

# Determinants of dietary and physical activity behaviour patterns associated with risk of adiposity and non-communicable diseases (NCDs): a study of Australian residents born in sub-Saharan Africa

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**Determinants of dietary and physical activity  
behaviour patterns associated with risk of adiposity  
and non-communicable diseases (NCDs): a study of  
Australian residents born in sub-Saharan Africa**

**Isaac Yeboah Addo**

A thesis in fulfilment of the requirements for the degree of

Doctor of Philosophy



Centre for Social Research in Health

Faculty of Arts and Social Sciences

October 2019

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Faculty	: Arts and Social Sciences
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	<b>Determinants of dietary and physical activity</b>
	<b>behaviour patterns associated with risk of</b>
Thesis Title	: <b>adiposity and non-communicable diseases</b>
	<b>(NCDs): a study of Australian residents born in</b>
	<b>sub-Saharan Africa</b>

<p align="center"><b>Abstract 350 words maximum:</b></p> <p>A significant amount of research suggests that excess weight gain can increase the risk of developing some non-communicable diseases (NCDs), such as diabetes and cardiovascular diseases. In 2014, a screening project organised by the Western Melbourne Regional Development Australia noted that 68% of Australian residents of African ancestry were overweight, obese or morbidly obese, which was higher than the national average of 61.3%. Previous studies indicate that post-migration changes in dietary and physical activity behaviours may contribute to these weight-related issues. However, there is a dearth of research examining the factors associated with dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa (SSA). Given the adverse health implications associated with excess weight again, it is important to investigate the dietary and physical activity behaviours of Australian residents born in SSA, to inform appropriate health promotion policies and interventions. This study examined factors associated with post-migration dietary and physical activity behaviours among Australian residents born in SSA. The study employed a mixed-method approach, comprising in-depth qualitative interviews and quantitative surveys. Using the Australian states of New South Wales and Victoria as the study setting, a quota sampling strategy was used to recruit 24 participants for the in-depth interviews, and a total of 253 respondents were recruited for the survey. Overall, the findings indicate significant changes in dietary and physical activity behaviours after participants settled in Australia. To a large extent, the post-migration changes in dietary and physical activity behaviours reflect less healthy behaviours and can put participants at serious risk of weight-related NCDs. Multiple interrelated factors, comprising acculturation, socio-demographic factors (e.g. age, duration of residence in Australia, rural or urban residency before immigration, and unemployment), environmental factors (e.g. availability and affordability of traditional African food and physical activity products), cultural factors (e.g. cultural beliefs about body sizes), and social-cognitive factors (e.g. attitudes and behavioural intention), were significantly associated with the reported changes in behaviours. It is, therefore, important to develop nuanced health promotion interventions to address the factors associated with the less healthy dietary and physical activity behaviours reported among this under-researched population.</p>
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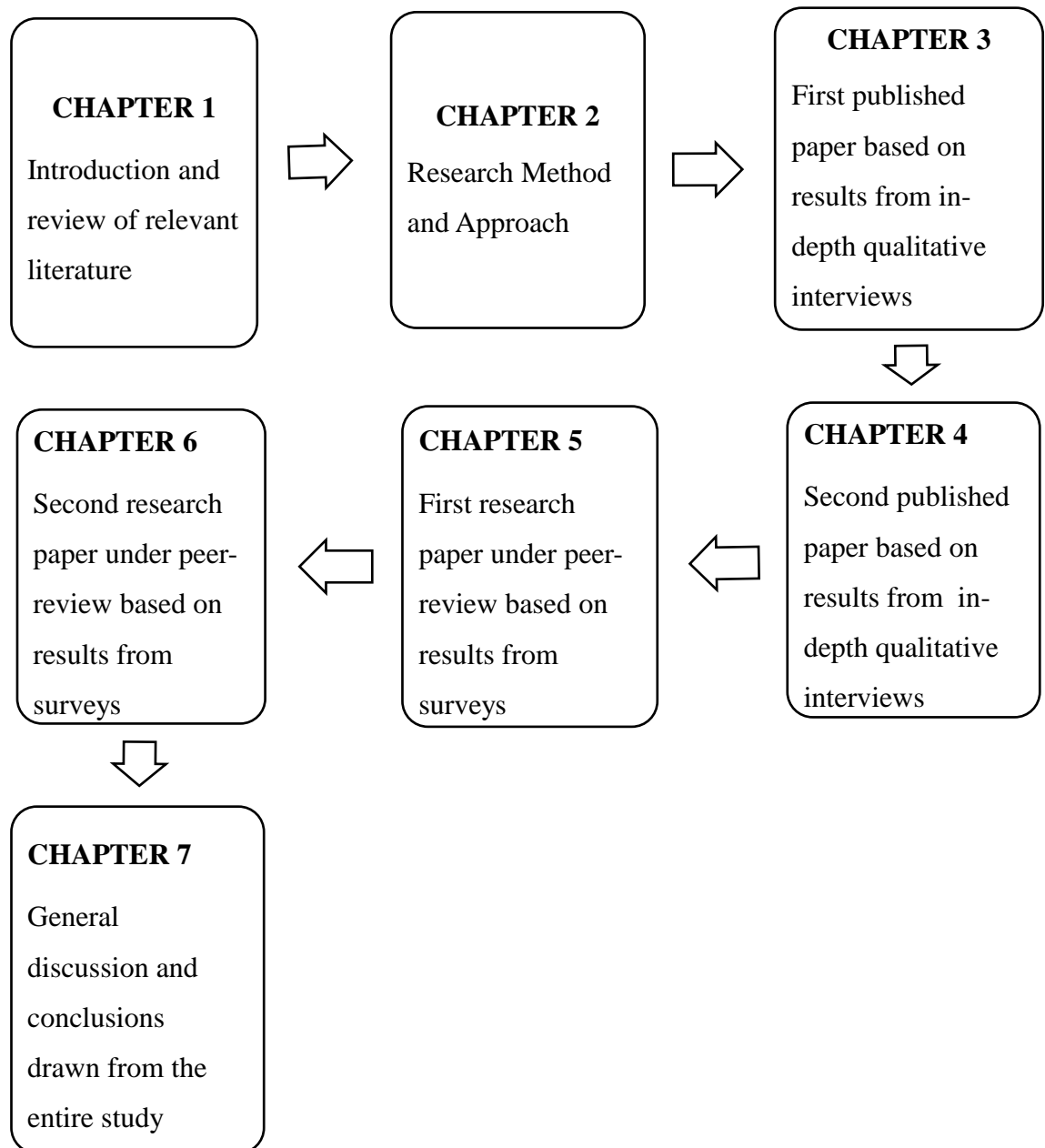
## **THESIS ABSTRACT**

A significant amount of research suggests that excess weight gain can increase the risk of developing some non-communicable diseases (NCDs), such as diabetes and cardiovascular diseases. In 2014, a screening project organised by the Western Melbourne Regional Development Australia noted that 68% of Australian residents of African ancestry were overweight, obese or morbidly obese, which was higher than the national average of 61.3%. Previous studies indicate that post-migration changes in dietary and physical activity behaviours may contribute to these weight-related issues. However, there is a dearth of research examining the factors associated with dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa (SSA). Given the adverse health implications associated with excess weight again, it is important to investigate the dietary and physical activity behaviours of Australian residents born in SSA, to inform appropriate health promotion policies and interventions. This study examined factors associated with post-migration dietary and physical activity behaviours among Australian residents born in SSA. The study employed a mixed-methods approach, comprising in-depth qualitative interviews and quantitative surveys. Using the Australian states of New South Wales and Victoria as the study setting, a quota sampling strategy was used to recruit 24 participants for the in-depth interviews, and a total of 253 respondents were recruited for the survey. Overall, the findings indicate significant changes in dietary and physical activity behaviours after participants settled in Australia. To a large extent, the post-migration changes in dietary and physical activity behaviours reflect less healthy behaviours and can put participants at serious risk of weight-related NCDs. Multiple interrelated factors, comprising acculturation, socio-demographic factors (e.g. age, duration of residence in Australia, rural or urban residency before immigration, and unemployment), environmental factors (e.g. availability and affordability of



traditional African food and physical activity products), cultural factors (e.g. cultural beliefs about body sizes), and social-cognitive factors (e.g. attitudes and behavioural intention), were significantly associated with the reported changes in behaviours. It is, therefore, important to develop nuanced health promotion interventions to address the factors associated with the less healthy dietary and physical activity behaviours reported in this under-researched population.

