these new foods from their friends at school and ask their parents to prepare these foods for them [131] and they do not want to take their traditional foods to school [133]. Unfortunately, the consumption of these new foods has contributed to the increase in obesity among migrant and refugee children [12, 137] as well as adults [21, 22].

African migrants and refugees living in developed countries have been reported to have a low BMI on arrival, which increases with duration of residence [19, 20, 22-24]. Similarly, diabetes another risk factor for cardiovascular disease (CVD) has also been found to be
high among African migrants and refugees living in developed countries [20, 33-36]. An increase in physical inactivity [25, 28], consumption of meat, processed foods and decrease in consumption of fruits, vegetables, lentils and grains [9, 11, 13, 129, 138-140], and cultural perceptions where overweight is viewed as a sign of prosperity [12, 40], have contributed to the increased rates of obesity and diabetes among African migrants and refugees in developed countries. These aforementioned studies show how the interaction between the African immigrants and refugees in concert with their environment affects their health.

3.2 Neighbourhood Food Environment
The food environment involves the social, economic, cultural and physical environments within which individuals select and acquire what they will eat or drink [141]. The availability, access, cost, and meaning attached to food influence food choices. The community food environment comprises the number, types and locations of food outlets while the consumer nutrition environment is what consumers encounter when they are purchasing food which includes the cost, quality and availability of food [142]. Additionally, it provides a glimpse of the food that may be found in the home as the availability of food at home is affected by the availability of foods in other food outlets as well as access to these outlets [142]. The neighbourhood or community food environment has been identified as a predictor of food choice and dietary patterns [143].

Recent reviews have identified that neighbourhood food environments vary by socio-demographic and racial/ethnic composition of residents [2, 30]. Some neighbourhoods have an abundance of food outlets while others have very few or no outlets. The former have been referred to as food oases and the latter as food deserts. The term “food desert” was first used in Britain to describe inner city suburbs that did not have nutritious and low-priced food [144]. Cummins and Macintyre defined food deserts as “poor urban areas where residents cannot buy affordable healthy food” [145]. Hendrickson and colleagues on the other hand defined them as “urban areas with ten or fewer stores and no stores with more than 20 employees” [146]. The definition by Whitehead as well as that of Cummins and Macintyre focuses on food type and price, while that of Hendrickson and associates
focuses on number and size of stores. These varied definitions demonstrate the ongoing debate around the definition of the term “food desert” [147].

3.2.1. Neighbourhood food environment factors that influence dietary intake

Availability of Food Outlets

Food outlets vary in important attributes which influence access to food. Various classification clusters have been developed. In Australia they have been categorised by the Australia and New Zealand Standard Industrial Classification (ANZSIC) into supermarkets and grocery stores (grocery stores, supermarket and convenience stores), specialised food retail (fresh meat, fish and poultry retailing, fruit and vegetable retailing, bread and cake retailing, and liquor retailing), and café and restaurants, as well as takeaway food services [148]. The availability of these food outlets varies substantially from neighbourhood to neighbourhood.

Several studies have reported that poor or predominately black neighbourhoods have more convenience and grocery stores and fewer supermarkets [46, 149-152] compared to wealthy or predominately white neighbourhoods. Other studies have however reported contradictory findings. For example, researchers in the UK [153, 154], New Zealand [155], and Canada [156, 157] found that the most deprived areas had more food outlets than the more affluent. Others in Australia [158] however found no differences in shopping infrastructure between areas with different socioeconomic differences.

Supermarkets are considered to have healthy foods as they stock fresh produce such as fruits and vegetables and as well as other low calorie, less processed and less energy dense foods [47, 159] at the lowest price [151]. Their availability has also been associated with consumption of fruits and vegetables [46, 47, 160-162] and lower body mass index [163]. Morland and associates [164] reported that Black Americans who had one supermarket in their neighbourhood were more likely to meet the dietary recommendations of fruits, vegetables and saturated fat. For every increase in the number of supermarkets in a black neighbourhood there was a reported increase in the consumption of fruits and vegetables. A study conducted in three rural Australian towns found that the full range of ‘healthy indicator’ foods that were selected from the Australian Guide to Healthy Eating (AGHE)
were available in supermarkets with a limited selection only available in convenience stores [165]. Thus people residing in neighbourhoods with multiple supermarkets may have improved access to healthy foods leading to consumption of a healthy diet.

There have been studies that have shown that availability and access to supermarkets in a neighbourhood does not improve residents’ diet. In the USA, the Pennsylvania Fresh Food Financing Initiative is a program that aims to increase supermarkets in underserved areas [166]. But a recent study in Philadelphia found that the residents did not use the new supermarkets, although they perceived improved access to healthy foods, there was no change in regards to their vegetable and fruit intake and BMI [167]. Similarly in Glasgow, UK Cummins and colleagues [168] did not find any improvement in fruit and vegetable intake following the introduction of a supermarket in an underserved area, although other researchers in Leeds found an increase in vegetable intake after the opening of a new supermarket [169]. Other researchers in New Zealand [170] found no association between supermarket access and vegetable and fruit intake. Hence introduction of a supermarket in a deprived area may not promote the expected behaviour change related to diet thus there is need to conduct explorative studies to uncover factors hindering diet change.

Grocery stores on the other hand are smaller and stock less perishable foods than supermarkets as they mostly stock dry goods, canned goods and non-food items while convenience stores provide limited fresh produce and have higher prices compared to supermarkets [171]. However in rural Texas, Bustillos and colleagues [172] found that both traditional food stores (supermarkets and grocery stores) and non-traditional food stores (dollar stores and mass merchandisers) carried healthy foods though fresh fruits and vegetables were not readily available in non-traditional or convenience food stores. An abundance of convenience and grocery stores in a neighbourhood food environment exposes its residents to fewer healthier food and dietary choices which could potentially be detrimental to their health. For instance, Franco and associates [46] found that black neighbourhoods not only had fewer supermarkets but more grocery stores that stocked less healthy foods than white neighbourhoods. Using the Healthy Availability Food Index (HAFI) which scores (ranging from 0 to 27) to determine the availability of healthy food in the neighbourhood stores, the authors found that the mean was 5.48 in black
neighbourhoods and 13.04 in white neighbourhoods and 5.20 in low income areas compared to 13.30 in high income areas. The HAFI was low across all stores in black and low income neighbourhoods suggesting that race and income were associated with availability of healthy foods available in stores.

Fast foods are energy-dense foods with a high saturated fat and low nutrient content [173-176]. Researchers have previously defined fast food outlets using franchise outlets only while others used both the franchise and other small independent fast food outlets. But a recent review on fast food outlets indicated that the definition of fast food outlets should include all outlets selling fast food and not just the major franchises [177], as fast foods are also sold in retail stores [178] which provide fast food opportunities [179]. Fast food outlets have also been reported to be highly concentrated in areas of low socioeconomic status and those with ethnic minorities [104]. In the USA, race-based segregation in neighbourhoods has led to a concentration of fast food outlets in black neighbourhoods [180, 181], making fried chicken more available than fresh apples in these areas [182]. Deprived areas in Australia [183], Canada [184], the UK [185, 186], and USA (Sharkey et al, 2011), have also reported a high presence of fast foods in low income areas. Conversely other studies in Canada [187], UK [188], Australia [189], and Denmark [190] have found that fast food outlets are more prevalent in wealthier areas.

Community and home gardens are often overlooked and not reported in the food environment literature as a food source, yet it has been reported that those engaged in community gardens have increased intake of fruits and vegetables. Alaimo, Packett, Miles and Kruger [191] found that respondents with a household member who participated in a community garden consumed fruits and vegetables 4.4 times a day compared to 3.3 times for respondents who did not have a gardener in their household. Other studies have reported similar findings [192, 193]. Immigrants have also reported using community gardens to supplement their diet [194-198]. Resettled African refugees participating in a university community garden in Australia reported that the garden provided them with familiar traditional foods [199]. Certainly community and home gardens are an important component of the neighbourhood food environment as they may address barriers such as
cost, distance to and lack of transport to food outlets that may impede the consumption of
healthful foods such as fruits and vegetables.

Lack of food outlets such as supermarkets, farmer markets and fresh food stores along with
the concomitant abundance of fast food outlets in areas of low socioeconomic status is of
concern. Immigrants and racial minority groups have been reported to settle in poor areas
[200, 201]. Few studies have specifically focused on immigrants to determine the
availability of food outlets in their neighbourhoods and how this may affect their dietary
habits. In the USA Galvez [202] and Lisabeth [203] together with their colleagues found
that predominately Latino census blocks had more convenience stores, speciality food
service stores and fast food restaurants compared to racially mixed census blocks. However
other studies have reported that these stores sell cultural/traditional foods [131, 204, 205]
which provide healthier food options as these traditional foods have been reported to be
healthy [206, 207]. Residents living in areas with high proportions of immigrants have been
found to have increased consumption of healthy foods [161, 204, 205, 208]. Thus a mixture
of store types in immigrant neighbourhoods may provide a variety of foods especially
culturally preferred foods that may lead to increased consumption of healthy foods.

Refugees resettled in developing countries experience a different food environment
compared to the one they had either in their home country or transition country. In their
new host country the refugees must learn to shop in enclosed supermarkets and not open
markets, as well as encounter frozen food, processed food, packaged food, precooked and
cooked food, as well as pet food [134, 140, 209]. This increased level of complexity
coupled with a lack of understanding of the host country’s language [210-212], lack of
food preparation skills [140], lack of knowledge on the nutritional value of food [140], not
knowing where to shop [213], unemployment [211], lack of facilities to prepare food
especially for those immigrants in temporary accommodation [214, 215], not knowing how
to use cooking equipment or cook the “new” food [135, 213, 216], and time constraints [38,
217], makes it very difficult for refugees to navigate their new food environment. This in
turn affects the foods purchased, consumed, their food security and eventually their health.
Only one study that looked at the availability of food outlets within resettled African
refugees neighbourhoods was identified [38]. For these reasons it is important to
understand refugees’ neighbourhood food environment as it influences their access to healthy food and, in turn the food they consume and ultimately their health.

Access to Food Outlets
An important aspect of access to food outlets within the neighbourhood food environment is peoples’ ability to reach food outlets by using convenient modes of transport [171]. This access may be “potential access” or “realized access”. “Potential access” refers to shopping opportunities, while the shopping opportunities that are utilized become “realized access” [218]. Transport is a key determinant of shopping locations and frequency. Lack of transport resources hinders access to healthy and affordable food especially if individuals have to travel beyond their local neighbourhoods to purchase food [219]. Many low income families do not own cars [220, 221] and this may hinder access to food outlets outside their neighbourhood, leading to reliance on those within their neighbourhood which may not stock healthy foods or may have limited variety [146]. When food outlets are co-located it eases travel time as people can access different food outlets in one location [222].

Accessing food outlets that carry healthy foods is important as it enables individuals to make healthful food choices. Healthy diets such as increased consumption of fruits and vegetables have been associated with access to supermarkets [152, 164, 223, 224]. Laraia and colleagues [162] reported a decrease in mean diet quality index scores (DQI-P) with increasing distance from supermarkets and convenience stores among pregnant women. In Australia recently arrived African humanitarian immigrants who lived less than one kilometre from a major grocery retailer had a higher consumption of vegetables [38]. Hence access to healthy outlets such as supermarkets is important, however their access is dependent on car ownership [224] as those who own cars have been reported to have easier access to supermarkets [220, 222]. In their study in Melbourne, Burns and Inglis [222] found that access to supermarkets was faster by car than by bus or foot. Similarly Ball and colleagues [225] also found that Melbourne residents who lived in affluent areas had easier access to supermarkets. Compared to those residing in areas of low socioeconomic position, those in areas of high socioeconomic position had better access to supermarkets and fruit and vegetable stores within a two kilometre buffer, as well as travelled the least distance to these outlets. Similar findings were also reported in Canada [226].
Although walking to and from food outlets is a cheaper alternative to using public transport or driving one’s own car, people are not able to carry their shopping home with ease. Although a distance of 2000 metres is considered an ideal distance when accessing food [227], there are still difficulties encountered. These difficulties include carrying the food, unsafe roads made more difficult when accompanied by children [220, 228, 229], all of which limit the amount of food purchased. Having reliable transport is important in accessing food outlets since individuals are able to acquire and subsequently transport the food they need [221, 222, 230]. Coveney and O’Dwyer [220] in their study in South Australia found that households of low socioeconomic status who had no car had difficulties accessing food outlets regardless of whether they lived in a food desert or not. Additionally, having to use public transport or walk to food outlets limits the variety of outlets that one may visit as well as the amount of food that one may purchase.

There have been contradictory findings on comparisons of access to fast food outlets between affluent and deprived areas. Some studies have reported that deprived areas have shorter travel distance to fast food outlets [184, 231] while other studies have reported longer travel distance when compared to affluent areas [189]. Proximity increases residents’ exposure to fast foods. This exposure to fast foods may act as a potential ecological promoter to overweight and obesity among residents in these deprived neighbourhoods [232]. However a study in Australia found that proximity to fast food outlets was not a predictor of fast food purchase after adjusting for socio-economic characteristics [233]. Nevertheless frequent consumption of fast food has been associated with increased BMI and obesity [234], and obesity is a major component of metabolic syndrome (MetS) and a predictor for type 2 diabetes mellitus (T2DM) and CVD [235]. A recent US study found a positive association between the geographic density of fast food restaurants and incidence of ischemic stroke cases [236]. Obesity has been associated with living in areas with high prevalence of fast food outlets [186, 232, 237] yet other studies have found no association between obesity and proximity to fast food outlets [238-241]. While there is still debate within the literature around the strength of the relationship between exposure to fast food outlets, consumption of fast foods and health outcomes, there
is sufficient evidence to be confident that a relationship does exist. Consequently people who are exposed to fast food outlets are at increased risk of consuming fast foods.

Studies among resettled refugees have reported transport as a barrier to consuming healthful foods or sufficient food [215, 216, 242]. Southcombe [243] reported that 56% (43/76) of recently resettled refugees in Sydney walked to purchase food and this hampered their ability to purchase foods in bulk and access cheaper and preferred food outlets. Liberian refugees [242] and a mixed group of refugees in the USA [213] reported shopping where they did because they did not know other shops where they could purchase food. There are several studies that have reported difficulty in locating traditional foods especially among recently resettled new immigrants and resettled refugees [129, 244]. Most of the traditional foods consumed by resettled refugees are not available in major chain stores or stores on public transport routes [134, 245]. Resettled refugees have reported visiting several food outlets or travelling long distances outside their neighbourhoods to purchase traditional foods ([131, 140, 246, 247]. Recently resettled Hmong refugees reported walking to food outlets near their residence, unlike those who had access to vehicles or public transport and could access outlets further from their homes [131]. Therefore, travelling outside one’s neighbourhood to shop for food is dependent on the availability of transport.

3.2.2 Measures of the Neighbourhood Food Environment

The neighbourhood food environment has been assessed by counting the range of food outlets within the neighbourhood using various methods. Food store lists from phone directories, commercial directories, and government listings [149, 151, 185, 248-250] are the most commonly used since they are convenient and inexpensive. However these lists may be incomplete, outdated and may lead to inaccurate measurements [251-253]. For example, ethnic stores are less likely to be included in business directories [254] while some other business may opt out [250]. Apart from using existing data to measure the neighbourhood food environment, a direct measurement of the food environment known as ground-truthing is regarded as the ideal method for food outlet identification [255]. This method involves physical enumeration of food outlets by walking or driving through the neighbourhood [6, 256]. This method is expensive and time consuming and can be used on
its own [150, 218, 248] or with a combination of other methods [218, 248, 257] to increase
accuracy. However enumeration of food outlets as a measure of the neighbourhood food
environment does not take into consideration individual and neighbourhood characteristics,
and other complementary measures are required to provide a complete picture of the
neighbourhood food environment

Geographic analysis which uses geographic measures such as Geographic Information
System (GIS) and other means of assessing geospatial location [5], is another method used
to measure the food environment. GIS can provide information on availability of food
outlets [258] by measuring the density of food outlets within geographical units such as zip
codes or census tracts. This density approach is used to quantify the number of food outlets
in defined areas using strategies such as buffer method, kernel density estimation and
spatial clustering [259]. Other studies have used the proximity approach, which measures
the distance and the travel time to food outlets from a specified location. The distance may
be measured in a straight line (Euclidean distance) between two points, or city block
distance (Manhattan) which measures the distance between two points at right angles or the
network distance. Euclidean distances do not take into account road networks and thus do
not provide actual distances [225]. Proximity to food outlets has been measured from a
focal point such as home or place of residence, the neighbourhood centroid, school or work.
Previous studies have used a radius of 100m [160], 500m [157, 247], 800m [157], 1500m
[157], 1 km [157, 226, 260], 2 km [38, 225, 227] and 2.5km [158] to measure the food
outlet distance from the focal point. Although a walking distance of 2km is considered ideal
when accessing food [227], the “ideal” distance to the food outlet is yet to be identified
hence the variety of reported distances. Travel time to food outlets from a focal point has
also been used to measure proximity to food outlets [155, 222, 261] and has been measured
using three modes of transport: car, bus, and foot. Although bicycles and motor cycles are
other potential forms of transportation, no study has addressed their use in accessing the
food environment.

Apart from the aforementioned objective measures, residents’ perception of their food
environment has also been used to measure the food environment. The residents’
perceptions of the access, availability, price, variety and quality of healthy food in their
food environment have been measured using Likert scales and questionnaires [262-266]. Residents’ perceptions of their food environment have been reported to mirror the reality of their food environment [262, 263], hence this method may be used to yield complementary results to objective measures. The measurement method selected for a study should be guided by the research question, and the advantages and disadvantages of each of the methods should also be taken into consideration.

3.3 The Home Food Environment
The home environment has been identified as a determinant of dietary intake as it plays a significant role in promoting or hindering healthy eating [3, 4]. The availability of food in the home may be affected by environmental factors such as the availability of and access to food outlets [255]. Timperio and colleagues [267] found that children who lived further from fast food outlets were more likely to eat vegetables three or more times per day, indicating that availability and proximity of unhealthy food outlets near the home, may also influence the dietary intake of household members. Within the home environment, underlying demographic factors have been associated with food availability as well as dietary intake. For instance, vegetable and fruit availability have been associated with income [268], age [269], gender [270, 271], ethnicity [272], education, marital status and household composition [273].

Associations have been reported between home availability and intake of fruits and vegetables [274-277]. Children’s consumption of vegetables and fruits has been associated with the availability of these foods in the home [278, 279]. The availability of milk at meal times has been associated with the intake of milk [277, 280] as well as higher calcium intake [280]. The availability of fatty unhealthy foods [281-284] and soft drinks [285, 286] has also been associated with their consumption. Despite these associations between home food availability and food intake, little is known about the home food availability among resettled African refugees hence this study contributes to our understanding of this topic.

3.3.1 Measures of Home Food Availability
Different methods have been used to measure the availability of food in the home [158, 159]. Home food inventories are the most commonly used method in measuring home food
availability. These inventories can either be open or pre-identified checklists [287]. Open inventories record all the foods present in the home while pre-identified checklists use a list of identified foods that are identified as either absent or present in the home [287]. The pre-identified checklists have been used to report on the availability of fresh, frozen and canned fruits and vegetables [276, 288, 289] and fatty foods [283]. Despite being time consuming and invasive (the researcher has to audit all food storage areas in the home), open inventories give a total count of all foods in the home. Likewise a single inventory can be used to document the food available in the home [274, 276, 282, 283, 290, 291] but multiple inventories taken over time provide a clearer picture of home food availability over a period of time [292].

Multiple inventories are more accurate as within the home, food availability may vary during the month which may be as a result of changes in income, household composition as well as seasonality. For example due to economic constrains African refugees in the USA reported consuming their traditional and fresh foods at the beginning of the month but a repetitive diet of soup in the second half of the month [217]. Additionally shopping frequency may influence home availability as frequent purchase may increase the purchase of fresh produce while infrequent shopping may increase the purchase of canned and frozen foods [293]. There is ongoing debate on the nutritional content of fresh, frozen and canned fruits and vegetables with some research showing that fresh produce is more nutritious than canned and frozen produce while others indicate that there is no nutritional difference between the three [294, 295]. Regardless of these conflicting studies, researchers agree they are comparable nutritionally and they should be recommended to promote fruit and vegetable intake [296].

Measuring household food and beverage purchases using receipts is another method used to measure home food availability [297]. Records of purchases are recorded over a period of time, providing information on the foods available in the home. The information collected from the purchase records has been used to examine its association with dietary intake [298]. However studies applying this method have only used supermarket and grocery receipts, while foods purchased from restaurants, fast food outlets and farmers’ markets are not captured.
3.4 Alternative Food Environment

Much of the research conducted on the food environment has concentrated on retail outlets such as supermarkets, convenience stores, fast food outlets and restaurants, with little being done on other food sources such as mobile and home based vendors and flea markets. Mobile food vendors include those selling foods by the roadside from carts, trucks and stands and are often located in low income areas and areas with minority populations [299-301]. Recent research also shows that mobile food vendors are contributing to the school food environment [299, 302]. Research has shown that the majority of the foods sold by mobile vendors are unhealthy [300, 301, 303] although some do offer healthy food options such as fruits, vegetables and natural fruit juice [301, 304].

Mexican-origin households living in the USA have been found to use mobile food vendors, flea markets and friends as alternative food sources [300, 301, 305]. Both healthy and unhealthy foods were sold by these alternative sources. These three alternative food sources sold traditional foods, and a large variety of culturally specific fresh fruits and vegetables as well as sweets and snacks. Provision of culturally specific fresh fruits and vegetables in neighbourhoods may increase their consumption as immigrants have reported lack of these cultural foods as an obstacle to their consumption. Although frequenting of mobile food vending outlets has been reported as common among recent immigrants [306, 307] no research has focused on alternative food environment sources used by resettled African refugees. Although Australian states have guidelines [308] regulating mobile food vending, no literature has reported their contribution to the food environment. People have been shown to purchase and consume fruits and vegetables from mobile vendors and they improve food neighbourhood food availability which may lead to improved diets. Further, since immigrant mobile vendors may sell culturally preferred foods and this may lead to increased consumption of these foods which in turn indicates the need to study the use of alternative food sources by resettled African refugees.

3.5 Food Promotion in the Food Environment

Other than the availability and access to healthy foods and food outlets within the food environment, food advertising plays a key role in influencing dietary habits. These advertisements can either occur inside or outside the food outlet. Within the food outlet,
food is promoted through product assortment [309, 310], in-store sampling [311], price discounts [312, 313], and food packaging [314, 315]. Television advertising of food is the most commonly used method of advertising outside the food outlet. Unfortunately, most of the foods advertised on television and especially on children television are those low in nutrients but calorie-dense [316-318]. This has prompted several developed countries to pass legislation regarding food advertising. For example, the UK has restrictions on the advertising of junk food [319], the province of Quebec in Canada has banned advertising to children under the age of thirteen [320] while in Australia mandatory regulations targeting food advertisements directed at children are included in the Children’s Television Standards (CTS) [321]. The CTS requires that all food advertisements shown during children’s television programs should not contain misleading or incorrect information regarding the nutritional value of the food. However, several food advertisers have breached the mandatory CTS regulations by advertising unhealthy foods [317, 322].

Apart from the television, food advertisers also use the internet [323], placement in movies [324, 325], promotional flyers [326], celebrities [327, 328] as well as provide premium offers such as free gifts and vouchers [329, 330] to promote their food. These in-store and out-of store food promotions may influence the consumption of unhealthy foods among resettled African refugees as they may think that the advertised foods are the foods that they ought to consume. In addition their children may request the foods advertised on television as research has shown that television advertising influences children’s and adults’ food preferences [328, 331, 332]. This may exacerbate the rates of obesity and overweight that have already been reported among the refugee children and adults [12, 13, 137].

3.6 Food Environment and Food Security
Resettled refugees have been reported to have high levels of food insecurity compared to the native population [9, 213, 216, 242, 333, 334]. Food and nutrition insecurity occurs when there is insufficient access to nutritious food to meet dietary needs and food preferences, and lack of environmental support for a healthy and active life [335]. Several researchers have reported a link between food insecurity and certain dietary habits. Food insecure individuals have low fruit and vegetable intake [336-338], and a high intake of
energy dense food [339], as well as low nutrient intake [340]. These dietary habits among food insecure individuals could be a result of poor access, low availability or the high cost of healthy foods.

Food insecure resettled African refugees in the USA have been found to have a low intake of fruits and vegetables, but high intake of meats and eggs [9, 337]. This increased consumption in foods such as meat and egg may be as a result of the high status ascribed to these foods by refugee families [129]. In addition resettled refugees have reported that the price of vegetables is higher while that of meat is lower [341] which may increase the consumption of these foods, especially in households with limited finances.

The pillars of food security: accessibility, availability, utilization and stability [342] are linked to the neighbourhood food environment.

- **Food access** denotes having sufficient resources to obtain healthy and nutritious food. This means that nutritious, safe and culturally acceptable food should be accessible and affordable to all regardless of race, class, gender, or ethnic differences. Barriers to food access may include lack of food outlets within the neighbourhood [145], availability of unhealthy food outlets within the neighbourhood [46, 179, 182], lack of transport to food outlets [220, 222], and lack of financial resources to access the food.

- **Food availability** represents supply. Nutritious, safe and culturally acceptable food should be available to all persons without discrimination. Availability of food may be influenced by inequalities in food supply caused by climate change, global and local trade policies as well as neighbourhood differences as previously discussed. Food availability does not necessarily mean that all individuals are able to access the food [343] as availability is linked to the individual’s ability to access the food and how the food is distributed within the food system.

- **Food utilization** refers to food usage, from how people use their food once they have accessed it to their ability to absorb and metabolise the nutrients of the food consumed. The latter factor being outside the scope of this research. Food utilization also encompasses food preparation, food quality, food safety and food hygiene. It is important that individuals understand how to prepare the foods that they access to
ensure that they get all the nutritional benefits from that food. Food utilization is often influenced by cultural factors, nutrition knowledge and attitudes, and personal preferences. Several studies have reported lack of food preparation skills among recently settled refuges in developed countries [213]. Most of the foods that they encounter in their new environment are unfamiliar [11, 135, 217], they are not able to read the language in which the cooking instructions appear [213] and thus they do not know how to prepare these foods [11, 135, 213, 244]. Lack of knowledge on how to incorporate the new foods into their diets has also affected resettled refugees’ food security [344].

• Food stability refers to the permanence of food access, availability and utilization, including nothing interfering with the accessibility, availability and utilization of the food. Households should have the ability to acquire healthy foods for its members all year round. Through stability, individuals do not lose access to food during events such as the recent global economic crises, are prepared for and can recover from such disasters.

Few studies have looked at food security among immigrants and in particular the association between food security and dietary habits among immigrants. Therefore this study hopes to fill this gap by exploring the association between the food environment, food security and vegetable consumption among resettled African refugees.

3.7 Conclusion

In summary, the food environment is a determinant of health since an individual’s health is influenced by the availability, accessibility, affordability and utilization of food. The above discussion has provided evidence that food neighbourhoods vary in relation to factors such as race/ethnicity and socioeconomic status. The evidence on variation relating to socioeconomic position is contradictory with some studies showing less availability of food outlets among low income neighbourhoods whilst others have shown increased food outlets in these areas. On the other hand, foods available in the home act as predictors of their intake, an indication that the home food environment plays a significant role in the dietary habits of the household members. This chapter has provided an overview of the neighbourhood and home food environment and how it can influence dietary habits.
4. METHODS

4.0 Introduction
This chapter presents the methodology that was used in this research. The primary purpose of this research was to investigate the influence of the food environment on the vegetable consumption of resettled African refugees. The study design, methodological approach, study population, data collection instruments, and data analysis techniques that were used will be discussed.

4.1 Research Design and Methodological Approach
This study used a cross sectional sequential explanatory mixed method design. Mixed methods research uses both qualitative and quantitative research methods so as to gain a deeper understanding of the phenomenon being investigated [345, 346]. This style of inquiry is underpinned by the pragmatic research paradigm. The pragmatic paradigm promotes choice of the most suitable methods for the research purpose and thus a researcher is at liberty to choose the methods, quantitative and qualitative, that will be used in their study. This research approach was considered appropriate for this study as it provided a way to incorporate study participants own perception of the issues being studied [347]. The primary aim of this study was to investigate how the food environment influences the vegetable consumption of the study participants. The use of quantitative methods provided the basis for statistical descriptions of the associations between the participants’ vegetable consumption and their local food environment, home environment and food security. Complementing the quantitative data, qualitative methods allowed an in-depth explanation of the quantitative findings including participants’ perspectives on their interaction with their local food environment.

As this research used a sequential explanatory mixed method study design, the quantitative data collection phase was followed by a qualitative data collection phase [348]. The quantitative data were collected and analysed and the results were used to inform and guide the development of the qualitative data collection phase. Although this design is time consuming, it enables the researcher to provide an in-depth exploration, explanation and understanding of the quantitative findings as well as the views of the study participants [349]. Collecting the quantitative data at the onset provided information on the associations
between the participants’ vegetable consumption and their local food environment. Any unexpected and outstanding findings were further investigated using qualitative methods to offer in-depth explanations and understanding on the participants perspectives of their interaction with their local food environment.

There are few studies that have used mixed methods to investigate the food environment, dietary habits and food security among resettled refugees [134, 139, 213, 217, 350]. Thus this study has contributed a mixed method design to this field of enquiry.

4.2 Study Population and Study Area
The study population was resettled African refugee households from Burundi, Rwanda and the Democratic Republic of Congo living in South East Queensland (SEQ). Participants from these three countries were selected to ensure that the study sample was relatively homogenous. This group was also selected for various reasons. Firstly, they are from neighbouring countries from the Africa Great Lakes region. Secondly, when they experienced civil wars in their countries a majority of them sought refuge in Burundi, Rwanda, Uganda, Tanzania and the Democratic Republic of Congo [86, 351]. Last, they speak the Swahili language which the researcher speaks and hence there was no need for interpreters. A map of Burundi, the Democratic Republic of Congo and Rwanda is shown below (Figure 4.1).
SEQ was selected as a study area as the state of Queensland has regional areas that have been identified for refugee settlement. These regions are Beenleigh, Logan, Toowoomba, Townsville and Woodridge [96]. In addition the SEQ suburbs of Annerley, Browns Plains, Kingston, Logan, Logan Central, Moorooka, Mt Gravatt, and Woodridge, have been reported as having the highest concentration of African immigrants [98]. Table 4.1 shows the number of Burundian, Congolese and Rwandan humanitarian immigrants that have been resettled in Queensland since 1991.

Table 4.1: Humanitarian Arrivals in Queensland from January 1st 1991 to September 4th 2013

<table>
<thead>
<tr>
<th>Country of birth (settlement)</th>
<th>Migration Stream (Humanitarian)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>535</td>
</tr>
<tr>
<td>Democratic Republic of the Congo</td>
<td>840</td>
</tr>
<tr>
<td>Rwanda</td>
<td>252</td>
</tr>
<tr>
<td>Total</td>
<td>1627</td>
</tr>
</tbody>
</table>

Source: DIAC 2013 [97]

Figure 4.1: Map of Burundi, Democratic Republic of Congo and Rwanda
4.2.1 Sample.

Due to lack of a database to draw up a sampling frame, a problem that has been identified in refugee research [353, 354] a non-probability sampling method was used in this study. As such snowball sampling was used as the sampling strategy for the research. Use of snowball sampling to identify study participants has been used in studies conducted among African refugees resettled in various countries [9, 129, 355, 356]. This sampling technique is cost effective and allows the researcher to access difficult to reach groups [357]. However, when using snowball sampling there is a danger of selection bias as the participants may nominate people they know who have the same characteristics or live in the same conditions, making the sample not truly representative [358]. To overcome this bias, this study used various agents in the recruitment process. Participants were recruited from African churches, community meetings as well as settlement agencies. The various sources of recruitment allowed the researcher to maximise recruitment and diversity.

The sample size for this study was 71, being primary food preparers and shoppers from 71 households. Food preparers and shoppers were selected as their food choices influence their own diet habits as well as those of their household members [359, 360]. The sampling of participants for the research proved a very difficult undertaking with the population of interest being small in number and wary of participation in research. The researcher was in the field for over 12 months, included a participation incentive and was persistent with potential participants. While the sample size is less than anticipated at study commencement (target was 100 food preparers and shoppers), a review of other studies of similar populations suggests there are difficulties in accessing African refugees as a population of interest. The sample size was settled upon after reviewing studies on dietary intake that have targeted African refugees and were able to achieve statistically significant results. In Australia, Burns [13] had a sample size of 45 , in the USA Dharod and colleagues [9] had a sample size of 35 while Hadley and Sellen [242] had a sample size of 33.

Recruitment of study participants

Recruitment of participants is a time consuming and difficult process more so when the participants are from minority and difficult to access groups [361]. Studies among refugee
populations and other hard to reach populations have reported the use of various avenues to reach and recruit their target population [129, 353, 354, 356]. Participant recruitment for this study was conducted through a number of avenues which included African churches, and ethnic organisations. Recruitment was also conducted during community events. Different recruitment agencies were used to ensure as many potential participants as possible were given an opportunity to participate in the study, to maximise recruitment and diversity, as well as reduce sample selection bias.

Before embarking on participant recruitment, an introductory email about the study was sent to the Queensland African Communities Council (QACC). The QACC was requested to formally introduce the study to the community leaders from the participating communities. Introductory letters were sent by QACC to community leaders from Burundi, the Democratic Republic of Congo and Rwanda. The researcher then contacted the community leaders and sought to meet with them. However the researcher did not meet with the community leaders but only managed to communicate with them via email. The objectives of the study were explained and the researcher requested them to inform their community members about the study and to ask interested members to contact the researcher. The eligibility criteria were also explained to the community leaders. To be included in the study one had to be a resettled refugee from Burundi, the Democratic Republic of Congo or Rwanda. One had to be aged 18 years and above, be a primary food preparer, have children aged below 18 years living in the household and be able to converse in either English or Swahili. The community leaders were contacted as they are considered gatekeepers of the community and previous studies using community leaders found them invaluable in the recruitment of study participants. However just as they may ease access to the study participants, they may also impede the progress of the investigation [362]. Thus it is important not to solely rely on community gate keepers only and that is why this study used various agencies, people and institutions to recruit the study participants.

Prior to the commencement of the study, the researcher had attended several community events and had made contact with people who worked with refugees as well as potential participants. These acquaintances were informed about the study and those interested were requested to contact the researcher. The participants were contacted and the study explained
to them, then those who accepted were interviewed. Each time the researcher interviewed a participant, a request was made to inform their community members about the study and to inform the researcher when one of their community peers was interested in participating. Once a potential participant contacted the researcher, the study was explained to them and once they agreed to participate, the researcher would visit them, interview them and would request them to inform other members of their community about the study and inform the researcher of other potential participants. This was done in each household the researcher visited and interviewed.

Not all potential participants who were contacted agreed to participate in the study. Some of them were suspicious of what would happen to the information they were giving the researcher. Others would agree to participate but cancel at the last minute due to other commitments while others did not return phone calls. There were some who felt that the researcher would gain financially from the information that they would provide and thus did not want to participate in the study. With this in mind, the researcher made a conscious effort to explain to all potential participants, as well as those who had already been interviewed, that the study was being conducted as part of the researcher’s degree program and no one was paying the researcher to collect data or for any data collected. It was also reiterated that participants’ identities would not be revealed and all personal information collected would not be shared. Nonetheless the recruitment process was slow and data were collected between April 2012 and April 2013. For their time and effort each participant received a $25 local supermarket grocery voucher for either participating in the quantitative or qualitative interviews. All participants were given a participant information sheet that contained information about the study (Appendix A). In addition all participants provided written informed consent (Appendix B and D).

4.3 Data Collection

Data were collected through face-to-face survey and semi-structured interviews to maximise response rate as well as clarify any questions that the respondents had. The researcher administered the tools used to ensure that people who were illiterate were not offended or embarrassed. Before commencing data collection, the researcher validated the adequacy of the research instruments. This was done to ensure that the questions were not
confusing and operational definitions used were well understood and above all measured what they were reported to measure. A bicultural trauma counsellor from the Queensland Program of Assistance to Survivors of Torture and Trauma (QPASST) was also consulted to ensure that the study questions did not pose danger and distress to the study participants. This process did not identify any question that would cause distress to the study participants.

4.3.1 Data Collection Tools.
This study utilised various tools to collect quantitative and qualitative data as it was a mixed methods study. By using these different data collection methods their strengths and weaknesses were offset. In this way, the study was able to confirm the findings, shed light on the divergent aspects of the phenomenon being studied as well as add insights and understanding that might be missed when one method is used [363].

4.3.1.1 Quantitative data collection
This study used researcher administered questionnaires to collect information on demographics, food security, food environment and dietary habits of study participants. A researcher administered questionnaire was used as they generate good response rates. The questionnaires contained primarily closed ended questions including several open ended items. For closed ended items the participants selected responses to questions on the questionnaire while open ended items allowed the participants to provide responses in their own words. The closed ended items enabled ease of data analysis, whereas the open ended items being time consuming to analyse, provided more vague responses. However the open ended items provided the respondents with the opportunity to express their views and perceptions of the topic under study. The survey took approximately 45-60 minutes to complete. The questionnaires that were used are discussed below. The compiled questionnaire is presented in Appendix C.

4.3.1.1.1 Food environment
A number of research instruments were used to measure the home and physical food environment.
**Household Food Inventory (HFI)**

A researcher administered predefined household food inventory (HFI) consisting of 26 African traditional vegetables and 23 Australian vegetables was used to assess the availability of vegetables in the home. Predefined inventories consist of a selected list of foods identified as present or absent in the home [287]. This predefined inventory was selected over the open inventory as it is able to capture the availability of specific foods of interest, and in this case African traditional vegetables and Australian vegetables. This method was also chosen over the open inventory as it was considered less invasive and it would not require the researcher to physically look for the food items on the HFI in the participants’ fridges, freezers, cupboards or pantries.

During the development of the HFI, community members from the African countries of interest were approached and requested to provide names of the traditional vegetables that they ate in their home countries. Vegetable names were provided in the members’ native language and Swahili and where known the English name was also included. The Swahili names were then translated into English and the vegetable list with pictures were shown to the community members to ensure congruency. This process continued until the members confirmed that the pictures matched the foods on the list and the list was comprehensive. The list of Australian vegetables used in the HFI was adapted from that used in a previous study [364]. During the data collection participants were asked if the foods on the lists were available in their homes and if unsure, were asked to check their storage cabinets and fridge during the interview. For every positive response, a point was given and the total sum of vegetable availability was used in the analysis with higher scores depicting greater availability. The vegetable availability score was categorized into two groups: low and high, consistent with previous research [365]. Home availability in the study is defined as the vegetables available in the home. The study did not look at the quantity of the vegetables but rather if the vegetable was available in the home. The study did not ask if the available foods were to be shared among household members as it was only interested in finding out what vegetables were available in the home.
Vegetable Consumption

Participant vegetable consumption was measured using a food frequency questionnaire (FFQ). A FFQ gathers information about frequency of consumption from a list of foods [366, 367] and portion sizes consumed over a specified period of time. The food items on the FFQ were similar to the items on the HFI. The FFQ used in this study was quantitative and researcher administered. The participants were asked to indicate their usual consumption of the foods on the FFQ in the previous six months from one of nine frequencies ranging from “never” to “more than once per day”. The participants were asked to describe the portions of the foods consumed using standard household measures provided by the researcher to ensure uniformity. Intake frequencies were converted to daily frequencies using the following conversion (never=0.0; less than once per month=0.01; 1-3 times per month=0.07; once per week=0.14; 2-3 times per week=0.36; 4-5 times per week=0.64; 6 times per week=0.086; once per day=1; and more than once per day=2). Daily servings for each item on the FFQ were calculated by multiplying the reported portion size and intake of each food item.

Food frequency questionnaires have been used to measure dietary habits among resettled African refugee groups in previous studies [9, 13, 242]. The representativeness of a FFQ provided a more illustrative diet, although it all depends on the ability of the respondent to identify the foods on the list and describe their diet.

Resident’s Perception of their Food Environment

The participants’ perceptions of access, availability, price, variety and quality of healthy food in their food environment were measured using questions that were adapted from previous studies [262, 265]. These perception related questions used five point Likert scales which ranged from strongly agree through neutral to strongly disagree. These perception measures have been found to have reliability and validity [265, 368].

Food security

Food security was measured with the USDA 18 item Household Food Security Module (USDA HFSM). This instrument contains 18 items which capture experiences related to
food insecurity. The questions address four different situations: anxiety that the household budget or food available was not enough; perception that the foods consumed by the household members are not adequate; reports of reduced food intake and the effects of the reduced food intake for adults; and reports of reduced food intake and the effect of reduced food intake for children. This tool also reports on the various components of food insecurity including severe levels of hunger [369]. The USDA HFSM tool was chosen over the Australian one item and two item food security tools as it is more comprehensive and provides information on severity levels of food insecurity within the household. A 16 item version of the USDA HFSM, was found to have more sensitivity than the Australian one item measurement [230]. The USDA HFSM tool has also been used among immigrant populations [370, 371] and validated to reflect household food insecurity in other settings [372]. Given the cross sectional nature of the study, a 6 month reference period was selected to capture any variability as opposed to a 30 day reference period. This extended reference period was chosen as food security is less likely to be experienced over a shorter reference period like 30 days as compared to a longer reference period such as 6 or 12 months (Keenan et al 2001).

The majority of the foreign language versions of the USDA HFSM like the Brazilian version (Gulliford et al, 2006), Bangladeshi version [373], Spanish version [372] do not use all the 18 items from the original USDA HFSM scale but some of the items. While majority of studies in Africa have used the HFIAS (household food insecurity access scale). The short form version of the USDA HFSM has been used among resettled refugees in the USA [213] while in Australia the Australian food security one question item has been used [216]. The English and Swahili versions of this scale used in this study were checked to ensure they had face validity. Potential participants were shown the questionnaires to ensure that the questions were not confusing, and that operational definitions used were well understood, and provided accurate measurements.

Responses to questions on the food security scale were recoded to determine the household food security and insecurity levels. Responses that had been coded as “often, “sometimes”, “yes” were recoded to “no” and responses that had been coded as “never true”, “don’t know or refused”, “no” were recoded to “yes”. The households were then labelled as either food
secure or insecure depending on the number of positive responses as shown in Table 4.2. The recoding was done as per the USDA HFSM guidelines [374]. The Cronbach alpha for the tool used in this study was 0.843, indicating that it had good reliability.

### Table 4. 2: Food Security Recoded Labels

<table>
<thead>
<tr>
<th>Positive responses</th>
<th>Code</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>0</td>
<td>Food secure</td>
</tr>
<tr>
<td>3-7</td>
<td>1</td>
<td>Food insecure without hunger</td>
</tr>
<tr>
<td>8-12</td>
<td>2</td>
<td>Food insecure with moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hunger</td>
</tr>
<tr>
<td>13-18</td>
<td>3</td>
<td>Food insecure with severe hunger</td>
</tr>
</tbody>
</table>

**4.3.1.1.2 Demographic information**

Demographic information was used to determine how these inter and intra personal factors influenced the participants’ interaction with their food environment and ultimately their dietary habits. The following demographic characteristics were collected:

- **Age**: year of birth
- **Marital status**: (i) married and (ii) not married.
- **Nationality**: nationality
- **Time spent in a refugee camp**: years spent in a refugee camp
- **Period of residence in Australia**: duration lived in Australia.
- **Education level**: (i) primary education and below; (ii) high school education and above
- **Employment status**: (i) unemployed (ii) employed
- **Annual household income**: total annual household income (i) less than $20,000; (ii) $20001-$30000; (iii) $30001 and above.
- **Household size**: Total number of people living in the house
- **Number of children in home**: Total number of children living in house
- **Language**: Are you able to speak English well: (i) No (ii) Yes

**4.3.1.2 Qualitative data.**

This study was a mixed methods study that utilized a sequential explanatory design, with qualitative data collected after the quantitative data. The results of the quantitative data
informed the development of the qualitative data collection tool. This was done to ensure that the questions asked would provide explanatory responses to extend the quantitative data results.