## THESIS STRUCTURE



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4. Addo, I. Y. (2017). Understanding the influence of migration on the food and physical activity offenses we commit against our bodies. Oral Presentation at Postgraduate Conference, UNSW Sydney, Australia

## **LIST OF ABBREVIATIONS**

ABS	Australian Bureau of Statistics
ADG	Australian Dietary Guidelines
ANPHA	Australian National Preventive Health Agency
AIHW	Australian Institute of Health and Welfare
AGDH	Australian Government Department of Health
BMI	Body Mass Index
CDCP	Centers for Disease Control and Prevention
EBSCO	Elton Bryson Stephens Co.
FCRN	Food Climate Research Network
GPAQ	Global Physical Activity Questionnaire
kg	kilogrammes
LMICs	low-and-middle-income countries
m <sup>2</sup>	Metres squared
NCD	Non-Communicable Diseases
NHMRC	National Health and Medical Research Council
NSW	New South Wales
SD	Standard Deviation
SDGs	Sustainable Development Goals
SPSS	Statistical Product for Service Solution
SSA	sub-Saharan Africa(n)
UK	United Kingdom
US/USA	United States of America
UN	United Nations
UNSW	University of New South Wales

VIA	Vancouver Index of Acculturation
Vs.	versus
WMRDA	Western Melbourne Regional Development Australia
WHO	World Health Organisation

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(Bernard of Chartres and Sir Isaac Newton)

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## **CHAPTER ONE**

### **INTRODUCTION AND REVIEW OF RELEVANT LITERATURE**

#### **Introduction**

This thesis addresses the effects of immigration on population health using post-migration changes in dietary and physical activity behaviours as basic indicators. More specifically, it assesses the extent to which post-migration changes in dietary and physical activity behaviours can be described as ‘good’ or ‘bad’ for health and examines underlying factors associated with the behaviour changes. The thesis is focused on Australian residents born and raised in sub-Saharan Africa (SSA) as evidence shows that migration from SSA to Western countries may be accompanied with increased risk of weight-related health problems, such as adiposity and some non-communicable diseases (e.g. diabetes, chronic respiratory diseases, some cancers, and cardiovascular diseases) (Babatunde-Sowole, Power, Davidson, Ballard, & Jackson, 2018; Renzaho & Burns, 2006; Western Melbourne Regional Development Australia, 2014).

In this thesis, terms, such as ‘adiposity’, ‘excess weight gain’, ‘excess body fats’, ‘obesity’, ‘large body’ and ‘overweight’ have been used interchangeably to refer to a condition of gaining body fats or lipids that are unrequired and medically considered excess of the body and which poses serious risks of morbidity (IFB Adiposity Diseases, 2018; Komaroff, 2016). This thesis is mainly concerned about the prevention of negative health implications associated with these health indicators and does not necessarily focus on the critical analyses of their measurements. This clarification is important as there is a school of thought in the literature that criticises the use of body mass index (BMI) and other related measures as indicators of health and body size classification.

In this first chapter of the thesis, relevant literatures that justify the significance of the study are reviewed. The chapter begins with a global overview of the burden of

non-communicable diseases (NCDs) and shows evidence on global risk and trends of adiposity. The chapter continues with a discussion of perspectives on adiposity and highlights what is known in the literature as the ‘obesity paradox’. Next, the chapter presents a review of research on modifiable behaviours associated with the risk of adiposity and NCDs. Based on evidence from widely recognised health institutions (for example, the World Health Organisation), the chapter describes what is recognised as ‘healthy’ eating and physical activity. The subsequent sections look at dietary and physical activity behaviours from a migration perspective. Evidence on the risk of developing adiposity and NCDs after individuals migrate from lower to higher-income countries is provided. Also discussed are the changes in dietary and physical activity behaviours that are often experienced after migrating from SSA to Western countries. The chapter further provides a review of empirical research regarding factors associated with post-migration dietary and physical activity behaviours. This is followed by a discussion of theory-based factors that may be associated with post-migration dietary and physical activity behaviours. In view of the gaps in the current literature, the chapter outlines an integrated conceptual framework guiding this study. The key objectives underlying this research are stated in this chapter, as are the research questions. Next, the significance of the study is provided. The chapter closes with an overview of the subsequent chapters and how these relate to the specific research questions.

### **Global burden of NCDs**

Over the years, NCDs have evolved as the leading cause of mortality in the world (71% of all global deaths), with an estimated 41 million annual deaths attributed to the diseases (Teo et al., 2009; World Health Organisation, 2013, 2018a). Of the four main categories of NCDs, cardiovascular diseases are responsible for 17.9 million annual deaths, followed

by cancers (9.0 million deaths), respiratory diseases (3.9 million deaths) and diabetes (1.6 million deaths) (World Health Organisation, 2018a). Over 16 million of NCD-related deaths are premature, meaning, they happen before a person reaches 70 years of age (World Health Organisation, 2015, 2018a).

Much of the recent research has drawn attention to the fact that mortality resulting from NCDs is disproportionately distributed across the globe, with the majority occurring in low-and-middle-income countries (LMICs) (Allen, Cobiac, & Townsend, 2017; Bollyky, Templin, Cohen, & Dieleman, 2017; Kankeu, Saksena, Xu, & Evans, 2013; Mendis et al., 2014; The Henry Kaiser Family Foundation, 2016). For instance, in 2012, nearly 82% of global premature deaths due to NCDs occurred in LMICs (World Health Organisation, 2015). NCD-related mortality is projected to increase in LMICs as countries become more urbanised (Chand, 2012; Habib & Saha, 2010; Wagner & Brath, 2012). For example, NCD-related deaths in LMICs were projected to increase from 30.8 million in 2015 to 41.8 million by 2030 (Piot et al., 2016). Even in LMICs where parasitic and infectious diseases are highly prevalent (mostly African countries), NCDs are projected to become the leading cause of deaths by 2030 (Chand, 2012; Wagner & Brath, 2012).

In addition to the mortality burden, NCDs, directly and indirectly, affect economic growth (Australian Institute of Health and Welfare, 2014; Bloom et al., 2011; Chaker et al., 2015; Chen, Kuhn, Prettnner, & Bloom, 2018; Engelgau, Rosenhouse, El-Saharty, & Mahal, 2011). The annual financial losses due to NCDs are estimated at an average of US \$25 per capita in low-income countries, US \$50 in lower-middle-income countries, and US \$139 in upper-middle-income countries (Bloom et al., 2011). In Australia, NCDs incurred an estimated \$27 billion (about 36% of total health expenditure) between 2008 and 2009 (Australian Institute of Health and Welfare, 2014).

Indirectly, NCDs also account for huge financial losses as a result of sick leave and unemployment (Chaker et al., 2015). Based on a global analysis of indirect financial losses owing to sick leave and unemployment, Chand (2012) has projected that a cumulative amount of US\$47 trillion will be lost by 2030 due to NCDs. In low-income settings, the often expensive healthcare costs associated with NCDs drain household resources forcing many into poverty (World Health Organisation, 2018a).

Although NCDs are a major global health challenge, it appears that health systems in many lower-income countries are ill-prepared for the burden of the diseases (Bollyky et al., 2017; Islam et al., 2014; Robinson & Hort, 2012). In a recent study that ranked 172 nations using a health system capacity index for NCDs, it was projected that low-income countries will have the largest increase in the disease burden over the next 25 years and will also be the least prepared for the change, as they ranked low on the capacity index and spent less money in the prevention of NCDs (Bollyky et al., 2017).

### **Global risk and trends in adiposity**

Given the burden of NCDs on population health and economies, it is important to recognise modifiable risk factors associated with the diseases, in order to develop appropriate interventions (Kelishadi, 2019; Passi, 2017; World Health Organisation, 2018c). Recent evidence suggests that more than 40% of the 41 million annual global deaths due to NCDs are preventable, by reducing the prevalence of adiposity (Broyles et al., 2015; Huo, Lyons, & Magliano, 2016; Malik, Willett, & Hu, 2013; Wahi & Anand, 2013; World Health Organisation, 2014, 2015; World Health Organisation, 2018a).

A considerable amount of studies emphasise that a chronic imbalance between energy intake and energy expenditure increases the risk of adiposity, therefore, a balance between the daily amount of calories consumed and calories expended is required for

preventing adiposity-related NCDs (Bouchard, 2008; Butte, Christiansen, & Sorensen, 2007; Egger & Swinburn, 1997; Jéquier, 2002; Romieu et al., 2017; Swinburn et al., 2011; Yeomans, 2010). To lose body weight, therefore, energy usage must exceed energy intake and to gain body weight, energy intake must exceed expenditure (Romieu et al., 2017).

Widely recognised behaviours associated with the risk of developing adiposity and related NCDs include consumption of excessive saturated fats, sugars, and salts; and insufficient physical activity (Baldwin, Kaneda, Amato, & Nolan, 2013; Schlesinger et al., 2019; United Nations, 2018; World Health Organisation, 2015; World Health Organisation, 2018a).

In addition to the recognition of modifiable risk factors associated with NCDs, a mapping of the global risk and trend of adiposity is needed to assist with addressing the global weight-related health challenge. In Australia, the rate of adiposity continues to rise, and this weight-related health condition resulted in an economic loss of \$8.6 billion between 2011 and 2012 alone (Australian Institute of Health and Welfare, 2017). Further evidence specifically shows that between 2014 and 2015, almost two-thirds (63%) of Australians aged 18 years and over were overweight or obese, with men having higher rates of overweight and obesity (71%) than women (56%) (Australian Institute of Health and Welfare, 2017).

After controlling for age differences, the prevalence of overweight and obesity among Australian adults increased from 57% in the year 1995 to 61% in 2007 and 2008. It increased further to 63% in 2011 and 2012 and remained quite constant at 61-63% in 2014-2015 (Australian Institute of Health and Welfare, 2017).

Data has also shown that the prevalence of what is commonly termed class II obesity (BMI of 35-40 kg/m<sup>2</sup>) has increased in Australia in recent years (Australian Institute of Health and Welfare, 2017). Between 1995 and 2014-2015, the prevalence of

class II and class III obesity ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ) among Australian adults nearly doubled, from 5% to 9% (Australian Institute of Health and Welfare, 2017).

Examining trends in adiposity prevalence in several regions across the world is also essential for understanding the extent and variations in risks among different populations. Although different figures have been presented in the various studies on the global prevalence and trends in adiposity, most studies indicate an increased risk of adiposity. According to the World Health Organisation (2018c), the global prevalence of obesity had nearly tripled between 1975 and 2016. By 2016, more than 1.9 billion adults aged 18 years and older were classified as overweight (World Health Organisation, 2018c). Of these, over 650 million were classified as obese (World Health Organisation, 2018c).

Evidence further shows that the obesity challenge is affecting children (World Health Organisation, 2018c). In 2016, 41 million children under the age of 5 were described as overweight or obese as were over 340 million children and adolescents aged 5 to 19 years (World Health Organisation, 2018c). In line with the report from the World Health Organisation (World Health Organisation, 2018c), a systematic review of global trends in adiposity prevalence has shown that adiposity is increasing in recent decades and is driven by a complex interplay of economic, environmental, and biological factors (Lahey & Khan, 2018). This systematic review also indicated that changes in food intake, such as increased consumption of energy-dense and added sugar, have contributed significantly to weight gain over the years (Lahey & Khan, 2018).

Furthermore, an international longitudinal study involving 9.1 million people provides an in-depth analysis of adiposity prevalence and trends across different regions of the world (Finucane et al., 2011). In their analysis, Finucane et al. (2011) highlighted that adiposity as a public health challenge was first noted in the United States in the early



1980s. In subsequent decades, increasing incidence of adiposity was recognised in European countries, contributing to the notion that this health condition was associated with high-income countries (Caballero, 2007; Finucane et al., 2011; Popkin, 2015; Prentice, 2005). Recent data, however, point to an increasing prevalence of adiposity in LMICs, drawing attention to the importance of recognising adiposity as a global health challenge (Amugsi, Dimbuene, Mberu, Muthuri, & Ezech, 2017; Lartey et al., 2019; Popkin & Slining, 2013). Additionally, available data show that the greatest increase in adiposity is occurring in developing countries, particularly Mexico, China, and Thailand (Caballero, 2007; Gillman, Gluckman, & Rosenfeld, 2013). Globally, adiposity prevalence has increased from 4.8% to 9.8% in men and from 7.9% to 13.8% in women between 1980 and 2008 (Finucane et al., 2011).

### **Perspectives on adiposity**

It is worth noting that there are varied views about body sizes, especially between scholars from public health and fat studies disciplines, which lead to conflicting perspectives (Carbone et al., 2019; Goossens, 2017; Hainer & Aldhoon-Hainerová, 2013; Satinsky & Ingraham, 2014). For instance, while many public health scholars support weight reduction philosophies that are often based on BMIs (Carbone et al., 2019; Goossens, 2017), scholars from the fat studies discipline often assess human bodies from a social justice perspective and criticise that the categorisation of body sizes using BMIs leads to stigma (Hainer & Aldhoon-Hainerová, 2013; Satinsky & Ingraham, 2014). Scholars of the fat studies discipline commonly argue that the measures used to classify people as overweight, obese and so forth are problematic and inaccurate (Hainer & Aldhoon-Hainerová, 2013; Satinsky & Ingraham, 2014). Some scholars from the fat studies discipline further hold ideas that obesity may enhance greater survival for some groups

of people, such as the elderly, in the event of some chronic diseases (Goossens, 2017; Hainer & Aldhoon-Hainerová, 2013). For instance, it is believed that obese persons tend to experience better health conditions after certain surgeries, such as coronary artery bypass surgery (Amundson, Djurkovic, & Matwiyoff, 2010). This idea is commonly termed in the literature as the ‘obesity paradox’ (Amundson et al., 2010; Badrick, Sperrin, Buchan, & Renehan, 2017; Elagizi et al., 2018; Franz, 2013; Hainer & Aldhoon-Hainerová, 2013; Oga & Eseyin, 2016; Satinsky & Ingraham, 2014).

Some recent studies have however argued that this obesity paradox is simply the result of what is termed as collider stratification, which means common selection bias associated with epidemiological research (Banack & Kaufman, 2013; Carbone et al., 2019). For instance, an investigator who focuses on estimating mortalities among obese persons may find misleading outcomes, as unmeasured factors in the sample, such as prevalence of cardiovascular diseases, may also contribute to mortality (Lee, Aronson, & Nunan, 2019). Evidence supports the notion that the obesity paradox, especially in patients with cardiovascular diseases may have resulted from several research limitations, including limitations in the measurement of actual body fats, selection bias, and time bias associated with disease diagnoses (Lahey & Khan, 2018).

While acknowledging that large body types which are often described as overweight and/or obese body types, e.g. Huang, Frangakis, and Wu (2006), are not automatic correlates of health problems (Hainer & Aldhoon-Hainerová, 2013), sufficient evidence from the literature shows that excess body fats and poor dietary and physical activity behaviours increase the risk of developing NCDs (Arena et al., 2015; Banjare & Bhalerao, 2016; Durstine, Gordon, Wang, & Luo, 2013; Murray & Collaborators, 2018; Musaiger & Al-Hazzaa, 2012; National Health and Medical Research Council, 2013; Tabish, 2017; World Health Organisation, 2018c).

Joining the debate surrounding the obesity paradox is not the focus of this study, however, the reasoning in this study tends to be based more on the public health perspective. This study ascribes to the use of the terms ‘excess weight gain’ (used interchangeably in the literature with ‘excess body weight’ or ‘excess body fats’) which has been commonly used in several public health literature and seems accepted in this field. Examples can be seen in the works of González-Rodríguez et al. (2017), Goossens (2017), Dong et al. (2018), among others.

### **Modifiable behaviours associated with the risk of adiposity and NCDs**

Evidence in health research suggests that it is possible to reduce adiposity risk through behaviour changes, such as eating healthily and moderately, and getting sufficient physical exercise (Baldwin et al., 2013; Chaker et al., 2015; Cruickshank et al., 2001; Di Cesare et al., 2013; Ford, Faber, Kunneke, & Smuts, 2016; George et al., 2016; Isara & Okundia, 2015; Janssen, Katzmarzyk, Boyce, King, & Pickett, 2004). A number of recent studies have drawn attention to an increasing level of less healthy dietary and physical activity behaviours across various populations worldwide, which in part, can explain the increasing rates of adiposity and related NCDs. For example, a recent study of 33 SSA countries found that adiposity was significantly associated with hypertension, which in turn was associated with low consumption of fruits and vegetables (Yaya, Ekholuenetale, & Bishwajit, 2018).

In a study of the nutrition transition and the epidemic of global diabetes, Popkin (2015) concluded that LMICs face a rapid change in nutrition, towards an increased risk of NCDs, and attributed this transition to the introduction of Western foods in numerous countries, introduction of technologies that influence a reduction in physical activities among some people, and urbanisation. Popkin (2015) further argued that this nutrition

transition is reflected in major shifts in diets, from intake of legumes, other vegetables, and fruits, toward increased intake of refined carbohydrates, added sweeteners, edible oils, and animal-source foods, which, in turn, has led to increasing adiposity prevalence in many regions across the world. In another study investigating risk factors associated with global adiposity, Malik et al. (2013) similarly noted that current food contents are characterised by animal fats, refined grains, and sugars. Drawing on a systematic review, Gilbert and Khokhar (2008) also found an increasing consumption of processed foods containing high levels of saturated fats, sugars, and salts. Additionally, several published papers (Fourat & Lepiller, 2017; Kim & Popkin, 2005; Oggioni, Lara, Wells, Soroka, & Siervo, 2014; Perez-Cueto, Verbeke, Lachat, & Remaut-De Winter, 2009) have shown considerable replacement of meals rich in fibre, vegetables and fruits with fatty, salty and sugary diets in LMICs.

Research has also drawn attention to a global reduction in physical activity levels at the workplace, in the home, during leisure or travel, and among different categories of people. An analysis of global physical activity levels, based on data from 122 countries estimated that 31% of adults are physically inactive worldwide, with proportions ranging from 17% in Southeast Asia to about 43% in the Americas and the Eastern Mediterranean (Hallal et al., 2012). A global study of physical activity levels in 20 countries reported that physical inactivity levels ranged from 9 to 43% (Bauman et al., 2009). A recent study of worldwide trends in physical activity from 2001 to 2016 involving a pooled analysis of 358 population-based surveys (1.9 million participants) showed that global prevalence (age-standardised) of insufficient physical activity was 28% in 2016, with men (32%) likely to be less physically active than women (28.6-39%) (Guthold, Stevens, Riley, & Bull, 2018). Between 2001 and 2016, women in Latin America and the Caribbean (43.7%), South Asia (43.0%), and high-income Western countries (42.3%) recorded the

highest levels of insufficient physical activity (Guthold et al., 2018). The prevalence of insufficient physical activity in 2016 was more than twice as high in high-income countries (36.8%) than in low-income countries (16.2%) (Guthold et al., 2018).