4.3.1.2.1 Participant recruitment
Fifteen participants from the quantitative phase were recruited using purposive and snowball sampling. During the collection of the quantitative data, the researcher asked participants whether they would be willing to participant in a semi-structured interview and those who agreed were later contacted to participate in the qualitative interview although some opted not to at this point.

4.3.1.2.2 Data collection
In-depth interviews were used to collect qualitative data as they have been identified as appropriate for examining perceptions and beliefs [375] and permits respondents to reveal their thoughts and beliefs of interest [376]. In-depth interviews allow probing by the researcher and provide in-depth explorations and explanations. This made this method suitable for this research as it enabled the participants to give their own perceptions of their food environment and how this has influenced their dietary habits.

The responses to the open-ended survey questions were collated after the analysis of quantitative data to enable the development of a tool that provided insight into and build upon the quantitative findings (Appendices E). It was also designed to elicit participants’ views on how they interacted with their local food environment and how this interaction influenced their vegetable consumption. Participants’ views on where they purchased their foods, why they purchased, how they accessed the food outlets, availability of foods of their choice, and sources where they obtained their foods, were sought to provide more information on their food acquisition habits.

4.3.1.2.3 Interview process
Data were collected between October 2012 and April 2013. The interviews were conducted at a venue suggested by the participant. The majority of the participants were interviewed in their homes and several were interviewed at a community garden. Before commencing
the interviews, the study was explained to the participants and their consent was sought. The procedure was similar to the procedure for the collection of the quantitative data. The only difference was the use of a tape recorder. A few of the participants wanted reassurance that they would not hear their voices on the television and they were assured that only the researcher would have access to the recording which would be deleted at the completion of the study.

Interviews were either conducted in English or Swahili, depending on the language that the participants preferred. Participants were not interrupted and probes were used during the interviews to encourage participants to talk more about the issues that were being discussed. At the end of each interview, participants were asked if they wanted to add anything that they felt the researcher had left out or if they had any questions for the researcher. The duration of the interviews ranged between 30 to 75 minutes. Apart from using a tape recorder as a data collection tool, the researcher made notes during the interview as well as recorded what was observed. The notes enabled the researcher to ask the participants questions on issues that they raised that were not in the qualitative tool but were beneficial to the study.

4.4 Data Entry

After data collection all questionnaires were screened for errors and missing data. Prior to data entry data, a code book was developed and it was frequently updated during data analysis. Data were coded and entered into the Statistical Package for the Social Sciences Statistical Package for the Social Sciences (SPSS) version 20 (SPSS IBM, New York, USA). Each entry was assigned a unique ID to ensure that no identifiable information was included in the database. After completion of data entry the frequency of each variable was checked including the minimum and maximum value to try and identify any errors such as duplicates and outliers, as well to ensure accuracy.

4.4 Data Analysis

4.4.1 Quantitative Data Analysis

Data was analysed using SPSS version 20 (SPSS IBM, New York, USA). Descriptive statistics were used to describe the sample’s demographic characteristics. Inferential
statistics were also used for analysis. Chi square tests were used to examine associations between demographic and socioeconomic characteristics, and food environment, with home vegetable availability. Chi square test was also used to examine associations between food security, social support, and demographic characteristics. The test used was used to explore mean differences within the household food insecurity categories and the adult food insecurity categories and vegetable intake. The two groups in each of the two categories were independent of each other, were normally distributed and the assumptions of the t-test were not violated. The Mann Whitney test was used to explore mean rank differences between child food insecurity category and vegetable intake. Logistic regression was used to determine association of demographic characteristics, social support with food security, food environment, home vegetable availability and vegetable intake.

### 4.4.2 Qualitative Data Analysis

Interviews were conducted in English and Swahili as participants switched between the two languages during the interview. The data were first transcribed before it was translated. This was done to ensure that participants’ views were captured verbatim and nothing was left out. The transcripts were then translated into English. To ensure participant confidentiality, the transcription was done by the researcher and no identifiable information was recorded on the transcripts. This also enabled the researcher to add any notes that were taken during the interview. The transcripts were read several times to become familiar with the content. To verify the accuracy of the transcripts, the researcher went through all the transcribed transcripts while listening to the audio tape to ensure that they were correctly transcribed. Additionally, the researcher also went through the translated transcripts to ensure that they were correctly translated. Transcripts were constantly reviewed during data collection to identify if new information was needed to assist in the interpretation of the findings. This was done until saturation and redundancy was attained. Thematic analysis was used to identify themes. A line by line analysis was conducted to identify these themes which were assigned codes. Constant comparison was done by reading and re-reading the transcripts, identified codes and themes to ensure that similar codes and themes were merged. These themes were reviewed to ensure that they provided responses to questions on the interview guide.
To ensure reliability and validity, which Guba and Lincoln [377] referred to as “trustworthiness”, credibility, conformity, and dependability were achieved by the researcher. Credibility which provides the standard for judging the true value of the findings [377] was achieved by recruiting participants who had similar shared experiences as resettled refugees and use of in-depth interviews that helped capture their experiences. The study findings and interpretations were also shared with the participants, a process known as member checking [378, 379], which enabled the participants to give their views as well as identify anything that was missing. Conformity refers to the objectivity of the researcher’s conclusions [380] and was attained by accurately transcribing and translating the data. Dependability occurs when the decision trail used by the researcher can be followed by another researcher [379-381]. This was achieved by accurately documenting data collection and data analysis methods.

4.5 Data Integration
Data integration has been defined as “the combination of quantitative and qualitative research within a given stage of inquiry” [382]. This integration may occur during data collection, data analysis and data interpretation. In this study data integration occurred during data collection since the quantitative data were used to develop the qualitative interview guide. Data integration also occurred during data interpretation to provide a richer discussion of the study outcomes.

4.6 Ethics
Despite the high value of knowledge gained through research, it cannot be pursued at the expense of human dignity. This study dealt with refugees, a population that is considered vulnerable [358] and the major ethical issues of concerns were: informed consent, privacy and confidentiality, anonymity and researcher’s responsibility. In this study, the researcher informed the participants of the purpose of the research. Each participant was given the study’s information sheet and after reading it, any questions or issues that were raised were answered by the researcher. Informed consent was sought from the participants. Study participants were assured of the confidentiality of the information given. All paper forms were kept locked in a secure cabinet in the investigators’ office. All computer files were password protected. No names were used in the analysis or in subsequent reports or
manuscripts which resulted from this work. All participants remained anonymous. The study participants were free to withdraw from this study at any point during the research process. The researcher informed the participants when using voice recorders during the qualitative interviews. All the interviewed participants agreed to be recorded. This study posed no risk to the participants and ethical approval for this study was granted by the Griffith University Human Research Ethics Committee (PBH/36/11/HREC).

4.7 Conclusion
This chapter has discussed the research methodology and research approach that was used to answer the study research questions. Participant recruitment for both the quantitative and qualitative phases was discussed. Data collection tools used and their suitability were also discussed as well as the data analysis procedures for both phases. The next chapter presents the manuscripts that were subsequently developed from the data collected.
5. MANUSCRIPT ONE: Using a Household Food Inventory to Assess the Availability of Traditional Vegetables among Resettled African Refugees

**Reader’s Note:**
The information in this section is under third review (with minor changes having been requested and completed) as an original research paper:

**Gichunge, C., N. Harris, and S. Somerset.** Using a household food inventory to assess the availability of traditional vegetables among resettled African refugees (under third review after revisions to manuscript, *Ecology of Food and Nutrition*).

The co-authors of this manuscript confirm that the research candidate has made the following contributions to this study:

- Developed the study design.
- Completed the human research ethics application.
- Designed and pilot tested the data collection instruments.
- Conducted all participant recruitment and participant interviews.
- Conducted statistical analysis of the data.
- Transcribed the interview recordings.
- Conducted the thematic analysis and participated in discussions for confirmation of themes.
- Prepared manuscript for submission to journal.

Signed: Date: 3/12/2013

Signed: Date: 3/12/2013
5.0 Introduction

Migration whether local or international, forced or voluntary, invariably leads to a change of environment that migrants have to adapt to, and how this is done may impact their health positively or negatively. Refugees who are forcibly removed from their countries find themselves seeking refuge in camps, villages or towns in countries that are different from their own, socially, culturally and environmentally. The world refugee population has grown substantially over the past few decades [383] and protracted situations in countries like Afghanistan, the Democratic Republic of Congo, Somalia and Sudan make it difficult for refugees to return to their homeland. This leads to resettlement in either first or third country of asylum to enable them to lead a “normal” life while offering them protection. In 2012, the UNHCR resettled 69,252 refugees of which 22% were from Africa with those from Somalia, the Democratic Republic of Congo and Eritrea being the majority [384].

Although resettled African refugees come from the same continent, they are linguistically and culturally diverse. This cultural diversity is reflected in their customs, traditions, clothing and food. The African traditional diet is made of staple foods that include cereal grains (maize, millet, sorghum, finger millet and teff) and roots and tubers (cassava, yams, sweet potatoes, and arrow roots) and plantains used to make the main meal which is eaten with a soup or sauce made from leafy vegetables (African nightshade cowpeas, amaranth as well as leaves from pumpkin, cassava and sweet potatoes), fruit vegetables (African eggplant) or legumes (beans, cowpeas, black eyed peas and pigeon peas) [206, 385]. Meat was rarely consumed while fish was common among those who lived in the coastal and lake regions. The availability of these traditional foods vary from region to region and they are cooked differently using different ingredients that gives them a unique regional taste.

Despite having important nutritional and medicinal benefits [206] the consumption of these traditional foods has decreased in Africa and they have been replaced with processed foods and foods rich in sugars and fats [206, 386]. In Africa this change in food habits also known as the nutrition transition is associated with socioeconomic changes that include but are not limited to urbanization, changes in income patterns, role of women and household food preparation methods [387, 388]. These changes in dietary habits have led to an upsurge of nutrition related non-communicable diseases (NCD) such as diabetes and
cardiovascular diseases (CVD) being witnessed in Africa [389, 390]. Traditional diets consisted of whole foods that were unprocessed and hence offered protection against these diseases.

Resettled refugees invariably spend an extended time in camps where the main diet is food aid [123] which may cushion them from consuming processed foods typical of the nutrition transition. However upon resettlement refugees increase their consumption of highly processed foods and meats [9, 13] and decrease their intake of fruits and vegetables [9]. As a result of these changes in dietary habits, many resettled African refugees have a high BMI despite having a low BMI on arrival [14]. Similarly, diabetes another risk factor for cardiovascular diseases (CVD) has also been found to be high among resettled African refugees [15].

Difficulties accessing food outlets that stock traditional foods in their new food environment may hinder the consumption of traditional foods [134, 245]. Ease of access to food outlets stocking healthy food options is important as it will enable them to make healthy food choices. Less healthy household food supplies have dietary consequences for household members [391] as this may promote or hinder healthy eating. Associations have been reported between the home availability and the intake of fruits and vegetables [274, 275] and fatty and unhealthy foods [282, 283]. Within the home environment underlying demographic factors have been associated with food availability as well as vegetable and fruit intake [268, 273].

Little is known about the home food environments of resettled African refugees. Insight into the foods available in their homes will provide a greater understanding of their home food environment and food habits and contribute to the development of appropriate intervention programs targeting food choices. African traditional vegetables are unique to the African diet and cuisine hence it is important to determine their availability in the home and consumption upon resettlement. The aim of this study was to examine the links between household availability and consumption of African traditional vegetables among resettled African refugees residing in Southeast Queensland, Australia.
5.1 Methods

This study used a cross sectional mixed methods sequential explanatory design to investigate the home availability of African vegetables among resettled Burundian, Congolese and Rwandese refugees. Quantitative data was collected first and analyzed after which a qualitative interview guide was developed to explore and extend the quantitative findings.

Sample recruitment

Purposive sampling was used to recruit participants for this study. As refugees are considered a hard to reach population [356], participant recruitment occurred via several mechanisms. Participants were recruited from African churches, community meetings as well as settlement agencies. The various sources of recruitment allowed the researcher to maximise recruitment and diversity within the sample as well as reduce sample selection bias. Recruitment was on a rolling basis and data were collected between April 2012 and April 2013. Primary food preparers and shoppers from households with children under 18 years were recruited. A total of 71 primary food preparers and shoppers were recruited from 71 households. For their time and effort each participant received a $25 local supermarket grocery voucher. All participants provided written informed consent.

Data collection

A researcher administered questionnaire was used comprising questions on demographics and socioeconomic characteristics, household food inventory (HFI), neighbourhood food environment, challenges faced during food acquisition and vegetable intake. Participants were probed to confirm portion sizes so as to ensure accurate measures were recorded. After analysis of the quantitative data, qualitative data were collected using in-depth interviews to explore the findings of the quantitative results. Fifteen participants who had participated in the quantitative survey were purposively selected for the qualitative interviews. The interviews lasted approximately 45 minutes each, and were audio recorded (with the participant’s consent) for subsequent verification of written notes. The research instruments were forward translated to Swahili from English. The translation was done by an experienced professional translator who has a doctorate degree in Kiswahili literature, and reviewed by the first author, who are both native speakers of Swahili and proficient in
English. Both the translated and original versions of the instrument were pre-tested to ensure that the translation was interpreted accurately. Participants were interviewed in the language of their choice, English or Swahili. This was done to ensure that they were comfortable and able to express themselves and most importantly their comments and opinions were not “lost” in translation.

A researcher administered predefined HFI consisting of 26 African traditional vegetables was used to assess the availability of these vegetables in the home. During the development of the HFI, community members from the African countries of interest were approached and asked to provide names of the traditional vegetables that they ate in their home countries. Vegetable names were provided in members’ native language and Swahili and where the English name was known, it was included. The Swahili names were then translated into English and the vegetable list and pictures were shown to the community members to ensure that there was a match between the vegetable names and pictures. This was done until the members confirmed that the pictures matched the foods on the list and the list was comprehensive. During the data collection participants were asked if the foods on the lists were available in their homes and if one was not sure, they were asked to check their storage cabinets and fridge during the interview. Home availability in the study is defined as the vegetables available in the home. For every positive response, a point was given and the total sum of vegetable availability was used in the analysis with higher scores depicting greater availability. The vegetable availability score was categorized into two groups: low and high. Availability scores that were less than the mean were categorized as low, while those which were equal or greater than the mean were categorized as high, similar to a previous study [365].

For this study the neighbourhood food environment was assessed by asking the participants if there was a farmer’s market and supermarket in their neighbourhood. Responses to these questions were dichotomized as “yes or no”. The neighbourhood was defined as the suburb in which the participant resided. Participants were also asked if they had a vegetable garden. The intake of African traditional vegetables was collected using a food frequency questionnaire (FFQ) with items that were on the HFI. Participants were asked their intake frequencies from nine frequencies that ranged from “never” to “more than once a day”. The
frequencies were converted to daily frequencies using the conversions shown in Table 5.1. The portion size for each item was determined using household measures provided by the researcher to promote uniformity. The daily servings for each item on the FFQ were calculated by multiplying the reported portion size and intake of each item. The total vegetable intake was then coded to be consistent with current Australian guidelines for vegetables for adults: 0-2 servings, 3-4 servings and 5 and above servings [392]

Table 5.1: Food Frequency Conversions

<table>
<thead>
<tr>
<th>Frequencies</th>
<th>Conversions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0.0</td>
</tr>
<tr>
<td>Less than once per month</td>
<td>0.01</td>
</tr>
<tr>
<td>1-3 times per month</td>
<td>0.07</td>
</tr>
<tr>
<td>Once per week</td>
<td>0.014</td>
</tr>
<tr>
<td>2-3 times per week</td>
<td>0.36</td>
</tr>
<tr>
<td>4-5 times per week</td>
<td>0.64</td>
</tr>
<tr>
<td>6 times per week</td>
<td>0.86</td>
</tr>
<tr>
<td>Once per day</td>
<td>1</td>
</tr>
<tr>
<td>More than once per day</td>
<td>2</td>
</tr>
</tbody>
</table>

Based on the quantitative data, three questions were developed to explore the quantitative results. The questions were: Where do you source for your vegetables?; Why do you have these vegetables in your home?; What problems do you encounter when sourcing for your traditional vegetables in your neighbourhood? Participants were not interrupted and probes were used during the interviews to encourage participants to talk more about the issues that were being discussed.

Data Analysis
The Statistical Package for the Social Sciences (SPSS) version 20 (SPSS Inc, Chicago, IL) was used for statistical analysis. Chi square analysis was used to determine associations between demographic and socioeconomic characteristics, and food environment, with home vegetable availability. Logistic regression was conducted to assess associations of home availability of African vegetable with vegetable intake adjusting for demographic and food environment characteristics that were significant in the bivariate analysis. A backward
elimination procedure was used and non-significant variables were removed. The statistical significance level was set at p<0.05.

Recordings of the qualitative interview were transcribed verbatim and the transcripts were read several times to understand their content. The transcripts were reviewed as part of a data collection and analysis cycle in order to establish if there was need to collect additional information to aid in interpreting the findings. This was done until saturation was achieved with no new or different information emerging from the interviews. Using thematic analysis a line by line analysis was conducted on the transcripts to identify themes. These themes were reviewed to ensure that they provided responses to questions on the interview guide.

5.2 Results

*Quantitative results*

The primary food preparer and shopper from each of the 71 households was surveyed. The average household size was 5.39±2.23 with an average of 1.8±0.69 adults and 3.59±1.94 children. The HFI revealed participants had a mean of 5.4±2.6 types of African vegetables in their homes at the time of audit. In the bivariate analysis shown in Table 5.2, the availability of the African vegetables in the home was significantly associated with age, employment, having a supermarket in the neighbourhood, and having a vegetable garden (p<0.05). Those who were older, employed, engaged in vegetable gardening and had a supermarket in their neighbourhood, reported high home African traditional vegetable availability.
Table 5.2: Associations between Socio-demographic and Food Environment Characteristics with Vegetable Intake

<table>
<thead>
<tr>
<th>Variable</th>
<th>HFI African Vegetable</th>
<th></th>
<th></th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low n (%)</td>
<td>High n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>17 (85.5)</td>
<td>3 (15)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>30 to 39</td>
<td>13 (44.8)</td>
<td>16 (55.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;40</td>
<td>5 (22.7)</td>
<td>17 (77.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td></td>
<td>0.060</td>
</tr>
<tr>
<td>Primary education and below</td>
<td>13 (38.2)</td>
<td>22 (61.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school education and above</td>
<td>22 (59.5)</td>
<td>15 (40.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
<td>0.005</td>
</tr>
<tr>
<td>Unemployed</td>
<td>29 (60.4)</td>
<td>19 (39.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>5 (23.8)</td>
<td>16 (76.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual household income</td>
<td></td>
<td></td>
<td></td>
<td>0.506</td>
</tr>
<tr>
<td>&lt; $20000</td>
<td>10 (50)</td>
<td>10 (50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20000-30000</td>
<td>15 (55.6)</td>
<td>12 (44.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;$30001</td>
<td>9 (39.1)</td>
<td>14 (60.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years lived in Australia</td>
<td></td>
<td></td>
<td></td>
<td>0.086</td>
</tr>
<tr>
<td>Less than 5 years</td>
<td>14 (63.6)</td>
<td>8 (36.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 years and more</td>
<td>21 (42.9)</td>
<td>28 (57.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to speak English well</td>
<td></td>
<td></td>
<td></td>
<td>0.144</td>
</tr>
<tr>
<td>No</td>
<td>17 (42.5)</td>
<td>23 (57.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18 (58.1)</td>
<td>13 (41.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supermarket in neighbourhood</td>
<td></td>
<td></td>
<td></td>
<td>0.032</td>
</tr>
<tr>
<td>No</td>
<td>5 (27.8)</td>
<td>13 (72.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30 (56.6)</td>
<td>23 (43.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers’ market in neighbourhood</td>
<td></td>
<td></td>
<td></td>
<td>0.883</td>
</tr>
<tr>
<td>No</td>
<td>18 (48.6)</td>
<td>19 (51.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15 (46.9)</td>
<td>17 (53.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grow own vegetables</td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
</tbody>
</table>
In the logistic regression analysis participants who reported low home availability of traditional vegetables were 0.19 (95%CI 0.057-0.634; p=0.007) times more likely to consume 0-2 vegetable servings compared to those from households with high vegetable availability (Table 5.3).

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable intake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 and above servings (ref)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4 servings</td>
<td>0.582</td>
<td>0.27-3.21</td>
<td>0.813</td>
</tr>
<tr>
<td>0-2 servings</td>
<td>0.19</td>
<td>0.06-0.63</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Qualitative results

Fifteen participants from the quantitative study were purposively selected to participate in the qualitative study. Table 5.4 shows their socio demographic and neighbourhood food environment characteristics which did not differ from those who did not participate in the qualitative interviews.
Table 5.4: Demographic and Neighbourhood Characteristics of Participants who Took Part in the Qualitative Interview

<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Employed</th>
<th>Number of Children</th>
<th>Food Environment (supermarket and farmers’ market in neighbourhood)*</th>
<th>Growing own vegetable (garden)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>Yes</td>
<td>5</td>
<td>SM, FM</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>No</td>
<td>5</td>
<td>SM, FM</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td>No</td>
<td>4</td>
<td>SM, FM</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>Yes</td>
<td>3</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>36</td>
<td>Yes</td>
<td>4</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>37</td>
<td>No</td>
<td>3</td>
<td>SM</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>37</td>
<td>No</td>
<td>5</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>No</td>
<td>4</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>27</td>
<td>No</td>
<td>2</td>
<td>SM, FM</td>
<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>52</td>
<td>No</td>
<td>2</td>
<td>SM, FM</td>
<td>Yes</td>
</tr>
<tr>
<td>11</td>
<td>43</td>
<td>Yes</td>
<td>6</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>12</td>
<td>31</td>
<td>No</td>
<td>2</td>
<td>SM, FM</td>
<td>No</td>
</tr>
<tr>
<td>13</td>
<td>33</td>
<td>No</td>
<td>5</td>
<td>SM, FM</td>
<td>Yes</td>
</tr>
<tr>
<td>14</td>
<td>31</td>
<td>No</td>
<td>1</td>
<td>SM, FM</td>
<td>No</td>
</tr>
<tr>
<td>15</td>
<td>35</td>
<td>No</td>
<td>2</td>
<td>SM, FM</td>
<td>No</td>
</tr>
</tbody>
</table>

* SM=supermarket, FM=farmers’ market

**Where do you get the vegetables?**

Participants reported that they sourced their traditional vegetables from a variety of outlets that included supermarkets, farmers’ markets and ethnic grocery shops. Nine of the 15 respondents had supermarkets and a farmers’ market in their neighbourhoods while one participant only had a supermarket in her neighbourhood. However five participants did not have a supermarket or farmers’ market in their neighbourhood. Compared to supermarkets and ethnic grocery stores, farmers’ markets were the preferred food outlet in terms of availability and cost by all the 15 participants.
If you do not go to the Sunday market (farmers’ market) you will not get African vegetables. ID 12

Some of the vegetables are available in the African and Indian shops but they are cheaper and abundant at the Sunday market (farmers’ market). ID 15

Community or home vegetable gardens were identified as an alternative source of African vegetables. Ten of the 15 participants who engaged in vegetable gardening reported that the African vegetables were available and accessible at no expense.

I used to buy vegetables (amaranth) but now I do not buy. I harvest from my garden. ID 5

Why are these vegetables available in your home?

Four factors that influenced the availability of vegetables in the participants’ homes were identified: vegetables were perceived to be healthy foods; family preferences; food preparation skills; and the traditional foods were familiar and more filling. All 15 participants reported that vegetables were healthy hence the reason they were available in their homes. According to them, vegetables were healthy as they were fat free and provided the body with important nutrients.

Vegetables are healthy. They have no oil that can give you problems. ID 6

They (vegetables) are healthy. Even when we were in Africa we were told it is good. Like cassava leaves adds blood to the body. Vegetables are good for health. ID 2

Home vegetable availability was influenced by the participant’s preferences. All the participants reported that they preferred their traditional vegetables and that is why they were available in their homes.

I cannot go for 3 days without eating beans. I like to eat beans. Beans, all vegetables. I cook beans and green bananas. I like them a lot. I also eat cassava. ID 10
Five of the participants reported that their spouses’ preferences for the traditional vegetables contributed to the availability of these vegetables in the home.

*He (husband) is like me. He does not like fatty foods. We like to cook like Africa. We cook beans and add pumpkins and make stew. We also make beans and cassava stew.* ID 7

Children’s preference for traditional vegetables was reported by 11 participants. Cassava leaves was mentioned by 11 participants as the traditional vegetable that was most liked by their children. One participant reported that her children liked cassava leaves and amaranth.

*My children like sombe (cassava leaves) and lengalenga (amaranth).* ID 3

One participant reported that her children had no problems eating the African vegetables when in Africa, but that changed when they arrived in Australia. The children now eat small quantities of the vegetables and have developed a preference for other foods found in Australia. She however continues to give them the traditional vegetables.

*My children were eating our food in Africa but they do not want it. If you cook chips and chicken they like it. They eat small quantities of sombe and lengalenga.* ID 13

Two of the 15 participants reported forcing their children to eat vegetables. These two participants were aware of the nutritional benefits of vegetables and wanted their children to eat the vegetables. The other reported that her child liked meat and she had to force her to eat vegetables. For these two participants their vegetable availability was influenced by their desire to ensure that their children had access to healthy foods.

*... she does not like it at all. She does not like the vegetables I cook. She just likes meat, meat, meat. I force her to eat vegetables. I have to sit next to her. She will chew one spoonful for five minutes.* ID 14
Traditional vegetables were purchased by all the participants as they were the foods that the participants were accustomed to. Participants reported purchasing these vegetables as they were familiar foods, foods that they were brought up eating, and the foods that their parents ate. They considered these foods a part of their lives.

*I can say culture. I buy stuff I used to eat in my country. We are still eating the same food we have not changed our meal style. That is why when I go shopping I focus on what we used to eat, what the kids like or the whole family likes. I am happy as I find all the stuff that I used to buy in my country.* ID 1

Other than being familiar, these are the vegetables they know how to prepare. One participant reported buying Brussels sprouts and having to throw them away as she did not know how to cook them. Although all the participants incorporated new foods in their diet, there was a preference for traditional vegetables. One participant reported that these traditional foods were more filling compared to Australian foods.

*Respondent: When I eat them (traditional vegetables) I get very satisfied but when I eat the foods from here (shrugs shoulders).*

*Interviewer: What foods do not make you satisfied?"*


**What problems do you encounter when sourcing for your traditional vegetables in your neighbourhood?**

Problems faced by the participants when sourcing their traditional vegetables were grouped into two: language barrier and travelling to other neighbourhoods. Four participants reported that they could not read English which made shopping especially in the supermarkets a challenge. Unlike in their home country where they had shopped in open markets, the Australian shops arrange foods in aisles with signs indicating the foods that are available on each aisle. And for those who could not read English, this was a problem.
Shops here are different. At home we used to shop in the market. Here things are on the shelves and aisles and it takes long to know where the food is. And you know you cannot ask where things are all the time as you are expected to read. ID 3

Lack of preferred vegetables in the neighbourhood food outlets was also a challenge which forced six participants to visit several shops as well as travel to other neighbourhoods. Although one participant reported that a non-petrol convenience shop was available in his neighbourhood, it did not sell any traditional foods.

The shop in my neighbourhood does not sell African food. They sell wazungu (white people) food, food for people who have been born here. We prefer our food. Like beans, there are no beans there, things like ugali flour, cassava, cassava leaves. So I have to go to (name of neighbourhood) and (name of neighbourhood). ID 5

Lack of transportation was a challenge identified by six participants as limiting their ability to access their preferred food outlets which were in other neighbourhoods. Lack of reliable transport meant that these participants had to use public transport which limited the amount of foods they purchased as well as the food outlets visited. This may also have influenced the availability or at least variety of vegetables in the home.

I am not able to go to the Sunday market (farmers' market) as it is in (name of neighbourhood) and I do not have a car. It is very difficult to travel on the train with food and children. Even when I go with the train, the market is far from the train station. ID 4

5.3 Discussion

This study found associations between the home availability of African traditional vegetables with participants’ age, employment status, having a vegetable garden and the availability of a supermarket in the neighbourhood. The association between age and home availability of African vegetables may be linked with older participants’ preferences for their traditional foods in while post-resettlement [134]. One participant expressed this by saying: “We have done this for a long time. We do not want to change our culture. We want
to keep our culture, eating the same stuff we were eating before”. Culture is a determinant of food habits [393] and food is central to individual identity [394]. By referring to their traditional foods as “our food” or “my food” is an indication that they perceive their traditional foods as their cultural and ethnic identity, findings that have been reported among other resettled refugees [133, 134].

Participants living in households with low availability of traditional vegetables were less likely to consume the recommended amount of vegetable servings. This low vegetable intake compares to that reported among the general Australian population that shows that the majority of the population do not consume the recommended vegetable servings [395]. This finding has important health implications as decreased consumption of vegetables may increase the risk of CVD and its co-morbidities as well as some types of cancer [2]. This low vegetable intake may be attributed to the participants’ age as more households with younger food preparers (<30 years) reported low availability. This may be because younger immigrants or first generation immigrants are more likely to adopt the local dietary customs [136, 396]. Another explanation may be that a larger percentage of those who were unemployed reported low vegetable availability. African traditional foods have been reported as relatively expensive [134] hence being unemployed may have hindered participants from stocking these vegetables in their homes. Consequently this low availability may have reduced their consumption as home vegetable availability has been associated with vegetable intake [274, 275]. It is therefore important that resettled refugees are encouraged to consume and stock their homes with these healthy traditional vegetables as they are high in micronutrients and dietary fiber compared to the new (exotic vegetables) they encounter in their new food environments [397]. A cheaper method of doing this is to encourage African resettled refugees to engage in home of community food gardening.

There was an association between the home availability of traditional vegetables and having a vegetable garden. Those who gardened reported high availability of traditional vegetables. Participants who gardened reported that they planted their traditional vegetables and this may have contributed to the home availability of these vegetables. Food gardening provides access to fresh foods and has been associated with an increase in the consumption of fruits and vegetables [191, 398]. Participants reported that they were able to access some
African vegetables from the supermarkets in their neighbourhoods but at a relatively high cost. Resettled refugees have reported that traditional foods are expensive and difficult to locate [134] hence having a food garden offers a cost-effective means to increase availability of traditional foods in the home. These traditional vegetables are easy to cultivate and some like amaranth can be grown as a dual purpose crop [399] and can be harvested over a year [400]. Reported barriers affecting resettled refugees engaging in food gardening include access to land suitable for cropping, small size of garden plots as well as access to gardening resources such as tools and water [199], and this may limit the availability and access of these traditional vegetables.

Despite there being no association between home availability of traditional vegetables and the availability of farmers’ markets in the local neighbourhood, participants reported shopping in farmers’ markets as they were perceived to be cheap and with a wide variety of fresh traditional foods. Nevertheless there was an association between the home availability of vegetables and having a supermarket in the local neighbourhood. Neighbourhood availability of supermarkets has been associated with increased intake of fruits and vegetables [47]. Thus having a supermarket in the neighbourhood may have increased home vegetable availability. Participants also reported purchasing their traditional vegetables from ethnic stores. This may also have contributed to the availability of these foods in the home even though the association was not measured. Hence refugees having access to a variety of outlets with their traditional foods, gives them opportunities to make healthy foods choices.

Participants may also be purchasing vegetables that their children prefer which may increase the availability of these vegetables in the home. Children’s consumption of vegetables and fruits has been associated with the availability of these foods in the home [278, 279], similarly the availability of unhealthy obesity promoting foods in the home promotes their consumption [284, 285]. However some participants reported their children no longer preferred the traditional foods they ate in Africa but instead favoured the highly processed foods available in their new environment. This finding is consistent with other studies on refugee children food choices [212, 217]. Although some studies have reported lack of association between parental influence and children’s food preferences [401, 402],
parents are important agents of change in promoting and improving consumption of vegetables and other healthy foods among their children [403, 404]. They do this by modelling healthy nutrition behaviour as well as controlling the availability and accessibility of foods in the homes [277]. Participants demonstrated awareness of the health benefits of these traditional vegetables which may have led them to stock their homes with these vegetables, supporting findings that mother’s nutrition knowledge is a mediator of home food availability [405]. It is therefore important that resettled refugees are encouraged to continue stocking their homes with these healthy traditional vegetables as availing them will provide their children with healthy food options leading to nutritional health.

Language was noted as a problem when shopping for foods including vegetables in enclosed shops, supermarkets and grocery stores. This has previously been observed in resettled refugees and immigrants [213, 406]. This may hinder participants from visiting these shops to purchase vegetables which may lead to a reduced vegetable intake or lack of vegetable intake. Other previously identified challenges that were confirmed in the present study included lack of traditional foods in their neighbourhoods of residence [245], having to visit several shops to source preferred traditional foods. One participant stated that she did not shop at the farmers’ market, a source of cheap and wide variety of vegetables, as it was located in another neighbourhood and she did not have a car. A lack of transport hinders access to healthy, affordable and culturally relevant vegetables especially if individuals have to travel outside their neighbourhoods to purchase them [221] which, in turn, influences the availability of foods in the home.

Importantly, results from this study confirm previous observations that consumption of traditional foods among resettled refugees continues well beyond resettlement [13, 133], in part because of perceptions that traditional foods are healthy and more filling [131, 133] than the new foods they encounter in Australia. Research evidence shows that these traditional vegetables have nutritional benefits and are superior to the processed foods and meats encountered upon resettlement, a sentiment that has significant health promotion potential [206, 397].
This study has a number of limitations. The sample size was small (n=71) and almost homogenous as most of the participants were from Burundi with fewer participants from Rwanda and the Congo, which might limit the generalizability of the study findings. It may be possible that nationality/ethnicity may impact home food availability but it was not measured in this study. The HFI used reported on the availability of traditional vegetables in the homes but not on the actual quantities available. Vegetable availability was only assessed at one point in time with data collected over autumn, winter and spring of 2012. The study was not able to take into account seasonal variations as well as variations in household food supplies and socio-demographic changes such as household composition and income. Conducting several household vegetable inventories could show changes in household food supplies over time. Self reporting on the FFQ may be biased as participants may have reported high intakes as high intake of vegetables is promoted as a healthy habit. Despite these limitations, the study has several strengths. Data was collected in the homes hence participants were able to check their food storage when reporting on the availability on the foods on the HFI. The pre-identified HFI used was easy to administer and included culturally preferred foods. This study contributes to the limited literature around household food availability among resettled refugees and immigrants [282, 407]

5.4 Conclusion
This study provides insights into the home availability of traditional vegetables among resettled African refugees and associated individual and food environment characteristics. Such information is useful in development of health and nutrition promotion programs for such population groups that have moved to a new and unfamiliar food environment. This study shows a trend where the intake of vegetables was lower for those in households with a low vegetable availability supporting findings that home vegetable availability influences vegetable intake. Food preparers, like the participants in this study, play an important role as their food habits influence and predict food habits of their family members, especially children. Interesting, this study suggests that resettled African refugee food preparers retain preferences for their traditional vegetables and foods. However, this population has difficulties navigating their new food environment associated with language, transport and location of food outlets that may be hindering access to and consumption of these preferred traditional vegetables and foods. The research suggests that interventions that work with
these resettled refugee communities to facilitate better access to traditional vegetables such as community food garden would be of great cultural and nutritional value to these communities. Future studies should be longitudinal so as to provide more detailed information on changes of home vegetable availability and vegetable intake of both food preparers and children, over time, taking into consideration seasonal changes as well as changes on the household socio-demographic characteristics.

Reader’s Note:
The information in this section is under review as an original research paper:
Gichunge, C. and N. Harris. Exploring perceptions of healthy food availability and access of resettled African refugees in Australia, (under review *Australia Journal of Health Promotion*).

The co-author of this manuscript confirms that the research candidate has made the following contributions to this study:

- Developed the study design.
- Completed the human research ethics application.
- Designed and pilot tested the data collection instruments.
- Conducted all participant recruitment and participant interviews.
- Conducted statistical analysis of the data.
- Transcribed the interview recordings.
- Conducted the thematic analysis and participated in discussions for confirmation of themes.
- Prepared manuscript for submission to journal.

Signed: Date: 3/12/2013
6.0 Introduction
The neighbourhood food environment correlates with food choice and dietary patterns [5]. The availability and access to food outlets associated with healthy foods such as supermarkets has been associated with an increased consumption of fruit and vegetables [47, 162]. Availability and access to food outlets stocking healthy foods varies from neighbourhood to neighbourhood [156, 225]. Few studies have specifically focused on resettled refugees to determine the availability and access of food outlets in their neighbourhoods and how this may affect their dietary habits [38, 130, 213]. In Australia, Pereira and colleagues [38] found that African refugees had access to 78 food outlets including a supermarket within a 2km radius of their residence and those who lived less than 1km from the supermarket had a higher consumption of vegetables.

Residents’ perceptions of their food environment have been reported to mirror the reality of their food environment [47, 262, 263]. Perceptions of food accessibility have been found to have significant associations with fruit and vegetable intake [408]. Similarly perceptions of food availability have shown significant associations with fruit and vegetable intake [47, 264, 408]. While these studies provide data on how residents’ perceive their neighbourhood food environments none has explored their rationale for these perceptions. Little is known on how resettled refugees perceive their neighbourhood food environment. The purpose of this study was to explore perceptions of healthy food availability and access of resettled African refugees in Queensland, Australia.

6.1 Methods
This cross sectional mixed methods study utilized a sequential explanatory design.

Sample Recruitment
The study was conducted among primary food preparers and shoppers from 69 households of African refugees from the African Great Lakes region (Burundi, the Democratic Republic of Congo and Rwanda) living in Southeast Queensland (SEQ), Australia. A large number of African humanitarian migrants have been reported to reside in SEQ [98]. Participants were recruited through purposive sampling from African churches, ethnic organisations and during community events. Participants were eligible for the study if they
had children aged under 18 years, were from Burundi, Rwanda or the Democratic Republic of Congo, spoke either English or Swahili and were the primary food preparers and shoppers in their household. All participants were informed of the study’s aim and each received a participant information sheet. A $25 grocery voucher was given to the participants for their time and effort.

Measures

Perception of neighbourhood healthy food access was measured using eight questions from a scale developed by Freedman and Bell [262]. Responses were coded on a five point Likert scale (strongly disagree to strongly agree). The total score ranged from 8 to 40 (8*5=40), with the highest score indicating higher access. The reliability of the scale in the current study was 0.728 (n=69).

Perception of neighbourhood healthy food availability was measured using three questions used in a previous study [47]. Responses were coded on a five point Likert scale (strongly disagree to strongly agree). The total score ranged from 3 to 15 (3*5=15) with a higher score indicating higher availability. The reliability of the scale in the current study was 0.839 (n=69).

Demographic information regarding participants’ age, household income, education level, car ownership information, and employment status information were collected. Four qualitative questions were developed to further explore the quantitative results. Emphasis was placed on understanding of the participants’ perception of their food environment relating to available food outlets, foods sold in food outlets, food outlets visited, reasons for visiting these outlets and barriers affecting their food access. Probes were used to encourage participants to elaborate on their responses.

Data collection and analysis

Quantitative data was collected from 69 primary food preparers and shoppers using a researcher administered questionnaire. The qualitative interview guide was developed following the quantitative data analysis. Fifteen participants selected through purposive sampling were interviewed using in-depth interviews in their homes or by telephone and all
interviews were recorded. Participants were not interrupted and probes were used during the interviews to encourage participants to talk more about the issues that were being discussed. The interviews lasted between 25-55 minutes and were conducted in English or Swahili. In this study, the neighbourhood was defined as the suburb where the participant resided.

Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) (version 20). Demographic data was analyzed using descriptive statistics. The interviews were translated into English. Transcripts were transcribed verbatim and reviewed to identify if there was any new information that needed further investigation. All the 15 transcripts were read several times in order to be familiar with the data. The transcripts were then read line by line to identify emerging codes. These codes were further grouped into categories. Constant comparison which involved reading the identified codes and categories was done to find relationships between them. This led to a further categorising of similar categories into themes. These themes were reviewed to ensure that they provided responses to questions on the interview guide.

6.2 Results

Quantitative results

Descriptive characteristics of the 69 household primary food preparers and shoppers that participated in the study are shown in Table 6.1. Participants had a mean age of 36.5 (±6.0) and majority were unemployed (69%) and had an annual household income below $30000 (69%).
## Table 6.1: Participant and Neighbourhood Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N(^a) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>36.53 (6.01)</td>
</tr>
<tr>
<td>Range (19-58)</td>
<td>39</td>
</tr>
<tr>
<td><strong>Years lived in Australia</strong></td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>4.82 (1.72)</td>
</tr>
<tr>
<td>Range (0.5-9)</td>
<td>8.5</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>48 (69.6)</td>
</tr>
<tr>
<td>Employed</td>
<td>21 (30.4)</td>
</tr>
<tr>
<td><strong>Annual household income(^*)</strong></td>
<td></td>
</tr>
<tr>
<td>Less than $20000</td>
<td>20 (29.4)</td>
</tr>
<tr>
<td>$20001-$30000</td>
<td>27 (39.7)</td>
</tr>
<tr>
<td>$30001 and above</td>
<td>21 (30.9)</td>
</tr>
<tr>
<td><strong>Car ownership</strong></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19 (27.5)</td>
</tr>
<tr>
<td>Yes</td>
<td>50 (72.5)</td>
</tr>
<tr>
<td><strong>Mode of transport used to travel to food outlet</strong></td>
<td></td>
</tr>
<tr>
<td>Own car</td>
<td>40 (58)</td>
</tr>
<tr>
<td>Bus</td>
<td>17 (24.6)</td>
</tr>
<tr>
<td>Walk</td>
<td>8 (11.6)</td>
</tr>
<tr>
<td>Bicycle</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (4.3)</td>
</tr>
<tr>
<td><strong>Perceived access scale</strong></td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>25.88 (±6.77)</td>
</tr>
<tr>
<td>Range (8-35)</td>
<td>27</td>
</tr>
<tr>
<td><strong>Perceived availability scale</strong></td>
<td></td>
</tr>
</tbody>
</table>
Mean (±SD) 10.77 (±4.01)
Range (3-15) 12

*One participant refused to answer this question

Fifty six percent of the participants scored over 12 points (range 3 to 15) in the perception of healthy food availability score. Summated mean score for this food availability scale was 10.77 (SD=4.1) indicating a strong availability of healthy food. As shown in Table 6.2 majority of the participants strongly agreed and agreed with the statements on the scale. However there was a large number (26.1%) who were undecided about the statement regarding availability of low fat products in the neighbourhood.