### **Healthy foods and physical activities**

Identifying ‘healthy’ and ‘less healthy’ dietary and physical activity behaviours is one of the important but controversial topics in contemporary health research (Chrysohoou & Stefanadis, 2013; Garnett, 2014). Classifying a dietary and physical activity behaviour as healthy or not goes beyond the components of food and exercise and includes other factors, such as timing (frequency, duration, and periods) and amount (portion sizes, level of moderation, among others) (Mattson, Longo, & Harvie, 2017; Rizza, Veronese, & Fontana, 2014; Sohal & Forster, 2014). In addition, people of different ages, gender, genetic makeup, and even health conditions may have different nutritional requirements for their bodies (Allafi et al., 2014; Govindaraju, Atzmon, & Barzilai, 2015; Rea & Mills, 2018; Sohal & Forster, 2014). Nevertheless, the Australian Government Department of Health (2019) and the World Health Organisation (2010) have provided important information that summarises what can be considered as ‘healthy’ dietary and physical activity requirements for an average person aged 18 years and over.

### ***Dietary Intake***

Studies suggest that diets, rich in fruits and vegetables, are important for promoting good health (National Health and Medical Research Council, 2013; World Health Organisation, 2018b). Fruits and vegetables, in particular, are nutrient-rich foods that, when regularly consumed, can decrease risk of developing numerous health problems, such as adiposity, type 2 diabetes, high blood pressure, stroke and heart diseases (National

Health and Medical Research Council, 2013; World Health Organisation, 2018b). In contrast, excessive and regular consumption of sugary, oily, salty, and fatty foods, increase the risks of developing health problems (National Health and Medical Research Council, 2013; World Health Organisation, 2018b). The 2013 Australian Dietary Guidelines (ADG) confirm that it is important for an adult to eat nutritious foods and drinks to meet their energy needs (National Health and Medical Research Council, 2013). More specifically, the guidelines include five main food recommendations for adults aged 18 years and over:

1. sufficient consumption of different types of vegetables, including legumes/beans;
2. sufficient consumption of fruits;
3. sufficient consumption of grain (cereal) foods, especially whole grains and/or a variety of cereals rich in fibre (e.g. breads, cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa, and barley);
4. moderate consumption of lean meats, poultry, fish, eggs, tofu, nuts, and seeds;
5. moderate consumption of milk, yoghurt, and cheese, especially those with a reduced amount of fat.

Similar to the recommendations in the ADG, the World Health Organisation (2018b) advises that a healthy diet for adults need to include the following:

1. sufficient amount of fruits, vegetables, legumes (e.g. lentils and beans), nuts and whole grains per day (e.g. unprocessed maize, millet, oats, wheat, and brown rice, at least 400 grams which is equivalent to five portion size);
2. less than 10% and preferably 5% intake of free sugars (i.e. sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices, and fruit juice concentrates);

3. reduction in fat intake (preferably, less than 30% of total energy intake from unsaturated fats). It is also suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and trans-fats to less than 1% of total energy intake. The recommendation also highlights that industrially-produced trans-fats are not part of a healthy diet and should be avoided;
4. less than 5 grams of salt should be consumed per day and should be iodised (equivalent to about one teaspoon).

Although the dietary requirements between ADG and the World Health Organisation vary slightly, both guidelines recommend diets that are high in fruits, vegetables, natural proteins, and fibres, while high intake of sugars, salt, and fats are discouraged.

### ***Physical activity***

Physical activity, which may be defined as “any bodily movement produced by one or more large muscle groups, for movement as part of: leisure (including sports, exercise and recreational activities); transport (for example walking or cycling to get to or from places); and occupation (including paid and unpaid work like lifting, carrying or digging) (Australian Government Department of Health, 2019, p. 1)”, is required for good health and wellbeing. According to the World Health Organisation (2010) physical activity includes leisure-time physical activity (for example: walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities. The Australian Government Department of Health (2019) suggests that for all adults aged 18 to 64 years, irrespective of cultural background, gender or ability, there is the need to accumulate 150 to 300 minutes (2.5 to 5 hours) of moderate-

intensity physical activity or 75 to 150 minutes (1.25 to 2.5 hours) of vigorous-intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week. Adding muscle-strengthening activities on at least 2 days each week is expected to provide additional health benefits (Australian Government Department of Health, 2019).

In parallel to the guidelines provided by the Australian Government Department of Health, the World Health Organisation (2010), also provides recommendations for physical activity for adults aged 18 to 64 years. Adults aged 18 years are expected to do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate and vigorous-intensity activity. The aerobic activity is expected to be performed in bouts of at least 10 minutes duration. It is also recommended in the guideline that if an adult is looking for additional health benefits through physical activity, he/she is expected to increase his/her moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate and vigorous-intensity activity. The World Health Organisation recommends that to boost more physical health, muscle-strengthening activities could be done on 2 or more days a week (World Health Organisation, 2010).

Again, strong similarities are evident in both the physical activity guidelines from the Australian Government Department of Health and the World Health Organisation. At a basic level, both guidelines recommend that adults aged 18 years to 64 years should do at least 150 minutes of moderate-intensity physical activity or 75 minutes of vigorous-intensity physical activity per week.



## **Immigration and risk of adiposity and NCDs**

There are increasing concerns over the relationship between adiposity and immigration; especially in countries hosting large populations of immigrants (McDonald & Kennedy, 2005; Murphy, Robertson, & Oyebo, 2017; Norredam, 2015; Solveig & Hadewijch, 2018). Over the past decade, a number of researchers have argued that new immigrants are, on average, healthier than residents of a country by birth. Justification for this claim is partly based on the notion that individuals who are motivated to migrate are required to undertake medical examinations and are usually healthy; while sick people mostly stay behind (commonly termed as the healthy immigrant effect) (Flores & Brotanek, 2005; Ichou & Wallace, 2019; Markides & Rote, 2019; Pfeifer, 2019; Vang, Sigouin, Flenon, & Gagnon, 2017).

In Australia, this healthy immigrant effect has been confirmed in a number of studies investigating differences in health status between overseas-born residents and individuals born in the country. An analysis of the 2001, 2003, 2007 and 2009 waves of the Household, Income and Labour Dynamic Surveys, comprising 17,939 responses, including immigrants from English and non-English speaking countries, concluded that the immigrants from the United Kingdom, United States of America, New Zealand, Canada, Ireland, South Africa, The Netherlands, Germany, Italy, Philippines, Malaysia, Vietnam, Yugoslavia, Poland, Sri Lanka and Croatia had fewer cases of NCDs than native-born residents (Jatrana, Pasupuleti, & Richardson, 2014). In a study employing data from three national health surveys (1989/90, 1995 and 2001) conducted by the Australian Bureau of Statistics (ABS) and involving a combined sample of 66,641 persons (aged 20-64 years) of which 28% were immigrants, findings also showed that the prevalence of NCDs was lower among immigrants upon arrival, compared with Australia-born residents (Biddle, Kennedy, & McDonald, 2007). Drawing on a study involving

64,194 Australian immigrants from Europe, Asia, Africa, Oceania and the Middle East, as well as 199,908 Australia-born participants selected from the 45 and Up Study (2006-2009), it was found that immigrants had a lower risk of adiposity than Australia-born residents (Sarich, Ding, Sitas, & Weber, 2015). A study involving 214,807 adults living in Australia, found that overseas-born participants more often had a lower mean BMI, especially China-born compared to Australia-born residents and that some ethnic differences matched the healthy migrant hypothesis (Astell-Burt, Feng, Croteau, & Kolt, 2013).

Similar findings have been observed in a number of studies conducted in the United States, Canada, and Europe. A systematic review of papers published between 1980 and 2007 found that adiposity was 10% lower in foreign-born men and 16% lower in foreign-born women upon arrival in the United States, compared with individuals born in the United States; and they also experienced fewer cases of cardiovascular diseases and some cancers than America-born residents (Argeseanu Cunningham, Ruben, & Venkat Narayan, 2008). Data from the 2011 Survey of Health, Ageing, and Retirement in Europe (SHARE), which covered 46,869 residents born in a country and 4,489 immigrants (foreign-born) from 16 European countries also showed that immigrants from neighbouring countries were healthier than the residents born in a particular European country (Neuman, 2014). A cross-sectional study using data from the National Population Health Survey and the Canadian Community Health Survey, which involved 7,626 (1994-95 wave), 73,402 (1996-97 wave) and 131,535 (2000-01 wave) respondents, highlighted that Canadian immigrants originating from non-English speaking countries (particularly Asia) as well as from English speaking countries (UK, Ireland, USA, Australia, and New Zealand) were less likely to have NCDs (McDonald & Kennedy, 2004).

Findings from a number of studies, however, suggest that the supposed health advantage of foreign-born over locally born residents of a country often diminishes with time (Gordon-Larsen, Harris, Ward, & Popkin, 2003; Montreal, 2015). As immigrants live in a host country for longer durations, their risk of adiposity and related NCDs become similar to, or even greater than that of locally born residents of the host country (Gordon-Larsen et al., 2003; Montreal, 2015). For instances, an analysis of data drawn from the Australian Bureau of Statistics found that while Australian residents born overseas initially had lower rates of adiposity than those born in Australia, they gained weight as their duration of residence increased (The Boden Institute of Obesity & The Menzies Centre for Health Policy, 2014). In a longitudinal study comparing foreign-born residents who had lived in Australia for 20 years or more with Australia-born residents, findings showed a substantive resemblance in the prevalence of NCDs between the two groups (Jatrana et al., 2014). Drawing on a review of published papers from Australia between 1980 and 2008, it was equally shown that the majority of immigrants initially had lower risk of NCDs than Australia-born residents, but that the migrants' health advantage decreased with increasing duration of residence (Anikeeva et al., 2010). In a retrospective analysis of 2001-2002 hospital data from Victoria, Australia, concerning more than 200 overseas-born population groups and Australia-born residents, it was found that men from four ethnic groups (USSR/Baltic; Southern Asia; Middle East; and Eastern Europe) had higher risk of acute myocardial infarction (commonly known as heart attack) than Australia-born men (Dassanayake, Gurrin, Payne, Sundararajan, & Dharmage, 2011). Women from the Middle East, Southern Asia, and Southern Europe were at higher risk of stroke hospitalisation than Australia-born women (Dassanayake et al., 2011). A cross-sectional study employing data from Victorian Population Health Survey (2003–2005), involving immigrants from 7 regions of Europe and Asia, with a

combined population of 6,376 males and 9,407 females showed that South Europe-born immigrants had higher body-mass-index (BMI) than Australia-born residents (Hauck, Hollingsworth, & Morgan, 2011).