### Table 6.2: Perceived Availability of Healthy Food in the Neighbourhood

<table>
<thead>
<tr>
<th>Variable</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly</td>
</tr>
<tr>
<td>Fresh fruits and vegetables in your neighbourhood are of high quality</td>
<td>16 (23.2)</td>
</tr>
<tr>
<td>A large selection/variety of fresh fruits and vegetables are available in your neighbourhood</td>
<td>14 (20.3)</td>
</tr>
<tr>
<td>A large selection of low-fat products are available in your neighbourhood</td>
<td>13 (18.8)</td>
</tr>
</tbody>
</table>

**Perception of neighbourhood healthy food access**

The mean score for the healthy food access score was 25.63 (SD=6.87) and ranged from 8-35. Fifty nine percent of the participants scored 25 and above on the perception of food access score indicating higher access. Majority of the participants disagreed with the following statements “you prefer to shop in the local shops in your neighbourhood” and “the stores in your neighbourhood sell outdates/expired or rotten products” (Table 6.3). However there were many who were undecided about whether alcohol and tobacco were easily available in their local outlets (27.5% and 30.4% respectively). These reported that they did not use these products thus were unable to ascertain their access. Thirty three
percent of the participants were undecided as to whether their local food outlets were expensive.

Table 6.3: Perceived Accessibility of Healthy Food in the Neighbourhood

<table>
<thead>
<tr>
<th>Variable</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly n (%)</td>
</tr>
<tr>
<td>It is easy to buy fresh fruits and vegetables in your neighbourhood</td>
<td>15 (21.7)</td>
</tr>
<tr>
<td>Your neighbourhood has the best stores in town</td>
<td>21 (29)</td>
</tr>
<tr>
<td>The food stores in your neighbourhood sell outdated/expired or rotten products*</td>
<td>32 (46.4)</td>
</tr>
<tr>
<td>It is easy to buy healthy foods in your neighbourhood</td>
<td>9 (13)</td>
</tr>
<tr>
<td>It is easy to buy tobacco products in your neighbourhood*</td>
<td>5 (7.2)</td>
</tr>
<tr>
<td>You prefer to shop in the local shops in your neighbourhood</td>
<td>18 (26.1)</td>
</tr>
<tr>
<td>It is easy to buy alcohol in your neighbourhood*</td>
<td>6 (8.7)</td>
</tr>
<tr>
<td>The food outlets in your neighbourhood are expensive*</td>
<td>18 (26.1)</td>
</tr>
</tbody>
</table>

* Item was reverse coded for composite food access scale; data shown not reverse coded

Qualitative Findings
Fifteen participants who had participated in the quantitative phase were purposively selected to participate in the qualitative phase of this study. The sample had a mean age of 36.53 (±6.05), had lived in Australia for an average of 4.5 (±2.2) years, was predominately
female (80%), unemployed (73.3%) and had an annual household income <$30000 (42.9%).

**Food outlets available in the neighbourhood**

There were various types of food outlets that were available in the participants’ neighbourhoods. Five participants had a supermarket, ethnic stores, fruit grocery stores and a farmers’ market. These five participants were from the two different neighbourhoods. The ethnic stores comprised of Asian, African and Middle Eastern shops. The farmers’ market was operational once a week, every Sunday. Seven participants from two different neighbourhoods had ethnic stores and supermarkets. Two other participants from two neighbourhoods only had a convenience store in each of their neighbourhoods, one had a petrol convenience store while the other had a non-petrol convenience store. One participant reported that she did not know where the food outlets were as she had recently moved into the area.

**Participants’ perception on definition of healthy food**

Participants were asked to explain what healthy foods meant in their own words. Foods that were mentioned as healthy were vegetables and fruits. Traditional vegetables were the most mentioned example of healthy foods. Fish was also mentioned as more healthier and better than meat. One participant mentioned that for food to be healthy it has to be fresh and not frozen.

*Healthy food is fresh food. When you buy fresh vegetables from the market, all these are healthy. Not the things that have stayed in the fridge. Things that are not frozen.*

**Perception of availability of healthy food in neighbourhood food outlets**

One participant reported that there were no healthy food options available as the only food outlet in his neighbourhood was a petrol convenience shop. According to this participant, this shop did not sell any fresh foods. However other participants reported that healthy food
options were available in their neighbourhood food outlets though some also reported the food was not fresh. In addition the food was also expensive.

*There are fruit and vegetable shops but the prices are not good.*

*The foods are there but I cannot say they are fresh. When I want fresh food I go to (chain supermarket A) or (chain supermarket B) in (name of other neighbourhood).*

When asked if low fat products were available in their neighbourhood, participant responses revealed a low level of understanding of food labels, which may explain their indecision regarding this statement.

*I see foods like 2% milk and light milk and full cream milk. I do not know the difference I wish someone would tell me.*

*I do not know the difference between light, lite and low fat foods.*

Another participant reported that “Africans did not know low-fat foods” as these foods were not available in Africa and foods in Africa were not labelled to indicate whether they were low fat or not. Another participant reported that she did not understand some of the contents on food labels. These remarks indicate that participants were reading food labels but they did not understand what they meant.

*I read the label and see things like cholesterol but I do not know what that means. They need to teach us these things.*

**Choice of food outlets and reasons for choice**

Participants reported shopping in different food outlets in their neighbourhoods as well as other neighbourhoods. However most of the food shopping was conducted in supermarkets and ethnic (African) shops outside the neighbourhood of residence. There was a preference for big chain supermarkets as well as ethnic shops. Although none of the participants
mentioned the availability of fast food restaurants in their neighbourhoods specifically, some reported them as food outlets from where they bought their food.

The most common reasons given for choice of shopping outlet were price, convenience, distance, quality of food, co-location of food outlets, and availability of preferred foods and lack of information on location of other food outlets. For participants who shopped in their own neighbourhood the main reason given was proximity to home and convenience as they were able to walk to and from the shops and did not need to spend money on travel. For others the convenience of having a store close to their home outweighed the high cost they had to pay for food from their local food outlets.

*What I like about these shops is that they are near me I do not have to travel. I walk to the shop.*

*I shop here as it is close even though the price is high.*

For those who shopped in other neighbourhoods the main reasons provided were that the preferred foods were not available in their neighbourhood food outlets, neighbourhood food outlets were expensive and did not sell good quality food, and availability of a wider variety of food outlets in other neighbourhoods. Those who had at one time purchased spoiled food from their local food outlets had stopped buying food from their local outlets. Another participant raised concerns about the safety of the foods sold in her neighbourhood and was suspicious that the shops were never inspected.

*I once bought maize flour here (own neighbourhood) and when I opened the packet it had a very bad smell, so I do not buy food here.*

For others the co-location of food outlets in other neighbourhoods made it easier for them to move from one outlet to another and they were able to compare prices as well as find food products that they were looking for. The participants were also able to access many outlets during one shopping trip, saving time and money as they were able to use vouchers in the supermarkets.
I like (other neighbourhood) as it has many shops and they are all in one place. If I miss something in (chain supermarket A), I can go to (chain supermarket C or B) I can also get discount for my vouchers in (chain supermarkets A and B) and I can buy petrol.

One participant had recently moved into her current neighbourhood and was still shopping in her former neighbourhood because she did not know where the food outlets were.

Food access barriers
Lack of food outlets in the local neighbourhood was also identified as a problem affecting healthy food availability and access.

There is only one small shop in (my neighbourhood). It is very very expensive. I do not shop there.

Access to culturally preferred foods which were perceived to be healthy was limited in local neighbourhoods and when available were costly. This made the participants travel to other neighbourhoods with more ethnic stores as they offered more variety not only in terms of price but also in types of food.

I cannot get palm oil in (name of own neighbourhood). I have to go to (name of other neighbourhood). I get dry fish and fresh fish from (name of other neighbourhood).

Participants also travelled to procure religiously acceptable foods that were not available in their neighbourhoods. Lack of transportation to food outlets limited the amount of food the participants purchased. As some had to use public transportation or walk, they only purchased what they could comfortably carry. As a result they shopped more frequently which may be more costly as it is cheaper purchasing food in bulk.

As I use the bus, I cannot buy a lot of food.
Carrying food home is tiring so I buy a little at a time.

6.3 Discussion

The self reported perception indicated a high availability of healthy foods. These high perceptions of food availability may be as a result of the availability of a variety of food outlets ranging from ethnic stores, supermarkets and farmers’ markets in participants’ neighborhoods. Supermarkets and farmers’ markets have been associated with availability of healthy food [47, 409]. Ethnic stores which are mostly convenience stores that are found in areas with a high population of immigrants have more stores that sell cultural/traditional foods [161, 205] which represent healthier food options. However, participants demonstrated a low level of understanding of low fat foods. Labels such as “light”, “lite”, “low fat” and “low cholesterol” were not well understood and majority did not know what these terms meant. This may prevent them from selecting healthier food options.

Participants demonstrated a low understanding of food labels which may lead to unhealthy food choices and ultimately poor health. Difficulties understanding food labels have been previously reported among resettled refugees in developed countries [130, 212, 341, 410]. Food labels provide nutrition information that aims to assist consumers make better informed dietary choices and decisions. In Africa, consumer usage of food labels is relatively low [411] and may be the reason one participant reported that they were not available in Africa. However participants showed a desire to understand food labels, and thus it is important they are provided with this information. Reading of food labels has been associated with healthy nutrition behaviours such as increased intake of fruits, vegetables and fibre and reduced intake of sodium, sugar, total fat and cholesterol [412, 413]. Providing opportunities for resettled refugees to learn how to decipher food label contents and messages may lead to healthier food choices as well as increased consumption of these food choices.

Participants perceived a high access to healthy foods within their local food environment. This may be as a result of the availability of food outlets like supermarkets, farmers’ markets and ethnic stores that were mentioned by the participants which made accessing
these healthy foods in their neighbourhoods easy. Those who shopped in their own neighbourhoods did so due to the outlet proximity to their home. However further exploration revealed that majority travelled to other neighbourhoods to shop as they perceived the outlets to have a better variety and quality of food items. Others reported that shops within their neighbourhoods sold rotten and expired foods hence the reason they travelled to other neighbourhoods. But for some, the shops in other neighbourhoods were close together hence making it easy for them to move from one shop to another. Co-location of food outlets eases travel time as people can access different food outlets in one location [222]. Supermarkets and ethnic food stores were the most common food outlets visited in other neighbourhoods. Supermarkets were perceived to provide more variety, fresh quality food and as they were located near other shopping outlets, providing participants with an opportunity to compare prices.

Although supermarkets have been reported to offer lower prices [151], compared to smaller outlets such as convenience stores [171], ethnic convenience stores provided access to traditional foods which are an important component of the African refugees’ diet that often requires travel beyond the local neighbourhood to source and purchase [245]. Studies have reported difficulty in locating traditional foods especially among recently resettled new immigrants and resettled refugees [129, 244]. Most of the traditional foods consumed by resettled refugees are not available in major chain stores or stores on public transport routes [134, 245]. Participants reported visiting several food outlets or travelling long distances outside their neighbourhoods to purchase traditional foods which corroborate findings reported in other studies [140, 246]. Thus accessing outlets selling culturally preferred foods is important for resettled African refugees and they are willing to travel to source these foods that are an important component of their diet. More importantly these findings show that choice of food outlets visited was determined by food outlet characteristics such as price, quality, availability of preferred foods and a wide selection of foods.

Lack of reliable or personal transport was mentioned as a barrier to food access as it limited the amount of food participants purchased when they walked home or used public transport consistent with other studies. Although walking to and from food outlets is a cheaper alternative to using public transport or driving one’s own car, it was difficult for
participants and this limited the amount of food they purchased as well as the variety of outlets they visited. As fresh produce has to be purchased frequently lack of transport may lead to purchase of dry and canned foods. Frequent shopping may increase purchase and consumption of fresh produce like fruits and vegetables while irregular shopping may increase the purchase of canned and frozen foods [293]. Regardless of the distance to the food store, transport played a key role in accessing food outlets and determined the type and amount of food that was bought by the participants.

This study has several limitations that warrant discussion. The small sample size and eligibility criteria limit the generalization of the findings to other resettled African refugees in Australia. Only participants who spoke English or Swahili were included in this study. As the study only used subjective measures of the food environment, the findings may not portray a true picture of resettled refugees’ food environment. However the use of qualitative research provided an understanding of reasons behind resettled refugees’ food outlet choice, barriers they encountered in the food environment as well as their interaction with their food environment.

6.4 Conclusion
The study findings suggest that despite high perceptions of availability and access to healthy foods in their local neighbourhoods, resettled refugees do not only rely on their local neighbourhood for their food needs especially their traditional foods. Food outlet characteristics played a key role in determining food outlets visited. Therefore studies looking at resettled African refugees’ food environment should not only concentrate on local neighbourhoods but also other neighbourhoods visited to show where they actually shop as this is what will constitute their food environment. In addition, development of culturally relevant campaigns and intervention programs that provide nutrition information and encourages retention of healthy cultural behaviours, may promote engagement in healthy nutrition behaviours among this population.
Reader’s Note
The information in this section has been accepted for publication as an original research paper:
Gichunge C. and F. Kidwaro. *Utamu wa Afrika* (The sweet taste of Africa): The Vegetable Garden as Part of Resettled African Refugees’ Food Environment (accepted for publication, *Nutrition & Dietetics*).

The co-author of this manuscript confirms that the research candidate has made the following contributions to this study:

- Developed the study design.
- Completed the human research ethics application.
- Designed and pilot tested the data collection instruments.
- Conducted statistical analysis of the data.
- Conducted all participant recruitment and participant interviews.
- Transcribed the interview recordings.
- Conducted the thematic analysis and participated in discussions for confirmation of themes.
- Prepared manuscript for submission to journal.

Signed: ____________________________  Date: 3/12/2013
7.0 Introduction
As people migrate they encounter new social, cultural and physical environments to which they have to adapt and how this is done may impact their health positively or negatively. The food environment is one environment that changes as a result of migration. African humanitarian refugees resettled in developed countries encounter a new food environment different from what they experienced in their home or transition countries [130, 134, 213]. Their interaction with their new food environment influences their food consumption habits as well as nutrition and health status [13, 130]. Thus, the food environment is increasingly being recognised as one such environment that changes upon migration and may significantly affect the migrants’ health over time.

One of the ways that migrants have adapted to the changes in their food environments is by growing their own food. Many migrants have reported growing food in home or community gardens as a way to maintain their traditional and cultural identity as well as having easy access and availability to familiar foods [197, 414]. Migrants have reported that their traditional foods are not easily available or accessible upon resettlement [245] and when available they are expensive [134]. This greatly affects their access to these traditional foods which may lead to an increase in the consumption of processed food that they encounter upon resettlement [13]. Finding ways to access affordable, healthy, familiar foods that are culturally acceptable for this group of migrants is important for cultural and nutritional reasons. The purpose of this study was to examine the role of gardening as a component of the food environment among resettled African refugees.

7.1 Methods
This qualitative study collected data through in-depth interviews as they have been identified as being appropriate for examining perceptions and beliefs [375], while permitting respondents to reveal their thoughts and beliefs of interest [376]. In-depth interviews allow probing by the researcher which enables further explorations of participants and provides more explanation on the issues being discussed. This made this technique suitable for this study as it enabled the participants to give their own perceptions of the garden as part of their food environment. A short questionnaire was used to collect socio-demographic data from the participants.
The study was conducted among resettled African refugees from Burundi, the Democratic Republic of Congo and South Sudan living in South East Queensland (SEQ) Australia. SEQ is home to a large number of African humanitarian immigrants [98]. Resettled African refugees from these three countries who engaged in home and community gardening and spoke English or Swahili were recruited using purposive sampling. This was done to ensure that participants had similar experiences and would be able to freely express themselves without having to have their responses interpreted by an interpreter. Seventeen gardeners were invited to participate, four declined to be interviewed and 13 were interviewed between December 2012 and April 2013. Out of the 13 participants who were interviewed nine were from Burundi, three were from South Sudan, and one was from the Democratic Republic of Congo. Participants were interviewed at community gardens or their homes. The interviews lasted between 35 to 75 minutes and were conducted face to face or by telephone. All interviews were tape recorded and verbal and/or signed consent was obtained from the participants before tape recording the interviews. Each participant received a $25 local supermarket grocery voucher as a token of appreciation for their time and participation. This study was approved by the University Ethics Committee.

Interviews were conducted in English and Swahili as participants switched between the two languages during the interview. The transcripts were translated into English and transcribed verbatim by the first author. The transcripts were read several times to become familiar with the content. Transcripts were repeatedly reviewed during data collection to identify if new information was needed to assist in the interpretation of the findings. Thematic analysis was used to identify themes. A line by line analysis was conducted to identify and codify themes. Constant comparison was done by reading and re-reading the transcripts, identified codes and themes to ensure that similar codes and themes were merged. In addition, through member checking the study findings and interpretations were shared with the participants [379] and they gave their views as well as identified mission information. The Statistical Package for the Social Sciences (SPSS) version 20 (SPSS IBM, New York, USA) was used to analyse the socio-demographic data.
7.2 Results
A total of 13 gardeners were interviewed. Three were from South Sudan, one was from the Democratic Republic of Congo and nine were from Burundi. Participant characteristics are shown in Table 1. Out of the 13 gardeners, only two gardeners had a garden at home and garden plot in the community garden. Majority of the gardeners were female (84.6%), unemployed (53.8%), had a high school education and more than half (54.9%) had an annual household income of less than $30,000. One gardener declined to indicate her annual household income.

Table 7.1: Participants' Demographic Characteristics

<table>
<thead>
<tr>
<th>ID</th>
<th>Gender</th>
<th>Age</th>
<th>Education†</th>
<th>Employment status</th>
<th>Years lived in Australia</th>
<th>Years active in home garden</th>
<th>Years active in community garden</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>40</td>
<td>High</td>
<td>Employed</td>
<td>6</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>34</td>
<td>Low</td>
<td>Unemployed</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>32</td>
<td>Low</td>
<td>Unemployed</td>
<td>5</td>
<td>1.5</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>40</td>
<td>High</td>
<td>Employed</td>
<td>7</td>
<td>0.25</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>36</td>
<td>High</td>
<td>Employed</td>
<td>7</td>
<td>3.5</td>
<td>1.5</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>37</td>
<td>High</td>
<td>Unemployed</td>
<td>7</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>27</td>
<td>High</td>
<td>Unemployed</td>
<td>4</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>52</td>
<td>Low</td>
<td>Unemployed</td>
<td>6</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>43</td>
<td>Low</td>
<td>Employed</td>
<td>7</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>33</td>
<td>Low</td>
<td>Unemployed</td>
<td>2</td>
<td>0.5</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>51</td>
<td>High</td>
<td>Employed</td>
<td>9</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>57</td>
<td>Low</td>
<td>Employed</td>
<td>11</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>43</td>
<td>High</td>
<td>Employed</td>
<td>10</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

†Low=primary education and below; High=high school and above

Three themes emerged from the data: food provision (access, availability, and affordability), health improvement (mental and physical), and barriers encountered in the food environment (limited knowledge on crop seasonality, size of garden and cost of manure).
Food Provision: Having a garden provided participants with easy access to their traditional foods as they did not need to travel to other neighbourhoods to access these foods.

When I got here (Australia) I had to wake up by 5am every Sunday to go to the Sunday market in (name of neighbourhood), so that I could be able to buy amaranth and other vegetables. You have to be early or you will not get the vegetables you want. This really bothered me and I thought that if I had a garden I would be able to sleep in and rest as I would grow my own food. (Male aged 36 years)

Availability of food as a result of gardening was echoed by all participants. They reported that the garden provided them with the foods that they needed.

So if you have a garden you get food. If you have corn you cook a big pot and the children eat and they are full. (Female aged 57 years)

I am able to get vegetables. I do not have to buy. (Female aged 34 years)

Participants reported that their preferred traditional foods were not available in their local food outlets and they had to purchase them from farmers’ markets, but these foods were now available in their gardens. Table 2 shows a list of vegetables that the participants had planted. The vegetable names are indicated in English and in the participants’ native language, where the English translation was not available.

I used to plant them (vegetables) in Africa and I feel excited when I eat it. These vegetables are not in Australia and I am used to the ones in my country. (Female aged 27 years)
Table 7.2: Vegetables Grown by Participants

<table>
<thead>
<tr>
<th>From Burundi (n=9)</th>
<th>From South Sudan (n=3)</th>
<th>From the Democratic Republic of Congo (n=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>African eggplant</strong> (7)</td>
<td><strong>African eggplant</strong> (1)</td>
<td>Cassava (1)</td>
</tr>
<tr>
<td>Amaranth (5)</td>
<td>Black eyed beans (2)</td>
<td></td>
</tr>
<tr>
<td>Beans (3)</td>
<td>Cowpeas (1)</td>
<td></td>
</tr>
<tr>
<td>Cassava (4)</td>
<td><em>Lakabi</em> (1)</td>
<td></td>
</tr>
<tr>
<td>Chili (1)</td>
<td><em>Luge</em> (1)</td>
<td></td>
</tr>
<tr>
<td><strong>Green bananas</strong> (4)</td>
<td><em>Malakwan</em> (2)</td>
<td></td>
</tr>
<tr>
<td><em>Ikipiri</em> (2)</td>
<td><em>Mulukia</em> (2)</td>
<td></td>
</tr>
<tr>
<td>Lettuce (1)</td>
<td><em>Nat</em> (1)</td>
<td></td>
</tr>
<tr>
<td>Sukuma wiki (kales) (1)</td>
<td><em>Nginyeri</em> (1)</td>
<td></td>
</tr>
<tr>
<td>Taro (1)</td>
<td>Okra (3)</td>
<td></td>
</tr>
<tr>
<td><strong>White maize</strong> (5)</td>
<td>Pumpkin (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spinach (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sukuma wiki (kales) (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sweet potatoes (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>White maize (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>White beans (1)</td>
<td></td>
</tr>
</tbody>
</table>

† Number of gardeners growing the vegetable is indicated in brackets

The garden was a source of the participants’ cultural foods which they preferred. The garden was also a source of fresh food that was considered to taste better than frozen or refrigerated foods available in the local food outlets.