In the United States, Canada, and Europe, some studies have specifically reported a higher prevalence of adiposity and NCDs among immigrants than locally born residents. A systematic review of studies undertaken using six EBSCO host databases found an increase in the incidence of adiposity among residents from eight different countries living in the United States (Delavari, Sonderlund, Swinburn, Mellor, & Renzaho, 2013). A comparative study utilising data from the 2000 Population Census and 2000-2006 waves of the National Health Interview Survey in the USA found that black immigrants from Europe reported similar levels of hypertension as non-Hispanic blacks born in the USA (Elo, Mehta, & Huang, 2008). A community-based cross-sectional study (Afro-Cardiac Study) of Ghanaian and Nigerian-born African immigrants aged 35-74 years and residing in the Baltimore-Washington noted high risk of cardiovascular diseases among the participants (Commodore-Mensah et al., 2016). A systematic review of research conducted in Canada and published between 1980 and 2014, showed that European immigrants' health advantage over Canada-born residents diminished as duration of residence increased (Vang et al., 2017). In a study of obesity and type 2 diabetes among sub-Saharan Africans in Africa and Europe, commonly known as the Research on Obesity and Diabetes among African Migrants (RODAM), findings showed that the prevalence of obesity and type 2 diabetes was highest among Ghanaian-born persons living in Europe (especially those living in London and Berlin) than Ghanaian-born persons living in Ghana (Agyemang et al., 2016). A study that reviewed the prevalence of cardiovascular diseases, diabetes, and established risk factors among sub-Saharan African residents in Europe noted that persons of African descent had an increased risk of stroke,

hypertension, diabetes, and obesity than European populations (Agyemang et al., 2009). In a cross-sectional study comparing adiposity prevalence between Swedish nationals and immigrants, Faskunger, Eriksson, Johansson, Sundquist, and Sundquist (2009) noted higher odds of adiposity in women from the Middle East than in Sweden-born women, and men of other European origin had higher prevalence of adiposity than Sweden-born men. Additionally, a cross-sectional study of 27,808 immigrants (aged 45 to 73 years) participating in a diet and cancer study in Malmö, Sweden highlighted that adiposity prevalence among non-Swedish Europeans was 40% higher than among Sweden-born (Lahmann, Lissner, Gullberg, & Berglund, 2000). A further cross-sectional study of 3,019 immigrants in Oslo, Norway also pointed to a higher prevalence of adiposity among the immigrants, in particular people from Pakistan, Sri Lanka, and Turkey than among Norway-born residents (Kumar, Meyer, Wandel, Dalen, & Holmboe-Ottesen, 2005).

Furthermore, in a systematic literature review of studies aimed to identify associations between migration to high-income countries and body weight, evidence synthesized across multiple studies showed a significant association between obesity and longer duration of residence (Alidu & Grunfeld, 2018). In another review of studies on the impact of immigration on health, the evidence suggested a high prevalence of obesity and type 2 diabetes among African, Chinese, Hispanic and South Asian migrants (Misra & Ganda, 2007).

### **Immigration and dietary and physical activity behaviours**

To increase understanding of the effects of immigration on population health, it is important to investigate the extent to which migrants' dietary and physical activity behaviours change after moving to a new country and critically assess whether the changes are healthy. In a survey conducted in Australia to find out whether newly arrived

migrants had changed their dietary habits, findings showed that several immigrants had made significant changes to their diets, characterised by Western foods (Thomson & McFeeter, 2016). More specifically, 41% had adopted eating of fast foods once or more times per week and 60% reported consuming an energy-dense soft drink at least one or more times per week (Thomson & McFeeter, 2016). A study of people of various ethnicities, including Vietnamese, Afghans, and Chinese, living in Australia concluded that participants reported a decrease in energy expenditure, an increase in fat and sugary drink intake, and a decrease in intake of healthy foods, such as lentils, soy, and greens (Wahlqvist, 2002).

A systematic review of studies of dietary changes among immigrants from low income countries in Europe noted less healthy dietary trends after immigration, including a substantial increase in energy and fat intake, a reduction in carbohydrate intake, a reduction in vegetable intake, a switch from intake of whole grains and pulses to more refined sources of carbohydrates, low intake of fibre, and an increase in intake of meat and dairy foods (Holmboe-Ottesen & Wandel, 2012). In the United States, a study that used data from the 2007 California Health Interview Survey showed that participants in migrant communities generally engaged in less healthy dietary behaviours and physical activity than white participants (August & Sorkin, 2011). A study using data from the National Longitudinal Study of Adolescent Health in the United States concluded that foreign-born residents, particularly people from Puerto Rico and Cuba, adopted less healthy foods and became less physically active after immigration (Gordon-Larsen et al., 2003).

It is important to note that not all studies have recorded decreased healthy dietary and physical activity behaviours in immigrant communities, with some studies showing improvements. However, any post-migration increase in healthy dietary and physical

activity behaviours is most notable in immigrant communities of Asian ancestry. For example, a study of 120 China-born migrants living in Canada showed that more than half of the participants reported an increase in their fruit and vegetable intake, and a post-migration decrease in the use of deep-frying method of cooking (Rosenmoller, Gasevic, Seidell, & Lear, 2011). A study of dietary patterns among South Asian immigrants in Canada also concluded that participants reported a variety of healthy dietary practices, including a post-migration increase in consumption of fruits and vegetables and a healthy change in food preparation methods, characterised by an increase in grilling and a reduction in deep frying (Lesser, Gasevic, & Lear, 2014).

### **Dietary and physical activity behaviours among immigrants of African ancestry**

To date, little empirical research has been conducted regarding the dietary and physical activity behaviours of Australian residents who emigrated from SSA. A recent study that looked at the health behaviour of SSA women in Australia showed that participants had increased their consumption of ‘fast foods’ and had become more sedentary leading to increased weight gain after immigration (Babatunde-Sowole et al., 2018). Another Australian study of 139 households of demographically diverse migrants from SSA concluded that many of the observed dietary changes were not consistent with good health and may predispose this population to rapid weight gain and chronic diseases (Renzaho & Burns, 2006). This study more specifically indicated dietary acculturation, characterised by three processes: substitution of ingredients (replacement of unavailable traditional African foods by close alternatives), supplementation of foods eaten (addition of new foods, such as pizzas, breakfast cereals and fast foods to their menus upon arrival) and modification of recipes (change in cooking methods, including ingredients) (Renzaho & Burns, 2006). Acculturation refers to “the dual process of cultural and psychological

change that takes place as a result of contact between two or more cultural groups and their individual members (Berry, 2005, p. 698).

The larger body of research conducted with emigrants from Africa living in other Western countries provides further insights for understanding changes in the dietary and physical activity behaviours among Australian migrants from SSA. A systematic review that synthesised the available evidence on dietary and physical activity behaviours among pregnant women and women of childbearing age who had emigrated from African countries to high-income countries observed a mixed dietary pattern encompassing both Western and African dietary practices (Ngongalah et al., 2018). A study that investigated the relationship between dietary change and health status among emigrants from Africa to the United States concluded that participants experienced moderate dietary change after settling in the United States, characterised by an increase in fast food consumption and a decrease in fruit and vegetable intake (Okafor, Carter-Pokras, & Zhan, 2014). A cross-sectional study of 213 Bubi people from Equatorial Guinea aged between 18-84 years who migrated to Madrid, Spain, found a change in dietary intake from lower fat but protein-rich diets to diets containing high calories from fat, protein, and carbohydrates (Gil, Vioque, & Torija, 2005). These changes in diets had a negative impact particularly on women's health, as 23.2% of the women were diagnosed as obese; 11% of the men experienced obesity as well (Gil et al., 2005). A qualitative study of 31 adults living in Greater Manchester, United Kingdom, aged 25 years and over and of Ghanaian ancestry concluded that participants maintained, to some extent, some aspects of Ghanaian dietary practices, but adopted key features of the local food culture (Osei-Kwasi, Powell, Nicolaou, & Holdsworth, 2017). A study of 5898 migrants and non-migrants in Europe (Amsterdam, Berlin, and London) observed a high prevalence of type



2 diabetes among lean African populations due to physical inactivity and the presence of hypertension (Chilunga et al., 2019).

### **Factors associated with post-migration dietary and physical activity behaviours**

A number of scholars have proposed factors thought to be associated with dietary and physical activity behaviours across a person's life course (Aleksavska et al., 2019; Brug et al., 2017; Buck et al., 2019; Condello et al., 2017; Jaeschke et al., 2017; O'Donoghue et al., 2018). Notably, the Determinants of Diet and Physical Activity (DEDIPAC) Knowledge Hub, 2013-2016, was developed by the Healthy Diet for a Healthy Life European Joint Programming Initiative to provide insight into factors associated with diet, physical activity and sedentary behaviours (Brug et al., 2017; Buck et al., 2019). As part of this initiative, a number of factors thought to be influencing dietary and physical activity behaviours was constructed for ethnic minority populations in Europe (Holdsworth et al., 2017). Seven factors, comprising 85 sub-factors were proposed as determinants of dietary behaviour among ethnic minority populations in Europe: psychosocial factors (e.g. attitude towards food intake), food beliefs and perceptions (e.g. perceptions of what constitutes a healthy food), socio-material resources (e.g. wealth status), accessibility of foods (e.g. access to traditional foods in a host country), the body (e.g. body size preference), socio-cultural environment (e.g. extent of influence by people within a person's social network), and migration context (e.g. immigration-related stress) (Holdsworth et al., 2017). On the other hand, eight factors, consisting of 183 sub-factors were proposed as determinants of physical activity behaviour among ethnic minority populations in Europe: psychosocial (e.g. attitude towards physical exercise), institutional environment (e.g. lack of physical activity resources in institutions, such as schools), political environment (e.g. the availability of government programmes supporting

physical activity), socio-cultural environment (e.g. extent of influence by peer group), physical environment and opportunity (e.g. access to play area and sports facilities), social and material resources (e.g. wealth status and educational level), health and health communication (e.g. poor physical fitness) and migration context (e.g. immigration policy) (Holdsworth et al., 2017; Langoien et al., 2017).

Satia-Abouta (2003) has also proposed a model of dietary acculturation which conceptualises factors that may affect migrants' dietary behaviours. The model posits that dietary acculturation is affected by four main factors: cultural factors (e.g. beliefs and values), socio-economic and demographic factors (e.g. gender, age, education, employment, and area of residence), psychosocial factors (e.g. diet and disease-related knowledge, attitudes toward food, and taste preferences), and environmental factors (e.g. accessibility, availability and affordability of traditional foods).

Further review of the literature suggests additional factors that affect dietary and physical activity behaviours in immigrant communities. The evidence from different empirical studies has been synthesised and is presented according to those related to post-migration dietary behaviours, post-migration physical activity behaviours or both behaviours.

### ***Factors associated with post-migration dietary behaviours***

The body of research illustrates a diversity of factors associated with post-migration dietary behaviours. Common factors that emerged from the various studies include acculturation, socio-demographic factors, environmental factors (economic, social, and physical issues), and social-cognitive factors (commonly termed psychosocial factors in some studies). Acculturation was found to be associated with other factors thought to influence post-migration dietary behaviours. For instance, a study of Australian residents

born overseas has shown that newly arrived immigrants often desired to maintain their familiar local meals and practises (Thomson & McFeeter, 2016), but made changes to their diets, due to lack of availability of ingredients, experience of new cooking methods, experience of new shopping practices, and the relatively wide differences in the prices of food (Thomson & McFeeter, 2016). In the systematic review of studies undertaken using six EBSCO host databases, findings showed that residents in the United States from the eight different countries adopted less healthy dietary behaviours due to acculturation (Delavari et al., 2013).

Differences in socio-demographic characteristics of immigrants, notably, differences in their ages, and duration of residence, were also found to be associated with variations in post-migration dietary behaviours. For example, in the study of the relationship between dietary acculturation and self-rated health among Australian residents of African ancestry, findings showed variations in dietary behaviours across age (Okafor et al., 2014). In the study of China-born persons who lived in Canada, duration of residence was found to be a major correlate of dietary behaviour, such that those with the longest duration of residence in Canada compared to the shortest, consumed significantly larger food portion sizes, dined out more often, and more often consumed fast foods (Rosenmoller et al., 2011).

A variety of factors related to the cognitive, socio-economic and physical environment of migrants also emerged in several studies to be associated with post-migration dietary behaviours. For instance, a study that included a systematic literature review of published papers between 2007-2017 and in-depth interviews, found several factors that affect dietary choices of immigrants, such as psychosocial factors (e.g. self-efficacy) and the physical food environment (e.g. availability of familiar foods) (Pha, Berggreen-Clausen, Daivadanam, & Berggreen-Clausen, 2017). A systematic review of

dietary change after immigration among persons from low-income countries in Europe concluded that dietary changes depend on a variety of factors, related to country of origin, urban/rural residence, socio-economic environment, and cultural environment (Holmboe-Ottesen & Wandel, 2012). Findings of the qualitative study of dietary practices among Ghanaians living in the United Kingdom also highlighted the complexity of factors associated with post-migration dietary behaviours, as different dietary practices were shaped by a cluster of factors related to the socio-cultural environment (e.g. influence of close relatives in the eating of traditional foods, such as ‘fufu’), availability of foods (e.g. increased consumption of Ghanaian foods due to their increasing availability in the United Kingdom), migration context (e.g. age at migration influencing extent of acculturation), and food-related beliefs/perceptions (e.g. belief that United Kingdom foods are more convenient for busy schedules than traditional African foods) (Osei-Kwasi et al., 2017).

### ***Factors associated with post-migration physical activity behaviours***

Similar to the evidence gathered on factors associated with post-migration dietary behaviours, acculturation, socio-economic environment, and socio-demographic factors were commonly reported in the literature as factors associated with post-migration physical activity. An example of the influence of acculturation can be found in a systematic review of studies of ethnic minority populations, which found that acculturation was associated with greater leisure-time physical activity across 57% of studies (Gerber, Barker, & Pühse, 2012). A study of sub-Saharan African migrants in Australia noted that acculturated children were less physically active compared with children who maintained their traditional African practises (Renzaho, Swinburn, & Burns, 2008).

Concerning socio-demographic factors, issues such as gender, age, employment status, duration of residence, and ethnicity emerged as correlates of post-migration physical activity. A study of a culturally diverse sample comprising 810 participants, categorised into three different language groups, found that less healthy physical activity behaviour change was related to gender, age, and employment status (Tang, MacDougall, & Gasevic, 2015). A study of data from the cross-sectional Canadian Community Health Survey involving immigrants from various countries also draws attention to the importance of socio-demographic factors as findings indicated that physical activity levels varied according to immigrant status and self-ascribed ethnicity, with duration of residence associated with increment in physical activity (Tremblay, Bryan, Pérez, Ardern, & Katzmarzyk, 2006). Findings from a study of 671 first-generation Latina immigrants aged 20-50 years living in North Carolina indicated that those who arrived in the United States when they were younger than 25 years were more likely to be physically active than those who arrived when they were 25 years or older (Evenson, Sarmiento, & Ayala, 2004).

Other studies have reported that post-migration physical activity behaviour is related to socio-cultural, economic and physical environmental factors. For instance, a systematic review of studies that examined correlates of sport and physical activity participation among immigrants, suggested that acculturation, as well as demographic, psychosocial, and environmental factors, affected physical activity behaviours, with important correlates including social support and safety, and cultural changes (O'Driscoll, Banting, Borkoles, Eime, & Polman, 2014). A study of persons from Somalia living in the United States identified physical, social, and economic environmental factors associated with physical activity, such as less walking opportunities in the United States,

high cost of exercise facilities, and harsh weather conditions (Mohamed, Hassan, Weis, Sia, & Wieland, 2014).

***Factors associated with post-migration dietary and physical activity behaviours***

Some studies have looked at correlates of both dietary and physical activity behaviours after immigration among people of diverse ethnicities, with acculturation and socio-demographic factors emerging as key factors. For example, a study that used data from the 2007 California Health Interview Survey has concluded that ethnic minority people generally engaged in less healthy exercise and dietary behaviours than the larger population, with differences more pronounced in middle adulthood (August & Sorkin, 2011). In a study of overseas-born persons in the United States that used data from the National Longitudinal Study of Adolescent Health, the results showed that rapid acculturation and patterns of diet and physical activity, between the United States-born and overseas-born persons, was related to longer duration of residence in the United States, especially among Puerto Ricans and Cubans (Gordon-Larsen et al., 2003).

Various cultural, environmental, economic and psychological factors have also been found in several as correlates of post-migration dietary and physical activity behaviours. For instance, a review that synthesised the available evidence on dietary and physical activity behaviours in pregnant women and women of childbearing age who had migrated from African countries to high income countries showed that their dietary and physical activity behaviours were influenced by food or physical activity-related beliefs and perceptions, physical environment culture, and religion (Ngongalah et al., 2018).

In some settings, body size perceptions and beliefs seem to be relevant factors that may influence post-migration dietary and physical activity behaviours as well. In a systematic review of studies among migrant populations, less healthy dietary behaviours

were observed for men than for women which were partly attributed to the women's adoption of slim body ideals from the host culture (Delavari et al., 2013). A qualitative study that assessed intergenerational differences in food, physical activity, and body size perceptions among overseas-born persons from the Horn of Africa living in Victoria, Australia, showed an association between body size beliefs and food practices (Renzaho, McCabe, & Swinburn, 2011). Similar findings were noted in the study of SSA immigrants in Melbourne, Australia, which concluded that participants saw pride and satisfaction in large body sizes (Renzaho, 2009).