Interviewee: *I am able to get my African food from my garden and not the ones from the fridge. I get utamu wa Africa (the sweet taste of Africa).*

Interviewer: Why don’t you like the ones in the fridge?

Interviewee: *The taste has left it. But the one from my farm still has the taste.* (Male aged 43 years)
It is part of my life. I feel bad when I have no garden. We do not like some of the Australian food. We are not used to Australian food. (Female aged 51 years)

The participants perceived the foods that they grew to be better and healthier compared to the Australian foods, as they believed them free from chemicals.

It is fresh and has no chemical. Some foods here have lots of chemicals and we feel sick. But if you eat this you feel good. (Female aged 33 years)

It is fresh food. No chemical. Organic. We used to eat organic food in Africa. You eat organic food and it is good for the body and tastes yummy (laughs). (Female aged 57 years)

As a result of having a garden, participants reported that they were able to save money as they did not need to purchase some foods.

If I grow corn I do not buy. White beans I cut and even when I have no money I take the beans and cook. I do not have to think about money to buy food. (Female aged 57 years)

I save money. If I need something that is in my garden I do not have to worry about where I will get it. (Female 37 years)

Having a garden also enabled the participants to channel the money that would have been used to buy traditional foods to other meet other financial obligations.

It enables me to save. When I grow them I get them from my own garden. I will not use money to buy them. I will use that money for other things. The children and my family may need something and I am able to buy it for them as I have saved money on my garden…. People spend a lot of money buying vegetables. (Male aged 36 years)
Enhanced wellbeing: The garden was viewed as a place that enabled the participants to engage in physical activity which they considered important for their bodies. Participants revealed a desire to keep active so as to stay healthy. They reported that “exercise” (physical activity) was good for the body. Those who were unemployed reported that gardening kept them active.

*Back home we were used to digging. Digging is a sport. It helps the body. We thought if we stay here without doing anything the veins may get tangled. But if we start digging, it is a sport. Now that I have no job I come here and dig and this helps my body but when I stay at home, my body will not be good. It makes my body good (Male aged 52 years)*

*Keeps me strong. Like when I dig or do something in the garden, I do exercise. It keeps me strong. (Female aged 51 years)*

Working in the garden was considered good for the body as it prevented the participants from gaining weight. Participants reported that they had engaged in gardening activities in their home countries and by taking up these activities upon resettlement they are able to engage in physical activity.

*We used to garden. If we stay like that it is boring and if you stay in the house you become fat. This exercise is good for the body. We like it. If we have more land it would be good. This it too small for us. (Female aged 57 years)*

All the participants had farmed in Africa and gardening enabled them to grow crops that reawakened positive memories of their past.

*To remind me of what I had in Africa. (Female aged 40 years)*

Community gardeners were the only participants that reported that gardening gave them a sense of self worth as they were able to provide for themselves and their families without having to depend on anyone. Having a garden plot of their own made them feel they were part of the wider Australian community.
I am eating my own sweat. I am not depending on anyone. (Male aged 43 years)

Having land (a place to garden) makes me feel like I belong. Like I am part of the wider Australian society. (Female aged 57 years)

Other than being a place for growing food, the participants reported that the garden offered them a place to relieve their stress. Participants reported that they were stressed as they had their own problems to deal with in addition to those of their kin back in Africa who looked up to them for support and assistance. The garden provided a place for them to keep busy and less preoccupied with these problems.

At times you come here (garden) it is good. If you do not have a job you think too much if you come here and work in your garden your head becomes fresh. It is nice. It keeps you busy and you do not think too much because we are thinking too much. We are here but think about those at home (Africa). Sometimes tonight you listen how many people call you and say help me, we are sick. When you wake up your head is not good so when you wake up in the morning you come to the garden and you feel good. (Female aged 57 years)

Barriers encountered in the food environment: The gardeners identified several barriers that they encountered in the food environment. Manure, a commodity they considered key to the growth of their crops is expensive. Participants reported that they needed to use a lot of manure due to the poor fertility of the soil. This is a source of concern for the gardeners as their garden produce contributes greatly to their household food needs.

Here it is different as you have to put this stuff, what do you call it? The one that makes food grow fast. But in Africa we did not use it. You see when you grow maize or vegetables here you have to put this stuff, yes fertilizer. (Female aged 51 years)

I do not know if it is the whole of Australia, but it is very expensive to buy manure. You need a lot of manure as the soil is not rich enough. We order from the farms.
Or you have to travel to the farms and buy them. A small bag is about ten dollars. There are a lot of farms but they are very far.... At times the fruit tree farmers sell manure but they are very expensive. It is cheaper to buy by the roadside as it is only two dollars. (Male aged 36 years)

The community and home garden plots were considered small. The participants requested access to vacant plots at a small fee where they could have larger plots that would enable them to cultivate more produce for their households.

This garden is too small. I need a big one for more food. (Female aged 40 years)

If more land it would be good. Even if we get a place to lease it will be good as it will be a big land. (Female aged 57 years)

Gardeners lacked knowledge on the crops that they could grow during the winter period. The African crops that the participants cultivated do not grow during the winter season thus during this period they have to purchase these foods, hence majority of the participants did not grow any crops during winter. Only two participants planted kales and spinach, exotic vegetables, during the winter season.

You cannot grow anything during winter. (Female aged 33 years)

I put sukuma wiki (kales) and spinach in winter time. Ours (African vegetables) will not grow in winter time, but it will grow in summer time. (Female aged 51 years)

7.3 Discussion

The important role of gardens as a component of the resettled African refugees’ food environment resonates from this study. Five key roles of gardening emerged. It provides gardeners with easy access to traditional vegetables. As the gardens are close to their homes they do not need to travel long distances to purchase their preferred traditional foods, a challenge that has been reported among resettled refugees [213]. Additionally these traditional vegetables have important nutritional benefits [206, 397]. Thus this easy access to their traditional vegetables may facilitate healthy food choices and increase the
consumption of these vegetables as gardeners have been reported to increase their consumption of fruits and vegetables [191, 192, 415].

Foods that are otherwise not available in the food outlets in the participants’ neighbourhoods or are only found in farmers’ markets are made more available by gardening. A lack of traditional foods in resettled refugees’ home neighbourhoods of residence has been reported in other studies [245]. Resettled refugees have reported lack of knowledge on how to prepare the new foods they encounter upon resettlement [13, 213] and availability of foods that they know how to prepare is important. In addition African traditional foods are unprocessed and whole [206], making them a healthier and better choice compared to the processed foods the refugees encounter upon resettlement.

The garden provides the participants with healthy foods at little or no cost. Healthy nutrient dense foods are expensive [416, 417] and the cost of fruits and vegetables has been identified as a barrier to their purchase and consumption [418]. In Australia resettled refugees have reported that the cost of vegetables is higher than that of meat [341] which may account for the increased consumption of meat and decreased consumption of fruits and vegetables reported among resettled refugees [9, 13]. In addition the cost of core foods such as fruits and vegetables has also been reported to be high across Australia [419-421]. As almost half of the participants were unemployed and more than half had annual household incomes below $30,000, they may not be able to afford to include healthy foods in their diets. Hence by growing their own food resettled refugees have an inexpensive way of accessing healthy foods such as vegetables enabling them to make healthy food choices at little or no cost.

Food availability, access, utilization and stability pillars of food security [342] all seem to be enhanced through gardening. Food and nutrition insecurity arise when there is insufficient access to nutritious food to meet dietary needs and food preferences, and lack of environmental support for a healthy and active life [335]. By having access to a vegetable garden, our participants were able to access healthy foods and utilize familiar and culturally acceptable foods whenever they need them. Resettled refugees have been found to experience high rates of food insecurity [213, 216] and gardens can in part assist to
alleviate food insecurity through provision of foods. The African traditional vegetables are easy to cultivate and some may like cassava and amaranth can be grown as dual purpose crops [422, 423]. However participants encountered several barriers such as small garden plots, lack of knowledge on seasonal crops and cost of manure. Similar barriers have been reported among resettled African refugees engaged in gardening [199]. These barriers need to be addressed as they may affect the accessibility and availability of their traditional vegetables as well as deter other resettled refugees from participating in gardening.

Apart from providing food, the garden was identified as promoting the physical and mental health of the gardeners consistent with findings in previous studies [414, 424]. Refugees are forcibly displaced from their homes and upon resettlement, they must create a new home. By engaging in gardening they are able to reawaken their past positive memories, maintain their traditions and culture as well as relieve their stress, findings that are consistent with previous literature [425]. In their new countries of resettlement there is an increase in the reliance on motor vehicles for transport, labour saving devices and engaging in sedentary leisure activities which in turn leads to a decrease in physical activity among migrant population [14, 426] increasing their susceptibility to cardiovascular diseases (CVD). Hence working in the garden provides them an opportunity to exercise which is important as risk factors for CVD such as obesity, hypertension and high density lipoprotein (HDL) cholesterol have been reported to respond favourably to increased levels of physical activity and exercise [427].

While the findings from this study are from in-depth explorations which are useful for researchers working with or interested with this population, our study has several limitations. The sample size was small and as some participants were recruited from a community garden as well as through community networks, this may have affected the composition of the sample. Only one participant was aged below 30 years and this may be due to older migrants preference for traditional foods compared to younger migrants [134], making them more likely to participant in gardening. This too may have affected the findings as well as the composition of the sample. However the researchers made a conscious effort to establish rigor for this research. Despite these limitations, rigor was applied in the qualitative methods by recruitment of participants who were likely to have
undergone similar experiences as refugees [377], the use of indepth interviews to capture individuals’ experiences, and through cross-checking of the data with the participants to ensure validity of thematic analysis [379, 380]. Future studies should include a larger sample comprising of both young and old gardeners as well as collect data on diet intake of participants to enable to show associations between gardening and dietary intake.

7.4 Conclusion

This study has demonstrated that community and home vegetable gardens are an important component of the resettled refugees’ food environment. The garden not only provides a source of culturally acceptable food but also can partially improve aspects of their mental and physical health. They can address barriers such as cost, distance to and lack of transport to food outlets that may impede the consumption of healthy foods such as fruits and vegetables. Through gardening the resettled refugees’ traditional foods are not only made available but easily accessible at little or no cost ensuring households are able to maintain a healthy diet and but most importantly they can partially attain food and nutrition security.
8. MANUSCRIPT FOUR: Relationship between Food Insecurity, Social Support and Vegetable Intake among Resettled African Refugees in Australia

Reader’s Note:
The information in this section has been accepted for publication as an original research paper:

Gichunge, C., N. Harris, S. Tubei, S. Somerset, and P. Lee. Relationship between food insecurity, social support and vegetable intake among resettled African refugees in Queensland, Australia (accepted for publication, Journal of Hunger & Environmental Nutrition).

The co-authors of this manuscript confirm that the research candidate has made the following contributions to this study:

- Developed the study design.
- Completed the human research ethics application.
- Designed and pilot tested the data collection instruments.
- Conducted all participant recruitment and participant interviews.
- Conducted statistical analysis of the data.
- Prepared manuscript for submission to journal.

Signed: Date: 3/12/2013

Signed: Date: 3/12/2013

Signed: Date: 3/12/2013

Signed: Date: 3/12/2013
8.0 Introduction

While attention is often directed towards food security in the least industrialized nations, food insecurity represents a global public health issue. Food and nutrition insecurity occurs when there is insufficient access to nutritious food to meet dietary needs and food preferences, and lack of environmental support for a healthy and active life [335]. The prevalence of food insecurity varies among industrialized countries. Immigrants, asylum seekers, and resettled refugees living in these countries are at a higher risk of food insecurity than the native population [215, 216, 242, 428]. Poverty, unemployment, low income, and low education have contributed to the high prevalence of food insecurity among these groups [216, 355]. Late welfare payments [216], sending money home to assist those who remain in the country of origin [216, 355], as well as costs incurred in sponsoring other family members to join them [429], also contribute to food insecurity among refugee households. Financial obligations between families undertaking resettlement and those remaining in the country of origin, compete with food, household, and education expenses, further increasing the risk of food insecurity in refugee households.

Food insecure households have been found to have poor diet quality as food insecurity is linked to unhealthy diets [338, 340]. Food insecure resettled African refugees in the USA have been found to have a low intake of fruits and vegetables, but high intake of meats and eggs [337]. This increased consumption of foods such as meat and eggs may be as a result of the high status ascribed to these foods by refugee families [129]. In addition, resettled refugees have reported that the price of vegetables is higher while that of meat is lower [341], which may increase the consumption of these foods, especially in households with limited finances. Furthermore, healthy nutrient dense foods are more expensive than energy dense foods [420, 430], which may hinder households with limited income from consuming a healthy diet.

One way of coping with food insecurity is by seeking assistance from one’s social support networks [431]. Shumaker and Brownell [432] refer to social support as “an exchange of resources between two individuals perceived by the provider or the recipient to be intended to enhance the well-being of the recipient.” These resources may be emotional,
instrumental, informational or companionship [433]. Lack of social support has been identified as a risk factor for poor nutritional status and food insufficiency and insecurity [434, 435]. Social support has been reported to play a key role in refugee resettlement especially for new arrivals as it buffers them from isolation, stress, anxiety and depression [436]. Resettled refugees who are forced out of their homes experience a breakdown of their social support structures. Upon arrival to their new host country refugees are often without members of their family and social support networks [437]. Thus, social ties established in their new country of residence may be important in reducing the risk of food insecurity.

Although food insecurity has been documented among refugees in Australia, little is known about the relationships between food security, social support, and vegetable intake among this population. This study was conducted to assess the interaction between food insecurity, social support, and vegetable intake among resettled African refugees. The major study objectives were to examine the prevalence of food insecurity; identify the predictors of food insecurity; and to assess the relationship between food security, social support, and vegetable intake.

8.1 Methods
Data for this cross sectional study were collected from 71 households of refugees from Burundi, Rwanda, and the Democratic Republic of Congo, residing in South East Queensland (SEQ). This group was selected as they are from neighboring countries in the Africa Great Lakes region, and when they experienced civil wars in their countries, a majority of them sought refuge in Burundi, Rwanda, Uganda, Tanzania and the Democratic Republic of Congo. They also speak the Swahili language which was one of the interview languages. Participants were recruited through purposive and snowball sampling. Refugees are considered a difficult to reach population, [356] therefore a range of agencies were used for recruitment to maximise diversity of participation, as well as reduce sample selection bias. To be eligible for this study the household had to have a child under 18 years of age, and the primary food preparer had to either speak English or Swahili. This study was conducted between April and December 2012, with data collected using a researcher administered questionnaire. Each participant received a $AU25 local supermarket grocery
voucher as a token of appreciation for their time and participation. This study was approved by the University Human Research Ethics Committee.

**Measures**
Demographic characteristics comprising age, annual household income, marital status, number of children, number of people in household, employment status, years lived in Australia, English proficiency, and level of education were collected. Level of education was dichotomized as high (high school education, vocational education, college or university education) and low (no education and primary education).

The USDA 18 item *Household Food Security Module* (HFSM) was used to measure food security [374]. This instrument captures experiences related to food insecurity in the six months preceding completion of the module. The questions address four different aspects: anxiety that the household budget or food available was insufficient; perception that the foods consumed by the household members were inadequate; reports of reduced food intake and the effects of the reduced food intake for adults; and reports of reduced food intake and the effect of reduced food intake for children. The HFSM is a widely used and validated instrument that enables the participating household to be assessed as either food secure or insecure, with further categorization as adult food secure or insecure, and child food secure or insecure [374]. The USDA HFSM tool has been used among immigrant and refugee populations [242, 371] and has also been validated to reflect household food insecurity in various settings [372]. The English and Swahili versions of this scale were checked to ensure they had face validity. Potential participants were shown the questionnaires to ensure that the questions were not confusing, and that operational definitions used were well understood, and accurate measurements.

Vegetable intake was determined using a food frequency questionnaire (FFQ). Intake frequencies were converted to daily frequencies using the following weightings (never=0.0; less than once per month=0.01; 1-3 times per month=0.07; once per week=0.14; 2-3 times per week=0.36; 4-5 times per week=0.64; 6 times per week=0.086; once per day=1; and more than once per day=2). Portion sizes for each food item were determined using standard household measures guide provided to each participant. The daily servings for each item on the FFQ were calculated by multiplying the reported portion size and intake of
each food item. To assess social support, participants were asked if they have people they can depend on when in need. The responses were dichotomized as “yes” and “no”.

**Data analysis**

Frequencies were calculated for all variables, and Chi square test was used to examine associations between food security, social support, and demographic characteristics. The independent sample t-test was used to explore mean differences between household food insecurity and adult food insecurity categories, and vegetable intake, while the Mann Whitney test was used to explore mean rank differences between the child food insecurity category and vegetable intake. Logistic regression was used to determine association of demographic characteristics, social support, and food security. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 20 (SPSS IBM, New York, USA). A value of \( p < 0.05 \) was used to determine statistical significance.

**8.2 Results**

One primary food preparer from each of the 71 households participated in the study. The 71 households comprised 383 household members (\( \text{M}=5.39, \text{SD} \pm 2.23 \)) of which 255 (67%) were children aged 18 years and below. Sixty three (88.7%) were female, and 53 (74.6%), 9 (12.7%) and 9 (12.7%) were from Burundi, the Democratic Republic of Congo and Rwanda respectively. The mean age of the participants was 34.0 years (\( \text{SD} \pm 8.5 \)). Participants had lived in Australia for an average of 4.9 (\( \text{SD} \pm 1.7 \)) years. Two thirds of the participants were unemployed (\( n=48, 67\% \)), and almost half had low education (\( n=34, 48\% \)). Of those who had low education, 24 (75%) were unemployed, 29 (85%) were female, and 31 (92%) had low English proficiency. Forty seven (66%) of those surveyed had an annual household income below $30,000. A summary of the participants’ characteristics is presented in Table 1.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Food Secure</th>
<th>Food insecure</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td>0.020</td>
</tr>
<tr>
<td>Primary school education and below</td>
<td>24 (70.6)</td>
<td>10 (29.4)</td>
<td></td>
</tr>
<tr>
<td>High school education and above</td>
<td>34 (91.9)</td>
<td>3 (8.1)</td>
<td></td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td>0.273</td>
</tr>
<tr>
<td>Unemployed</td>
<td>41 (85.4)</td>
<td>7 (14.6)</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>16 (76.2)</td>
<td>5 (23.8)</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td>0.273</td>
</tr>
<tr>
<td>Not married</td>
<td>19 (76)</td>
<td>6 (24)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>39 (84.8)</td>
<td>7 (15.2)</td>
<td></td>
</tr>
<tr>
<td>Annual household income</td>
<td></td>
<td></td>
<td>0.290</td>
</tr>
<tr>
<td>$20001-30000</td>
<td>16 (80)</td>
<td>4 (20)</td>
<td></td>
</tr>
<tr>
<td>&gt;$30000</td>
<td>20 (74.1)</td>
<td>7 (25.9)</td>
<td></td>
</tr>
<tr>
<td>&lt;$ 20000</td>
<td>21 (91.3)</td>
<td>2 (8.7)</td>
<td></td>
</tr>
<tr>
<td>Years lived in Australia</td>
<td></td>
<td></td>
<td>0.155</td>
</tr>
<tr>
<td>Less than 5 years</td>
<td>20 (90.9)</td>
<td>2 (9.1)</td>
<td></td>
</tr>
<tr>
<td>5 years and above</td>
<td>38 (77.6)</td>
<td>11 (22.4)</td>
<td></td>
</tr>
<tr>
<td>Able to speak English well</td>
<td></td>
<td></td>
<td>0.300</td>
</tr>
<tr>
<td>No</td>
<td>31 (77.5)</td>
<td>9 (22.5)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27 (87.1)</td>
<td>4 (12.9)</td>
<td></td>
</tr>
<tr>
<td>Has people to depend on</td>
<td></td>
<td></td>
<td>0.088</td>
</tr>
<tr>
<td>No</td>
<td>17 (70.8)</td>
<td>7 (29.2)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>41 (87.2)</td>
<td>6 (12.8)</td>
<td></td>
</tr>
</tbody>
</table>

*Chi square

Thirteen (18%) of the primary food preparers reported they that had experienced food insecurity in the 6 months preceding the study. Socioeconomic characteristics according to food security status are outlined in Table 1. In bivariate analyses only education (p=0.020) was significantly associated with food security. Social support was marginally associated with food security (p=0.088). Adult food insecurity was experienced in 25 (35%) households, while child food insecurity was experienced in seven (10%) households (Table
2). Eighteen (25.4%) households reported that adults reduced the size of their meals, while 10 (14.1%) households reported a reduction in the size of their children’s meals, as well as the child/children having skipped a meal.