#### ***Appraisal of the evidence on post-migration dietary and physical activity behaviours***

While commendable efforts have been made to conceptualise factors that influence dietary and physical activity behaviours in several studies (Brug et al., 2017; Buck et al., 2019; Holdsworth et al., 2017; Langoien et al., 2017; Satia-Abouta, 2003), a number of issues warrant attention. First, there is a lack of adequate understanding of how the various factors reported in the several studies interact to produce a dietary or a physical activity behaviour. For example, studies have commonly controlled the influence of participants' socio-demographic characteristics in the understanding of the interplay between post-migration dietary and physical activity behaviours and acculturation (Deng, Zhang, & Chan, 2013; Sanou et al., 2014; Tami, Reed, Boylan, & Zvonkovic, 2012). Interestingly, it is commonly thought that socio-demographic characteristics of immigrants can influence variations in acculturation, and acculturation, in turn, can affect post-migration dietary and physical activity behaviours (Berry, 1997). Rather than examining a direct relationship between these factors (e.g. association between dietary behaviour and acculturation), a simultaneous assessment of multiple associations among factors (e.g. interplay of dietary and physical activity behaviour with acculturation and

socio-demographic factors) may be more useful (Pérez-Escamilla & Putnik, 2007; Satia-Abouta, 2003).

Another concern is that studies associated with the DEDIPAC project have commonly outlined factors thought to be influencing post-migration dietary and physical activity behaviours. Given that the DEDIPAC project was focused on ethnic minority groups in Europe (Holdsworth et al., 2017), the applicability of the proposed factors to some ethnic minority groups may be limited as immigrant population characteristics and migration situations vary tremendously (Conn, Chan, Banks, Ruppar, & Scharff, 2013; Ludwig, 2016; Morawska, 2004; Peng et al., 2017).

Additionally, the reviewed literature demonstrates a scarcity of studies that have looked at the role played by social-cognitive factors and body size beliefs in post-migration dietary and physical activity behaviours. For instance, the evidence that SSA migrants admire large body types is small in the present literature review (Ettarh, Van de Vijver, Oti, & Kyobutungi, 2013; Hugo, 2009; Renzaho, 2004). Understanding this broad range of factors that can affect post-migration dietary and physical activity behaviours may assist in providing evidence-based recommendations for improving health in ethnic minority communities.

Furthermore, some factors associated with post-migration dietary and physical activity behaviours are understood, defined and reported differently by different authors (Fox, Thayer, & Wadhwa, 2017b; Holdsworth et al., 2017; Schwartz, Unger, Zamboanga, & Szapocznik, 2010). For instance, while some studies have reported duration of residence in a host country, age at arrival in a host country, language preferences, and ethnic identification as indicators of acculturation (Fox, Thayer, & Wadhwa, 2017a; Rosenmöller, Gasevic, Seidell, & Lear, 2011; Van Hook, Quiros, & Frisco, 2015), others have controlled such factors and classified them as socio-demographic characteristics



(Chrisman, Daniel, Chow, Wu, & Zhao, 2015; Neuhouser, Thompson, Coronado, & Solomon, 2004; Novotny et al., 2012; Subramanian et al., 2019).

In addition, several studies have focused on different aspects of dietary and physical activity behaviours making it hard to arrive at a consensual perspective of socio-economic and physical environmental factors associated with the behaviours. While some studies have focused on socio-economic and physical environmental factors associated with post-migration dietary behaviours (Gilbert & Khokhar, 2008; Oladele et al., 2018; Pha et al., 2017), others have focused on those associated with post-migration physical activity (Langoien et al., 2017; Tang et al., 2015; Zevallos-Morales, Luna-Porta, Medina-Salazar, Yauri, & Taype-Rondan, 2019), with few studies reporting on both behaviours (August & Sorkin, 2011; Holdsworth et al., 2017).

### **Theoretical perspectives on post-migration dietary and physical activity behaviours**

Research has shown that theory-based understanding of human behaviour and development of interventions can generate better outcomes than interventions developed without theoretical bases (Fishbein & Ajzen, 2005; Glanz & Bishop, 2010; Michie et al., 2017; Murawski et al., 2018; Ng et al., 2018; Voils et al., 2014). However, developing a theoretical understanding of post-migration dietary and physical activity behaviours is complex and cuts across various disciplines, such as health psychology, migration studies, sociology and anthropology (Astell-Burt et al., 2013; Michie & Johnston, 2012; Turner & Baker, 2019). For instance, studies in the field of social psychology usually focus on the role played by human cognition in the performance of behaviour, while studies in the field of anthropology emphasise how cultural beliefs and characteristics shape behaviour (Conner & Norman, 2015; Ellen, 2010). Therefore, to provide a better understanding of how different levels of factors influence post-migration dietary and physical activity

behaviours, it is important to develop a theory based on a cross-disciplinary approach to understanding health behaviour.

Among the several behaviour theories used in various academic disciplines (Burke, 2006; Burke & Stets, 2009), acculturation theory, social-ecological theory, social-cognitive theories, and socio-cultural theory were deemed most relevant for this study. Acculturation theory was employed to conceptualise changes in dietary and physical activity behaviours that may have occurred after the SSA migrants in Australia interacted with persons of different cultures. Social-ecological theory guided the understanding that post-migration dietary and physical activity behaviours may be influenced by a synergy of various factors that operate from a broad environmental level to an intra-individual level. Social-cognitive theories assisted in learning about the various thinking pathways through which dietary and physical activity behaviours are performed. Socio-cultural theory was used to address the relationship between socially constructed body standards and how these body standards influence dietary and physical activity behaviours among the SSA migrants. Together, these theories informed the development of an integrated framework for this study which conceptualises the associations and synergistic processes between and across various factors associated with post-migration dietary and physical activity behaviours. Development of this conceptual framework was important as available evidence shows no previous study that has examined the processes leading to post-migration dietary and physical activity behaviours, especially among Australian residents born in SSA. Before proceeding to the integrated conceptual framework, it is, however, important to describe the individually named theories to set the basis for a better understanding of the framework.

### *Acculturation theory*

Newly arrived immigrants may have different experiences in a new environment which may lead to changes in their usual behaviours (Berry, 1997; Bornstein & Cote, 2010; Mesoudi, 2018). Over the past two decades, numerous attempts have been made to theorise the process of adjusting to a new environment after immigration. One perspective which has been widely applied to the understanding of changes in migrants' behaviours is referred to as acculturation (Chakraborty & Chakraborty, 2010; Fox et al., 2017b; Guarnaccia & Hausmann-Stabile, 2016; Iwamasa, Regan, Subica, & Yamada, 2013; Maehler, Weinmann, & Hanke, 2019). Acculturation theory has been conceptualised differently by authors from different fields of study, especially in anthropology and social psychology (Chakraborty & Chakraborty, 2010; Fox et al., 2017b; Guarnaccia & Hausmann-Stabile, 2016). However, the different conceptualisations of acculturation, including those by Fedi et al. (2019), Erten, van den Berg, and Weissing (2018), Titzmann and Fuligni (2015), Chakraborty and Chakraborty (2010), Schwartz et al. (2010), Bhugra (2004) and Berry (1997), converge on the idea that when a group of people with a shared culture come into contact with others of a different cultural orientation, there is a likelihood of subsequent changes in the cultural traits of one or both groups.

According to the acculturation theory perspective, when immigrants arrive in a new country, they either maintain their culturally oriented behaviour or adopt different behaviour patterns from the host society or a dominant social group (Berry, 2005; Mesoudi, 2018). It is believed that acculturation involves a change in individuals' reasonings in order to adjust to the new environment (Mesoudi, 2018). Berry (1980) suggests that in the process of either adopting a different behaviour or maintaining prior culturally oriented behaviour, one of four acculturation schemes is likely to emerge: assimilation, separation, integration or marginalisation. Assimilation refers to a process

whereby immigrants adopt the cultural norms of a dominant group or host country over their own original culture (Berry, 2005; Lechuga & Fernandez, 2011; Pauls, 2019). Separation refers to a process whereby immigrants preserve their own original culture and show indifference towards the culture of a host country or a dominant group. Integration means that immigrants preserve part of their own original culture, and at the same time, adopt some part of the host country or dominant group's culture. Lastly, a process whereby immigrants reject their own original culture, as well as the culture of a host country or a dominant group, is termed marginalisation. Acculturation theory plays an important part in understanding post-migration dietary and physical activity behaviours, as individuals in cultural minority groups are likely to experience continuous contact with people of diverse cultures (Berry, 1997; Mesoudi, 2018; Renzaho & Burns, 2006).

### ***Social-ecological theory***

The main idea behind the social-ecological theory was postulated in the work of Bronfenbrenner in the 1970s, which was focused on understanding the ecology of human development (Bronfenbrenner, 1979). In subsequent years, the social-ecological theory has been applied to several health behavioural research, including the works of Kilanowski (2017), Salihu, Wilson, King, Marty, and Whiteman (2015), Richard, Gauvin, and Raine (2011), Kremers et al., 2006, Swinburn, Egger, and Raza (1999), Stokols, Allen, and Bellingham (1996), and McLeroy, Bibeau, Steckler, and Glanz (1988). Several of these social-ecological theories have been developed to study obesity related behaviours, such as EnRG framework developed by Kremers et al. (2006) and Angelo framework developed by Swinburn et al. (1999). However, most of these frameworks do not theorise obesity-related behaviour in the context of migration, hence, miss the key

interest of this thesis, i.e. the association of migration with dietary and physical activity behaviours.