Table 8.2: Prevalence of Adult and Child Household Food Insecurity

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult food insecurity</td>
<td></td>
</tr>
<tr>
<td>High food security among adults</td>
<td>46 (64.8)</td>
</tr>
<tr>
<td>Food insecurity among adults</td>
<td>25 (35.2)</td>
</tr>
<tr>
<td>Child food insecurity</td>
<td></td>
</tr>
<tr>
<td>High or marginal food security among children</td>
<td>64 (90.1)</td>
</tr>
<tr>
<td>Low food security among children</td>
<td>7 (9.9)</td>
</tr>
</tbody>
</table>

The logistic regression model containing demographic and social support variables explained 28.7 % (Nagelkerke $R^2$) of the variance of food insecurity, and 85.3 % of cases were correctly classified. Participant’s education level ($p=0.049$), and availability of social support ($p=0.049$) were significant predictors of food insecurity. Compared to those with a high education level, participants with a low education level were 4.7 times more likely to be food insecure. Individuals who did not have social support, that is someone to depend on when in need, were 4.4 times more likely to be food insecure compared to those with social support (Table 3). No significant associations were found between vegetable intake and food security status.
### Table 8.3: Predictors of Food Insecurity

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school education and below</td>
<td>4.7</td>
<td>1.0-28.72</td>
<td>0.049</td>
</tr>
<tr>
<td>High school education and above (ref)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>0.29</td>
<td>0.06-1.43</td>
<td>0.129</td>
</tr>
<tr>
<td>Employed (ref)</td>
<td>1.00</td>
<td></td>
<td></td>
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<tr>
<td><strong>Annual household income</strong></td>
<td></td>
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<tr>
<td>$20001-30000</td>
<td>2.5</td>
<td>0.43-14.37</td>
<td>0.306</td>
</tr>
<tr>
<td>&gt;$30000</td>
<td>0.55</td>
<td>0.07-4.3</td>
<td>0.571</td>
</tr>
<tr>
<td>&lt; $ 20000 (ref)</td>
<td>1.00</td>
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<tr>
<td><strong>Has people to depend on</strong></td>
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<tr>
<td>No</td>
<td>4.4</td>
<td>1.01-18.81</td>
<td>0.049</td>
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<tr>
<td>Yes (ref)</td>
<td>1.00</td>
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ref, reference category

### 8.3 Discussion

The high level of reported food insecurity in this sample is consistent with findings from other studies conducted among African refugees resettled in industrialized countries [216, 242, 355]. However this prevalence (18%) is considerably lower than that previously reported (71%) among refugees in Australia [216]. It should be noted however that participants in the Australian study by Gallegos and colleagues [216] were accessing a torture and trauma service which may have contributed to this increased prevalence. Furthermore, the difference may also be attributed to the food security measurement that was used in the two studies. The USDA tool was chosen over the Australian single and two item food security tools as it is more comprehensive and provides information on severity levels of household food insecurity. A 16 item version of the USDA tool used in this study, is more sensitive than the Australian single item measurement [230]. Another Australian study reported a food insecurity prevalence of 25% using the 18 item USDA tool [438].

Child food insecurity has been identified in previous studies with African refugees [242, 439]. In the present study, 14.1% of participating households (10/71) reported reducing the
portion size of their child/children’s meals, and that children had skipped meals because of financial constraints. This is indicative of food deprivation and hunger, a severe form of food insecurity. This finding is cause for concern as reduced food intake and disrupted eating patterns can compromise diet quality [440], impair children’s social, health and academic outcomes [441] and is also linked to antisocial behaviour [442]. In the present study there were more households that reported adult food insecurity compared to those that reported child food insecurity. This may be as a result of the adults shielding their children from food insecurity. Adult food insecurity is associated with both nutritional and health problems [340, 438]. Food insecurity among resettled African refugees needs to be addressed to ensure that integration into their new country is not compromised by poor health [443].

Low education was identified as a predictor of food insecurity consistent with findings from other studies [242, 337]. In addition, the majority of those with low education also had low English proficiency, and were unemployed. Although employment status was not a predictor of food insecurity in the present study, many participants (67%) were unemployed which may relate to their low education and English proficiency levels. Among resettled refugees, low education status, lack of recognition of previous academic qualifications and work experience, and discrimination contributes to high unemployment rates [444, 445]. Although refugees in Australia receive 510 hours of free English classes, many refugees, especially mothers with inadequate childcare, are unable to attend all classes [446]. Consequently, many have low English proficiency which is a barrier to gaining employment [37].

Although length of stay in Australia was not associated with food insecurity, the present study found that a majority of those who were food insecure had resided in Australia for ≥ 5 years. In addition, fifty six percent of those who were unemployed had lived in Australia >5 years. This indicates that food insecurity can endure well beyond the initial settlement period, possibly due to entrenched socioeconomic constraints associated with unemployment. Those with social support were less likely to be food insecure, suggesting that their social networks may protect against food insecurity. Social networks increase refugees’ access to emotional support, as well as material support such as money and food
Although the present study did not investigate who participants called on when in need, the present findings confirm similar studies showing that lack of social support is a risk factor for food insecurity [434, 435].

Contrary to a study among food insecure Somali refugees in the USA [337], no difference in vegetable intake between food secure and insecure participants was detected. A plausible explanation is that the continued consumption of traditional foods post-resettlement. The vegetables in the FFQ comprised both traditional African vegetables and Australian vegetables. Food insecure African refugees have been found to consume their traditional and staple foods post-resettlement [242]. However, these foods are expensive [134], which may increase the risk of food insecurity, although further research is required.

The present study has several limitations. Due to the difficulty of accessing the population of interest, a non-probability sampling method was used. These purposive and snowball sampling strategies may have resulted in a selection bias. Given the nature of the population, the sample size was small (n=71) and was conducted among refugees from only three African countries. The present findings should therefore be generalized to other African refugees in similar settings with caution. In addition, the study design was cross-sectional, hence causative pathways of associations could not be established.

8.4 Conclusion
Food insecurity is more prevalent among post-resettlement African refugees compared to the general Australian population. The present study provides evidence that food insecurity is associated with education and social support, and endures beyond initial resettlement. In Australia, the Humanitarian Settlement Strategy (HSS) provides assistance to those on refugee visas for the first six to twelve months, after which they are expected to have attained self sufficiency [447]. It is therefore important for resettlement agencies to develop measures that assist refugees beyond this period, since some may not have attained self-sufficiency. Additionally, welfare payments provided for such vulnerable groups should take into consideration the increasing cost of living.

Education and training, language, employment, social support networks, and community engagement are all important for successful integration and settlement [443]. Providing
opportunities for resettled refugees to access such services may work towards alleviating food insecurity among this group. As refugees are not a homogenous group, resettlement programs that are tailored to the needs of the diverse refugee groups may be more beneficial.
9. DISCUSSION AND CONCLUSION

9.0 Introduction
The main aim of the research was to investigate the food environment of resettled Burundian, Congolese and Rwandan refugees in order to understand the factors within these food environments that influence their home vegetable availability and vegetable consumption. The four objectives that were developed to achieve this aim assessed the links between home availability, food security and vegetable consumption as well as the vegetable garden as part of the food environment. The research provided previously undocumented evidence on the role of the food environment on the vegetable consumption of Burundian, Congolese and Rwandan resettled refugees. Such information is useful in development of health and nutrition promotion programs for such population groups that have moved to a new food environment. Details of how these objectives were measured can be found in Chapters 5, 6, 7 and 8. This chapter presents the research findings from the four manuscripts developed from this study as they relate to the study’s main aim and specific objectives. This will be followed by a discussion of study implications and limitations, concluding with recommendations for future research.

9.1 Review of findings
One of the significant findings to emerge from this study is that the food environment plays a key role in the access and availability of food and consequently home vegetable availability and vegetable consumption of resettled Burundian, Congolese and Rwandan refugees. The findings from Manuscripts One, Two and Three show the relationship between the food environment, vegetable availability and vegetable consumption while those from Manuscript Four explain the relationship between food security and vegetable consumption. A summary of the aims and findings of each manuscript are presented in Table 9.1.

Findings in Manuscript One suggest that the home vegetable availability for Burundian, Congolese and Rwandan refugees is influenced by both individual and food environment characteristics. Age, household income, employment status, participation in food gardening and the availability of a supermarket in the local neighbourhood were significantly associated with home vegetable availability. Participants from households with high vegetable availability had high vegetable intakes. Findings from Manuscript Three showed that vegetable gardens contributed to household food access and
availability through the provision of culturally preferred foods at little or no cost. These outcomes are supported by some of the findings from Manuscript One. Culturally preferred foods were the most sought after foods in the food environment as identified in Manuscript Two. Although participants’ self-reported perception of the availability and access to healthy foods within their neighbourhood was high, they still travelled to other neighbourhoods to shop for food. This demonstrates that resettled refugees are not able to accurately assess the availability or access to healthy foods in their neighbourhood food environments. Barriers faced in the food environment were reported in Manuscripts One, Two and Three. Barriers included lack of understanding of the local language and food labels, lack of traditional vegetables in the neighbourhood food outlets, lack of transport, small garden plots and unfavourable weather. These barriers may not only affect the availability of vegetables in the home but also their consumption as they limit the access to both healthy foods and outlets with healthy food options.

<table>
<thead>
<tr>
<th>Manuscripts</th>
<th>Aim</th>
<th>Findings</th>
</tr>
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<tbody>
<tr>
<td>One</td>
<td>To examine links between home vegetable availability and consumption of African traditional and vegetables among Burundian, Congolese and Rwandan refugees.</td>
<td>1. Home vegetable availability was associated with age, household income, employment status, having a vegetable garden and a supermarket in the neighbourhood. 2. Participants from homes with a high vegetable availability were more likely to consume the recommended vegetable servings daily. 3. Lack of understanding of local language, lack of transport and unavailability of traditional vegetables in the local neighbourhood were the main food access barriers.</td>
</tr>
<tr>
<td>Two</td>
<td>To explore the perceptions of healthy food availability and access of resettled African refugees.</td>
<td>1. Participants perceived high availability and access to healthy foods in their local food environment 2. Qualitative analyses provided</td>
</tr>
</tbody>
</table>
contradictory findings as participants reported food outlets within their neighbourhood were expensive, stocked poor quality foods, lacked traditional foods and did not sell a variety of food.

3. Lack of transport and lack of understanding of food labels were identified barriers to food access.

<table>
<thead>
<tr>
<th>Three</th>
<th>To explore the role of the vegetable garden as a component of the resettled African refugee food environment.</th>
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<tbody>
<tr>
<td></td>
<td>1. Vegetable gardens contribute to household food provision through availability, access and affordability.</td>
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<td></td>
<td>2. Improves mental and physical health.</td>
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<tr>
<th>Four</th>
<th>To assess the interaction of food insecurity and vegetable consumption among Burundian, Congolese and Rwandan refugees.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1. Eighteen percent of the participants experienced food insecurity.</td>
</tr>
<tr>
<td></td>
<td>2. Low education level and lack of social support was associated with food insecurity.</td>
</tr>
<tr>
<td></td>
<td>3. Vegetable intake was not significantly associated with food insecurity.</td>
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<tr>
<td></td>
<td>4. Households with adult food insecurity had lower vegetable intake while those with child food insecurity had higher vegetable intake.</td>
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Findings from Manuscript Four imply that food insecurity is prevalent among resettled African refugees post resettlement consistent with other studies [216, 242, 337]. Predictors of food insecurity were low education and lack of social support. Although food insecurity was not significantly associated with vegetable intake, individuals from households with adult food insecurity had a lower vegetable intake while those from households with child food insecurity had a higher vegetable intake.
9.2 Public Health and Policy Implications of the Research

Food environment characteristics influenced vegetables intake. Households with a high vegetable availability had comparatively higher intakes of vegetables, suggesting that home vegetable availability encouraged consumption, a finding that is consistent with other studies [274-276]. There is therefore a definite need to encourage participants to purchase and stock their homes with healthy foods such as vegetables. Traditional vegetables were the most frequently consumed vegetables not only as a result of cultural preference but also due to the perception that they are a healthier option. However participants bemoaned their expense which may discourage their frequent consumption. In this case it is important for participants to be encouraged to consume the new vegetables found in Australia even though some of them reported that they did not know how to cook the Australian vegetables. Resettlement agencies should provide refugees with recipe books and cooking classes that use Australian foods and ingredients. The recipe books should use simple language and contain many pictures to enable those who cannot read to follow the cooking instructions. This would likely promote consumption of Australian vegetables as they are more readily available and vegetables are important foods in the diet. Healthcare providers should encourage resettled refugees to continue consuming their traditional vegetables as well as the vegetables encountered in Australia.

Vegetable consumption was associated with having a supermarket in the neighbourhood as well as having a vegetable garden. As supermarkets have been identified as a source of affordable fresh foods including vegetables [47, 151, 159], having a supermarket in the neighbourhood may have increased the access and availability of vegetables in the home and ultimately their consumption. Gardens were an important source of frequently consumed traditional vegetables and were associated with consumption of vegetables, a finding supported by other studies [191, 192]. Supermarkets were also reported to have a wider variety of Australian vegetables but a limited variety of traditional vegetables which were highly priced. Although farmers’ markets were reported to have a wider variety of both African and Australian vegetables at a cheaper price, their existence in the neighbourhood was not associated with vegetable intake or household availability. This may be as a result of the availability of supermarkets in the neighbourhood as well as access to vegetable gardens which enabled participants to readily access vegetables. As the participants also preferred their traditional vegetables this may have influenced
them to stock these vegetables in their homes. Even though participants self-reported perceptions on the availability of and access to healthy foods in their neighbourhoods were high, further exploration revealed that there were those who did not have food outlets with healthy food options in their neighbourhoods. Others reported travelling to adjacent or other neighbourhoods to procure their preferred as well as healthy foods. This shows that participants are not able to accurately assess their neighbourhood food environments indicating that the participants may be lacking knowledge of what constitutes healthy food. This may affect access to healthy food and ultimately the diet of these resettled refugees.

Lack of knowledge on nutritious foods that are needed for a healthy life among resettled refugees has led to increased consumption of processed foods and decreased consumption of vegetables [9, 13] which is detrimental to their health. Equally, physical inactivity has contributed to increased cases of obesity as well as CVD [14]. For such groups it is important for them to know and understand the link between diet, lifestyle choices and diseases. This can be done by improving their health literacy through education on importance of fruits and vegetables in the diet, healthy substitutes for African traditional foods that are not available in Australia, engaging in physical activity, lifestyle diseases like diabetes, as well as the importance of seeking early medical assistance rather than waiting until the condition becomes more serious or life threatening. This training should be continued beyond early arrival interventions and could be offered by resettlement agencies and health care facilities. Ethnic community groups should also be encouraged to offer such training as most if not all refugees make contact with such groups upon arrival and during their resettlement and having this information shared in a language they understand may make them respond positively to the health messages.

As vegetable gardens are an economical source of vegetables, challenges which face gardeners as well as those interested in gardening, should be addressed. The high cost of manure, small garden size and unsuitable weather for some of the African foods, may lead to low crop yield, affecting the gardeners vegetable availability that may ultimately lead to poor intake of these vegetables. These may be solved by equipping the gardeners with skills and knowledge on how to prepare their own compost manure, the best seasons to grow vegetables including Australian vegetables and the use of container or sacks to grow more vegetables. For those living in private housing where gardening is
not allowed, the use of containers or sacks may enable them to grow traditional vegetables. These efforts could contribute to the increased consumption of vegetables by making preferred vegetables more available, accessible and affordable through gardening.

Resettled refugees in Australia have reported that the cost of vegetables is higher than that of meat [341] which may account for the increased consumption of meat and decreased consumption of fruits and vegetables reported among resettled refugees [13]. In addition, the cost of core foods such as fruits and vegetables has also been reported to be high across Australia [419-421]. Hence, by growing their own food resettled refugees have an inexpensive way of increasing access to healthy foods such as vegetables enabling them to make healthy food choices at little or no cost. As the gardens are close to their homes they do not need to travel long distances to purchase their preferred traditional foods, a challenge that has been reported among resettled refugees [213]. Thus this easy access to their traditional vegetables may facilitate healthy food choices and increase the consumption of these vegetables as gardeners have been reported to increase their consumption of fruits and vegetables [191, 192, 415].

Barriers encountered within the neighbourhood food environment have several implications. Lack of transport may hinder participants’ from visiting food outlets further from their homes and especially those in other neighbourhoods. As a result they may visit food outlets near their homes that may stock little or no healthy foods such as vegetables, which may subsequently encourage consumption of unhealthy foods. The lack of transport may also limit the amount of food purchased especially when using public transport and walking. Lack of food outlets selling traditional vegetables in the neighbourhood food environment limits access to these vegetables leading to lower intake and yet these vegetables have important nutritional benefits [152, 308, 361]. Resettlement agencies as well as community organisations should provide resettled refugees with names and locations of outlets selling traditional foods. This information will enable the resettled refugees to know the stores selling traditional foods in their own neighbourhood or those in nearby neighbourhoods.

Lack of understanding of the local language made it difficult for participants to communicate with staff or read notices on shelves and aisles in food outlets. This may
cause refugees to avoid shopping in supermarkets and if they have no farmers’ markets in their neighbourhood or vegetable garden, their vegetable intake would be affected. In addition poor understanding of the local language prevented participants from understanding food labels which may further hinder selection of healthier food options. As refugees were used to shopping in open markets, resettlement agencies should provide orientation sessions on how foods are arranged in Australian supermarkets, how to ask for assistance in the food markets, what to look for on food labels and what food labels mean. Including pictorial signs on food aisles will also make shopping easier for them. Having interventions such as taste testing, promoting healthy foods, labelling food shelves to indicate healthier options, encouraging store owners to stock more healthy foods and training store owners on how to handle fresh foods, will also assist resettled refugees. Although these interventions are costly and need the cooperation and participation of shop owners and funding from either the state and/or local governments, they have been found to work in the USA [448, 449]. Such strategies may help the refugees navigate their new food environment leading to access and selection of healthier food options.

In addition to the food environment characteristics, personal and demographic characteristics such as income, education and employment status were also found to predict home vegetable availability. As many refugees have spent most of their lives in displacement, many have little or no formal education which makes it difficult for them to engage in gainful employment upon resettlement. Moreover, lack of recognition of previous academic qualification and work experience coupled with discrimination has contributed to the high unemployment among this group [445, 450]. This situation limits their access to food but, more particularly, also the home availability of healthy nutrient dense foods which are more costly than less healthy energy dense foods [327, 363]. Under these circumstances resettled refugees may consume unhealthy foods which will over time affect their health outcomes. Therefore it is important for resettlement agencies to provide resettled refugees with little or no formal education avenues that may enable them to continue with their education or engage in employment, either as a paid employee or self-employed. This will ensure that these resettled refugee households are able to purchase and stock their homes with healthy foods that may otherwise be out of reach if they remain unemployed.
Social networks are important sources of social capital among immigrant and resettled refugees. Upon arrival to their new homes, resettled refugees more often than not have no social connections and have to form new networks. But as most refugees are from countries where ethnic conflicts were the cause of wars in their countries, this has led to mistrust in resettlement diminishing their social capital [437]. Social networks enable them to access information, goods and services [437] in their new country. These networks are built by interacting with neighbours, classmates, going to church and volunteering [451]. Through social networks many have been able to find employment [445, 450] which is important for successful settlement and integration [443]. The networks also protect the refugees from isolation [210] and poor health [429, 437, 452] and this may ease their integration in their new country. Thus resettlement agencies as well as ethnic communities should encourage and provide avenues for resettled refugees to interact and broaden their social networks.

Participants also reported purchasing vegetables that their children preferred. This finding has important implications as children’s consumption of healthy and unhealthy foods has been associated with the availability of these foods in the home [278, 279, 281, 284-286]. It is therefore important for health care providers to encourage refugees to purchase vegetables that their children prefer as this will encourage the children to consume them. As the study participants demonstrated knowledge on health benefits of vegetables and high intake of vegetables, they should be encouraged to continue modelling this behaviour so as to encourage their children to consume vegetables. It has been documented that the food habits of food preparers’ influence those of other family members especially children [359, 360]. Although other studies have reported lack of association between parental influence and children’s food preferences [401, 402], parents are important agents of change in promoting and improving consumption of vegetables and other healthy foods among their children [403, 404]. However, children influence the foods that parents purchase [453] and hence participants should be encouraged to purchase healthy food for their children and not to give in to their demands for unhealthy food purchases.

Although food insecurity was not significantly associated with vegetable intake, individuals from households with adult food insecurity had a lower vegetable intake. Households with child food insecurity reduced the portion sizes of children’s meals and the children also skipped meals. Such strategies are indicative of food deprivation and
hunger, a severe form of food insecurity. When the child’s food intake is reduced and eating patterns are disrupted, the diet quality of the child is compromised [440]. This reduced food intake can negatively affect children’s social, health and academic outcomes [353, 364] and may also lead to antisocial behaviour [442]. Food insecure households have been reported to have poor diet quality as food insecurity has been linked with unhealthy diets [249, 251, 366] that puts them at risk of becoming obese and developing other cardiovascular risk factors [339, 454]. There is, therefore, a definite need to address and monitor food insecurity among resettled refugees. Since monitoring is a continuous process, it will provide data and information on their nutrition status and food security and hence if there is any problem it can be detected early and interventions provided before either one or both conditions worsen. Monitoring will also ensure that they are in good health and are able to integrate into their new country.

Of great concern is that results from this study indicate that the majority of those who were food insecure had resided in Australia for a period of 5 years and more, had low education, and no social support. This suggests that refugees’ experiences of hunger endure beyond the initial settlement period. Resettled refugees are provided with assistance for the first six to twelve months after which they are expected to be self sufficient. It is therefore important for resettlement agencies to develop measures that assist the refugees beyond this initial settlement period, since some may not be able to attain or maintain a food secure status. Providing opportunities that promote resettled refugees’ social, economic and cultural integration will lead to successful integration and settlement including alleviation of food insecurity.

Food availability, access, utilization and stability as the pillars of food security [342] seem to be enhanced through food gardening. Having access to a vegetable garden enabled participants to access healthy foods and utilize familiar and culturally acceptable foods whenever they needed them. Resettled refugees have been found to experience high rates of food insecurity [213, 216] and gardens can, in part, assist to alleviate food insecurity through provision of foods. The African traditional vegetables are easy to cultivate and some like cassava and amaranth can be grown as dual purpose crops [399, 455]. Additionally, working in the garden provides them with an opportunity to exercise which is important as risk factors for CVD such as obesity, hypertension and high density lipoprotein (HDL) cholesterol have been reported to respond favourably to increased levels of physical activity and exercise [427].
9.3 Limitations
This study had several limitations that need to be considered.

Participant recruitment
Due to the difficulty of accessing the population of interest, non-probability sampling methods were used. Purposive and snowball sampling were used to identify the sample, which may have resulted in some degree of selection bias. Some participants were recruited from a community garden as well as through community networks and this may have affected the composition of the sample. In addition, only participants who spoke English or Swahili were included in this study excluding those who did not speak either of these languages. The researcher did not want to use an interpreter as some participants may not have been comfortable with an interpreter from their own community. Most importantly, the researcher did not want any of the participants’ responses to be “lost” in the translator’s interpretation.

It is important to recognise the participants in this study come from countries where ethnic conflict was the primary factor that contributed to the wars experienced in their countries and in turn their migration to Australia. Even in resettlement, ethnic group identification plays a role in determining one’s associates. The participants of this study were from warring ethnic groups hence the decision was made not to use interpreters as the participants were not asked to report their ethnic groups due to ethical issues. During a number of interviews when participants were talking about their experiences in their home countries or in the refugee camps or countries of transition, some talked negatively about other ethnic groups including blaming these groups for their forced migration and social status.

While acknowledging these sampling limitations, it is equally important to note the researcher made a determined and conscious effort to include as many people as possible so as to limit sample bias. Data collection was difficult and took place over an extended period of fourteen months.

Sample size
Given the size and nature of the population, recruitment of refugees from only three African countries, the final sample size of 71 household food preparers and shoppers was achieved through the concerted extended efforts of the researcher. The sample was
largely homogenous as most of the participants were from Burundi with fewer participants from Rwanda and the Congo. As a result the impact of ethnicity on the study's outcome was not measured even though it may be possible that nationality might have an impact. Households who had no children and those with adult children (those over 18 years), as well as food preparers who did not speak English or Swahili were excluded yet they may have provided different data from that provided by those who were included in the study. Future studies should be more inclusive.

Study design
Due to the cross-sectional nature of the study it is not possible to establish causation between study variables. In addition causative pathways of associations could not be established as to examine causation requires at a minimum, longitudinal data with multiple data collection points.

Generalizability of study findings
Several things limit the generalizability of this study’s findings. First, the sample being a convenience sample may not be representative of all resettled African Great Lakes refugees in SEQ. Second, the study was conducted among participants from suburbs in SEQ that have been reported to have a high number of African migrants and as such may not be representative of other neighbourhoods in the region with a different ethnic and socio-demographic composition. However, the snowball sampling strategy used by the researcher was part of a conscious effort to penetrate the population of interest and achieve diversity in the sample.

Measures used to study variables
Home vegetable availability measures
The household food inventory (HFI) used reported on the availability of vegetables in the homes but not on the actual quantities available. In addition, only the availability of African vegetables was assessed and no other foods, thus the study is not able to present a full picture of the food available in the home. The use of a researcher administered pre-identified inventory may have caused some participants to report some foods as available even when they were not. This would not have been the case if an open inventory was used as the researcher would be checking and recording foods available in all the food storage facilities in the home. As the household inventory was only conducted once it does not show changes in household food supplies over time as well
as seasonal variations, changes that may have been observed if several household inventories were conducted over a period of time [292].

**Vegetable intake measures FFQ**

As the consumption of vegetables is promoted as a healthy habit, the food frequency questionnaire (FFQ) responses may have been biased as respondents may have given a higher serving intake. The nutrient intake was not calculated as the content of some of the traditional foods were not available in the nutrient analysis program. The FFQs only measured the consumption of vegetables and not other foods and yet vegetables are not eaten in isolation and diets consist of other foods.

**Food Environment measures**

All participants were asked about the availability of supermarkets and farmers’ markets in their neighbourhoods. This was limiting as it excluded other outlets like convenience and grocery stores thus not portraying a full picture of the food environment. Data was not collected on the use of these food outlets as participants may choose to shop in food outlets further from their homes or even in other neighbourhoods. The study was also limited to the number and types of food outlets in the food environment and did not investigate the availability of foods in these outlets or the cost or quality of these foods.

**Food Security Measure**

The USDA HFSM has several limitations. It does not capture other dimensions of food issues such as nutrition status, food availability and sources of food. It also does not measure individual or household members’ nutritional status nor the barriers encountered in food acquisition. As the participants were asked about their food security status six months preceding the interview, they could have in fact been food secure at the time of data collection [374].

**Acculturation**

Acculturation was not measured and thus the study did not capture the stage of acculturation the participants were in and how this influenced their vegetable intake, home vegetable availability and food security.

**9.4 Recommendations for Future Research**

Findings from this study provide the following insights for future studies:
• Measure availability of all foods from all food groups in the home and not only vegetables. This would provide a fuller picture of foods available in refugee households and would provide more detailed information.
• Conduct longitudinal research so as to measure changes in dietary habits, home vegetable availability and food security over time.
• Measure the dietary intake of children and other household members and how it is influenced by the home and neighbourhood food environments.
• Use of objective measures of the neighbourhood such as ground truthing or geographic analysis such as Geographic Information System (GIS) to document the types and number of food outlets in the food environment. This will provide a real picture of the resettled refugees’ food environment.

9.5 Conclusion
Findings from this study provide evidence that both individual and food environment characteristics play a role in the access and availability of food and vegetable consumption of Burundian, Congolese and Rwandan resettled refugees. Food outlets characteristics strongly influenced food shopping patterns with the majority of the participants incorporating travel to other neighbourhoods to access identified shops and foods, in particular traditional foods. These shopping patterns suggest that resettled refugees’ food environments are not restricted to their local neighbourhoods. Consumption of traditional foods among the resettled refugees continues post-resettlement and at the same time food insecurity is also prevalent post-resettlement. Limited availability and access to healthy food options especially culturally preferred foods may expose resettled refugees to unhealthy food options and food insecurity.

This study adds to our knowledge by providing data on food security among resettled African refugees in Australia; how their food environment (both objective and subjective) influences their vegetable intake and home vegetable availability. This is the primary contribution of this study. This information is important as it will enable resettlement agencies, health care providers and other groups working with resettled refugees to know what areas to put emphasis on or discourage. This study also provides a foundation for future research and programs promoting healthy nutrition education, behaviour and engagement among this population. Such programs will aid in encouraging resettled refugees to retain healthy elements of their culture such as consumption of traditional vegetables. In addition, such programs will provide
opportunities for these refugees to access education, training, employment and social support networks. Collectively these programs will work towards preventing their marginalization and isolation while promoting their integration in a multicultural Australia.
REFERENCES


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Warland, J., T. Zaian, H. Stewart, N. Procter, M. Sawyer, and P. Baghurst, Challenges faced when conducting research with young Australians with...


APPENDICES
APPENDIX A: PARTICIPANT INFORMATION SHEET

Title
Food Environment as a Determinant of Vegetable Availability and Intake among Resettled African Refugees in Southeast Queensland, Australia

Who is conducting the research?
Griffith University researchers: Dr Neil Harris, Dr Shawn Somerset, Dr Patricia Lee and PhD student Catherine Nkirote Gichunge.

What is the research about?
African humanitarian immigrants arriving in Australia encounter a new living environment which includes the food environment that is different from what they experienced in their home countries or countries of transition. Adapting to this new environment and how this adaptation and navigation is done determines their interaction with their food environment and their dietary habits. The purpose of this study is to understand how the African humanitarian immigrants’ environment influences their vegetable consumption.

What will participation involve for you?
Your participation in this research will involve answering a few questions about your food availability, access, acquisition and security as well as a household food inventory and food frequency questionnaire. The questionnaire will take approximately 45-60 minutes. All paper and audio recordings will be deleted after data entry and analysis.

Participation is voluntary
Your participation in this research is completely voluntary and you may withdraw at any time.

Your confidentiality
All information collected for the purpose of the research will be confidential and your name and any other identifying characteristics provided for this purpose will not be made public.

Feedback on the project to you
If you would like a summary of the research findings, please provide your contact details in the research consent form.

Questions / further information
For additional information about the research project and its corresponding questionnaire, contact Catherine Gichunge, PhD student, Phone (07) 338 21303, catherine.gichunge@student.griffith.edu.au.

The ethical conduct of this research
Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Human Research. If you have any concerns or complaints about the ethical conduct of the research you should contact the Senior Manager, Research Ethics and Integrity on 3735 5585 or research-ethics@griffith.edu.au.

Privacy Statement
The conduct of this research involves the collection, access and/or use of your identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes. However, your anonymity will at all times be safeguarded. For
further information consult the University’s Privacy Plan at www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan or telephone (07) 3735 5585.

**Appreciation**
As a token of our appreciation for your participation in this study, we will present you a $25 grocery voucher from Coles.

**Consent to participate**
Signing of the consent form and answering of this questionnaire will indicate your consent to participate in this research

*Please tear off and retain the information sheet. Thank you*
APPENDIX B: INFORMED CONSENT FOR QUANTITATIVE QUESTIONNAIRE

Title of project: **Food Environment as a Determinant of Vegetable Availability and Intake among Resettled African Refugees in Southeast Queensland, Australia**

By signing below, I confirm that I have read the information sheet and understand that:

- The study is to investigate the effect of the food environment on vegetable intake and availability and I will be asked to complete a questionnaire;
- I might also be asked to participate in a qualitative interview;
- There is minimal risk involved in participation;
- My participation in this research is voluntary and I may withdraw at anytime without explanation or penalty;
- I will receive a $25 food voucher as a token of appreciation for participating in this study
- If I have any additional questions I can contact the research team and the Senior Manager, Research Ethics and Integrity, at Griffith University Human Research Ethics Committee on 3735 5585 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project.

I agree to participate in the project.

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

Are you interested in receiving a summary of the study findings?

1. No
2. Yes- provide your address:

I have received a $25 grocery voucher: Signature_________________________
APPENDIX C: QUANTITATIVE QUESTIONNAIRE

Food Environment and Vegetable Intake and Availability among Resettled African Refugees in Southeast Queensland, Australia

Filter questions
Are you the primary food preparer and shopper?
☑ No-thank the participate and terminate interview
☑ Yes-proceed with interview

What is your nationality?
☑ Burundi
☑ Congolese
☑ Rwanda
☑ Other-if other, thank the participants and terminate interview

Do you have children under 18 years of age living in your house?
☑ Yes
☑ No-if no, thank the participant and terminate the interview

Official use only

<table>
<thead>
<tr>
<th>Study ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
</tr>
<tr>
<td>Time:</td>
</tr>
</tbody>
</table>

Overview of participant information sheet
☑ Yes ☐ No
Discuss consent form
☑ Yes ☐ No
Sign consent form
☑ Yes ☐ No
Received food voucher
☑ Yes ☐ No

Thank you for participating in this study and please answer the following questions.

Please indicate:
Your suburb: Zipcode:
Part 1: I will begin by asking you questions about your background. Please feel free to ask me questions if you do not understand the questions and if you need further clarification.

<table>
<thead>
<tr>
<th>Part 1: Demographic Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is your date of birth? <strong><strong>/</strong></strong>/______</td>
</tr>
<tr>
<td>2. What is your gender? 1 Male 2 Female</td>
</tr>
<tr>
<td>4. Did you spend time in a refugee camp? 1. No-if no go to Q7 2 Yes.</td>
</tr>
<tr>
<td>5. How many years did you spend in the refugee camp?</td>
</tr>
<tr>
<td>7. Before coming to Australia where were you living? 1.Refugee Camp 2.Home country (Name) 3.Country of transition (name)</td>
</tr>
<tr>
<td>8. When did you come to Australia? <strong><strong>/</strong></strong>/______ Month/day/Year</td>
</tr>
<tr>
<td>10. Number of people living in your household including yourself</td>
</tr>
<tr>
<td>11. Number of children in your household including those of your other relations if any</td>
</tr>
<tr>
<td>12. What is your level of education? 1. Primary education and below 2. High school education and above</td>
</tr>
<tr>
<td>13. What is your current employment status? 1.Employed 2. Unemployed</td>
</tr>
<tr>
<td>14. What is your total annual household income? (your income and your partner’s income if married; your income only if single) 1. Less than $20,000 2. $20,001-$30,000 3. $30,001 and above</td>
</tr>
<tr>
<td>Language Competence</td>
</tr>
<tr>
<td>15. Do you speak English well? 1. Yes 2. No</td>
</tr>
</tbody>
</table>

158
**Part 2: I will now ask you questions about your food environment—where you get your food, what types of food, and any barriers you encounter when acquiring your food. Please feel free to ask me questions if you do not understand the questions and if you need further clarification.**

**Part 2: Food Environment**

**Food Availability**

Do you agree with these statements about your neighbourhood?

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. The fresh fruits and vegetables in your neighbourhood are of high quality</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. A large selection/variety of fresh fruits and vegetables is available in your neighbourhood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. A large selection of low-fat products is available in your neighbourhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Food Access**

19. How do you travel to the food outlet that you frequent?

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
</table>

**I am now going to ask you about your shopping experience here in Australia.**

Do you agree with these statements:

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. It is easy to buy fresh fruits and vegetables in your neighbourhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. Your neighbourhood has the best food stores in town</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. The food stores in your neighbourhood sell outdated/expired or rotten products</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24. It is easy to buy healthy foods in your neighbourhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25. It is easy to buy tobacco products in your neighbourhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26. You prefer to shop in the local shops in your neighbourhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27. It is easy to buy alcohol in your neighbourhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28. Other than the supermarkets, the food outlets in your neighbourhood are expensive/ have high prices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**I will now ask you questions about food gardening**

29. Do you grow your own vegetables, fruits or herbs? | 1. No | 2. Yes |
|---|----------|----------|
### Part 3: Food Security

**Now I’m going to read you several statements that people have made about their food situation**

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
</table>
| 31. In the last 6 months you worried whether your food would run out before you got money to buy more. | 1. Often  
2. Sometimes  
3. Never true  
4. Don’t Know or Refused |
| 32. In the last 6 months the food that you bought just didn’t last, and you didn’t have money to get more | 1. Often  
2. Sometimes  
3. Never true  
4. Don’t Know or Refused |
| 33. In the last 6 months you couldn’t afford to eat balanced meals | 1. Often  
2. Sometimes  
3. Never true  
4. Don’t Know or Refused |
| 34. In the last 6 months, did you/you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? | 1. Yes  
2. No if no skip 35  
3. Don’t Know or Refused skip 35 |
| 35. How often did this happen? | 1. Almost every month  
2. Some months but not every month  
3. Only 1 or 2 months  
4. Don’t Know or Refused |
| 36. In the last 6 months did you ever eat less than you felt you should because there wasn’t enough money for food? | 1. Yes  
2. No  
3. Don’t Know or Refused |
| 37. In the last 6 months were you ever hungry but you did not eat because there wasn't enough money for food? | 1. Yes  
2. No  
3. Don’t Know or Refused |
| 38. In the last 6 months, did you lose weight because there wasn't enough money for food? | 1. Yes  
2. No  
3. Don’t Know or Refused |
| 39. In the last 6 months, did you/you or other adults in your household ever not eat for a whole day because there wasn't enough money for food | 1. Yes  
2. No if no skip 40  
3. Don’t Know or Refused skip 40 |
| 40. How often did this happen? | 1. Almost every month  
2. Some months but not every month  
3. Only 1 or 2 months  
4. Don’t Know or Refused |
| 41. In the last 6 months, you relied on only a few kinds of low-cost food to feed your child/the children because you were running out of money to buy food | 1. Often true  
2. Sometimes true  
3. Never true  
4. Don’t Know or Refused |
| 42. In the last 6 months you couldn’t feed your child/the children a balanced meal, because you couldn’t afford that | 1. Often true  
2. Sometimes true  
3. Never true |
<table>
<thead>
<tr>
<th></th>
<th>In the last 6 months your child was/the children were not eating enough because you just couldn't afford enough food</th>
<th>4. Don’t Know or Refused</th>
</tr>
</thead>
</table>
| 43. | 1. Often true  
2. Sometimes true  
3. Never true  
4. Don’t Know or Refused | |
|   | In the last 6 months did you ever cut the size of your child's/any of the children's meals because there wasn't enough money for food | 1. Yes  
2. No  
3. Don’t Know or Refused |
| 44. | 1. Yes  
2. No skip 46  
3. Don’t Know or Refused skip 46 | |
|   | In the last 6 months, did any of the children ever skip meals because there wasn't enough money for food | 1. Yes  
2. No  
3. Don’t Know or Refused |
| 45. | 1. Almost every month  
2. Some months but not every month  
3. In only 1 or 2 months  
4. Don’t Know or Refused | |
| 46. | 1. Yes  
2. No  
3. Don’t Know or Refused | How often did this happen? |
|   | In the last 6 months was your child/children ever hungry because you could not afford more food? | 1. Yes  
2. No  
3. Don’t Know or Refused |
| 47. | 1. Yes  
2. No  
3. Don’t Know or Refused | |
|   | In the last 6 months, did your child/any of the children ever not eat for a whole day because there wasn't enough money for food? | 1. Yes  
2. No  
3. Don’t Know or Refused |
**Part 6:** I will now ask you questions about the consumption of vegetables. I will begin by asking about your consumption of your traditional vegetables and after that I will ask you if these vegetables are available in your house today. In the past 6 months how often did you consume the following traditional vegetables?

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Number of times consumed</th>
<th>Household Food Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Portion size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Never</td>
<td>Once per week</td>
</tr>
<tr>
<td></td>
<td>2-3 times per week</td>
<td>4-5 times per week</td>
</tr>
<tr>
<td></td>
<td>6-7 times per week</td>
<td>Once per day</td>
</tr>
<tr>
<td></td>
<td>More than once a day</td>
<td></td>
</tr>
<tr>
<td><strong>English</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaranth</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Arrowroot leaves</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>African eggplant leaves</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bean leaves</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Green beans</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Beans (soft)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Beans (dry)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Black night shade</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cassava leaf</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Jute mellow</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Peas</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Potato leaves</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pumpkin leaf</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sweet potato leaf</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Taro leaves</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>African eggplant</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Arrowroot</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bittergourd</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Capsicum</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cassava</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Number of time consumed</td>
<td>HFI</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Portion Size</td>
<td>Never</td>
</tr>
<tr>
<td>Chilli -big</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Chilli-small (bird eye chilli)</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Green bananas (Plantains)</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Onion</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Pumpkin</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Sweet potato (white)</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Sweet potato (orange)</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Taro-small taro</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Taro-big taro</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Tomato</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Indigenous potato/Country potato</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Yams</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

I will now ask you questions about the consumption of vegetables. I will begin by asking about your consumption of Australian vegetables and after that I will ask you if these vegetables are available in your house today. In the past 6 months how often did you consume the following Australian vegetables?
<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lettuce (common)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lettuce (iceberg)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Rhubarb</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Silverbeet</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Spinach</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sweetcorn</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Beetroot</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Carrot</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Carrot juice</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Capsicum</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cucumber</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Eggplant/ Brinjal</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Green beans/ String beans/ French beans</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mushroom</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Olive</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Potato</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Tomato</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Zucchini</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Please check that
- [ ] All the questions have been answered.
- [ ] Participant has signed consent form
- [ ] Participant has received food voucher
- [ ] Thank the participant
APPENDIX D: INFORMED CONSENT FOR QUALITATIVE INTERVIEW

Title of project: Food Environment as a Determinant of Vegetable Availability and Intake among Resettled African Refugees in Southeast Queensland, Australia

By signing below, I confirm that I have read the information sheet and understand that:
- The study is to investigate the effect of the food environment on vegetable consumption and availability;
- I will be asked interview questions that will be recorded;
- There is minimal risk involved in participation;
- My participation in this research is voluntary and I may withdraw at anytime without explanation or penalty;
- I will receive a $25 food voucher as a token of appreciation for participating in this study;
- If I have any additional questions I can contact the research team;
- I can contact the Senior Manager, Research Ethics and Integrity, at Griffith University Human Research Ethics Committee on 3735 5585 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project.

I agree to participate in the project.

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

Are you interested in receiving a summary of the study findings?
3. No
4. Yes - provide your address below:

I have received a $25 grocery voucher: Signature________________________
APPENDIX E: QUALITATIVE INTERVIEW GUIDE

Introduction
I thank you for agreeing to meet with me today. My name is Catherine Gichunge and I am a PhD student from Griffith University. I would like to talk with you about the foods that you eat and your experiences when accessing these foods. The interview will take less than one hour. I will be recording our conversation. This will ensure that I am attentive and capture all that we discuss as I do not want to miss your comments. Our conversation will be kept confidential and no identifiable information will be used. Please note that you do not have to talk about anything that you do not want to and you may end the interview at any time. Do you have any questions?

Are you willing to participate in the interview? Yes ☐ No ☐

If no, thank participant and leave.

Check:
- Overview of participant information sheet ☐ Yes ☐ No
- Discuss consent form ☐ Yes ☐ No
- Sign consent form ☐ Yes ☐ No

Questions
1. What food outlets are available in your neighbourhood (write down names of outlets mentioned)?
   - Do these outlets sell foods that you like?
   - What do you consider as healthy foods?
   - Do these outlets sell healthy foods?

2. Which shop do you buy most of your food from?
   - Why do you shop where you shop?
   - Tell me about your experiences when you go shopping for food here in Australia

3. Are foods from your country available in your neighbourhood?
   - If no, where do you get foods from your country?
   - If yes, do you still travel to other neighbourhoods to buy your traditional food? Why?

4. Availability of vegetables in home (both traditional and Australian)
   - What vegetables do you have in your house?
   - Why do you have these vegetables in your house?
   - Where do you source for your vegetables?
   - Are there any problems that you encounter when sourcing for these vegetables? What are these problems?

5. For those who have gardens
   - 1. How long have you had this garden?
      - Is this the only garden you have?
      - If not, where is the other garden located?
      - Have you always had a garden?
   - 2. Why did you decide to have a garden?
   - 3. What crops do you grow in your garden?
      - Are these crops available in the shops in your neighbourhood?
   - 4. Do you grow these crops for your home use?
5. How have you and your family benefited from this garden? Has your garden contributed to your household food needs? In what ways?

6. Are there times you do not have food in your garden?
   - When? Why? At such times where/how do you get the foods that would have been in your garden?

7. When you garden produces more food—what do you do with the excess food?
   - How do you manage the excess food?

8. Is there anything you would like to tell me about your garden that I have not asked you?

6. Is there anything you would like to add?

End of interview. Thank the participant.
- Are there any other comments you would like to add?
- Do you have questions?
- Thank you.
- Received food voucher ☐ Yes ☐ No