Social-ecological theory proposes that various levels of influence intersect to shape behaviours, and individuals are thought to be nested within these levels (Conner & Norman, 2015; Golden & Earp, 2012; Riekert, Ockene, & Pbert, 2014). The levels of influence often described by social-ecological theorists include the intra-individual level, interpersonal level, organisational level, community level and broad societal level (Centers for Disease Control and Prevention, 2009). Firstly, broad societal issues, such as health policies and economy are believed to generate an atmosphere within which behaviour is performed or constrained. Secondly, community-level factors, such as cultural norms are believed to encourage the performance or avoidance of the behaviour. Within communities are organisations, such as workplaces and schools which may hold their own expectations of the behaviour. Interpersonal relationships, especially, interactions with friends, partners, and family, may also increase or decrease the likelihood of performing the behaviour. Lastly, intrapersonal level of influence encompasses personal knowledge, attitudes, and beliefs that shape the performance or avoidance of the behaviour (Conner & Norman, 2015; Golden & Earp, 2012; Riekert et al., 2014).

Social ecologists commonly assume that these variety of levels both shape and are shaped by human behaviour (Conner & Norman, 2015; Golden & Earp, 2012; Riekert et al., 2014). It is therefore believed that creating a conducive environment for a behaviour can promote desirable individual behaviours (Harper, Steiner, & Brookmeyer, 2018; Salihu et al., 2015). While social-ecological theories are important for understanding several levels of factors that affect human behaviour, it is often difficult to conceptualise

how these several levels of factors intersect to produce a behaviour (Newes-Adeyi, Helitzer, Caulfield, & Bronner, 2000).

### ***Social-cognitive theories***

Social-cognitive theories were employed in this study to provide a better understanding of how the various levels of factors, as explained in social-ecological theory, intersect to produce a behaviour. Social-cognitive theories contribute to a greater understanding of the cognitive processes involved in the performance of behaviours (Conner & Norman, 2015). Social-cognitive theories suggest that a person's behaviour is the result of his/her cognitive decision-making process (Conner & Norman, 2015). More specifically, they assume that internal factors, such as a person's intention to perform a behaviour, mediate the influence of extrinsic factors (e.g. health policies and socio-cultural norms) on the actual performance or avoidance of a behaviour (Conner & Norman, 2015). These intrinsic factors, especially intention, are considered by several social-cognitive theorists as the proximal determinants of behaviour (Conner & Norman, 2015).

A number of significant social-cognitive theories have been developed by social psychologists, and this study utilises ideas from two of these theories: theory of planned behaviour and theory of triadic influence. The theory of planned behaviour, which was developed by Ajzen (1985), proposes that a person's behaviour is closely determined by his/her intention, and this intention, is a function of other belief factors. Specifically, it is believed that intention is influenced by a person's beliefs about the outcome of the behaviour and the importance of the outcome (attitude); perceptions of whether others will accept or reject the behaviour (subjective norm); and the extent to which the person who is about to perform the behaviour feels he/she can actually perform or avoid the behaviour (perceived behavioural control). In summary, attitudes toward a behaviour,

subjective norms about the behaviour and perceived control of that behaviour, together shape an individual's intention to perform the behaviour, and his/her intention is considered as the most proximal influence on the behaviour. These explanations suggest that to change human behaviour, it is important to concentrate on changing attitudes toward the behaviour; changing beliefs about how significant others will view the behaviour and assisting the individual to focus on his/her self-efficacy to perform or avoid the behaviour.

One other social-cognitive theory that seems to combine useful ideas from both the theory of planned behaviour and social-ecological theory is the theory of triadic influence. The theory of triadic influence, developed by Flay, Snyder, and Petraitis (2009) asserts that different levels of influence affect decisions made prior to behaviour. These levels of influence are categorised into ultimate, distal and proximal levels. As also noted in several social-cognitive theories, the theory of triadic influence emphasizes that intra-personal factors or the internal characteristics of a person, such as intention, have direct and proximal influence on behaviour and are under the control of the individual. In addition, distal factors, which are largely considered as interpersonal relationships, are thought to contribute to the formation of social normative beliefs about a specific behaviour. Social normative beliefs, in turn, are thought to be influenced by motivation to comply with or please significant others. The theory suggests that individuals may have some control over distal factors, but not as much as the proximal factors. As can be observed, distal factors of the theory of triadic influence are similar to the 'subjective norms' explained in the theory of planned behaviour. Ultimate factors, which can be described as macro-environmental factors are thought to be the underlying causes of behaviour, are broad and relatively stable, and individuals have little or no control over

them (Flay et al., 2009). Causation used in this sense is considered as the most probable influence of behaviour, and not a definite predictor of behaviour (Flay et al., 2009).

In agreement with the theory of planned behaviour, the theory of triadic influence assumes that the effects of ultimate and distal variables on behaviour often occur through proximal factors, such as behavioural control (self-efficacy), social normative beliefs, attitudes, and intentions (Conner & Norman, 2015). Flay et al. (2009), however, caution that while most behaviours are based on rational cognitive processes and the weighing of the perceived benefits and/or disadvantages associated with the performance of the behaviour, behaviour can also be affective or emotional and considered less rational.

### ***Socio-cultural theories***

Studying dietary and physical activity behaviours of people of African ancestry without considering socio-cultural factors related to the behaviours is likely to produce an incomplete picture of why certain behaviours are performed (Galli, 1973; Johnson, 2016; Scott, Ejikeme, Clotey, & Thomas, 2012; Thind, Goldsby, Dulin-Keita, & Baskin, 2015). There could be culturally diverse beliefs and perceptions about diets, physical activity, and body sizes in many African cultures, which can influence post-migration dietary and physical activity behaviours (Ibe-Lamberts, 2016; Jakub, Turk, Fapohunda, & Zoucha, 2018; Johnson, 2016; Renzaho, 2004). For example, it is commonly assumed that large body sizes are admired in several African cultures and this assumption, if true, may be associated with weight-related behaviours among the Australian residents of SSA ancestry (Ettarh et al., 2013; Hugo, 2009; Renzaho, 2004).

Socio-cultural theory, which was pioneered by Vygotsky (1978), emphasises the importance of social interactions in human cognitive development and assumes that human learning starts from the social level, between people (inter-psychological), and



later, at the individual level (intra-psychological or within the learner). In other words, socio-cultural theory suggests that interactions among people shape their reasonings and subsequent behaviours that result from their reasonings (Cole, John-Steiner, Scribner, & Souberman, 1978; Marginson & Dang, 2017).

In recent years, socio-cultural theory has been applied in several health-related studies on body image; examples can be seen in the works of Dakanalis et al. (2014), Quick (2013), and Bautista-Diaz et al. (2012). These studies suggest that knowledge of an ‘ideal body image’ is socially constructed and shared among people in a community and these socially constructed body standards affect health behaviour (Dakanalis et al., 2014; Morrison, Kalin, & Morrison, 2004). Notably, it is assumed that internalisation of cultural standards of body size often leads to constant self-appraisal to meet societal standards, which in turn may lead to poor eating behaviours (Dakanalis et al., 2014; Morrison et al., 2004). Given the assumption that persons of African descent admire large body sizes (Ettarh et al., 2013; Hugo, 2009; Renzaho, 2004), applying the socio-cultural theory to body size beliefs among the Australian residents born in SSA and understanding the effects of these beliefs on post-migration dietary and physical activity behaviours were considered an important area for knowledge contribution.

### **Conceptual framework for the study**

Berry’s (1997) acculturation framework helps to understand the process through which a person’s dietary and physical activity behaviour may change after settling in a new country. According to Berry (1997), the likelihood that a person’s behaviour or culture will change after settling in a new country is shaped by moderating factors that exist prior to or arise after settling in the new place. These moderating factors relate both to groups and to individuals and may include socio-demographic and environmental factors, such

as pre/post-migration support, age at first migration, duration of stay in the host country, a migrant's educational level, availability of familiar resources in the host country, among others. Thus, moderating factors shape the nature of a person's psychological acculturation (i.e. whether a person will think of adopting the mainstream culture of the host country and/or maintain his/her pre-migration cultural values). In turn, psychological acculturation may result in practical behavioural outcomes, such as the consumption of traditional foods of the host country.

Berry (1997) has emphasised that some 'mediating' factors may intervene directly between the process of acculturation and behavioural outcomes. However, Berry (1997) has noted that different empirical studies assign different roles to both moderating and mediating factors and it is not possible at this point in acculturation research to unambiguously claim them to be one or the other. Nevertheless, social cognitive theories (e.g. the theory of triadic influence) provide explanations to the pathways through which acculturation, moderating factors, and mediating factors may interact to shape behaviour trajectories (Conner & Norman, 2015). Social cognitive theories assume that moderating factors may shape the nature of a person's acculturation but the propensity for psychological acculturation to result in an actual change in behaviour may be dependent on mediating proximal factors, such as behavioural control (self-efficacy), social normative beliefs, attitudes, and intentions (Conner & Norman, 2015).

Based on evidence from the empirical literature and the various theoretical perspectives, an integrated framework is proposed to capture the conceptual reasoning underlying this study. The framework is graphically presented in Figure 1. It suggests that when a person or group of people migrate to a different country, particularly, a higher income country, they are likely to encounter diverse cultures. As they interact with people of these diverse cultures, especially those belonging to the most dominant culture, they

may begin to learn different norms, values, beliefs, and ways of doing things. In the process, they may adopt the different culture(s) over their own original culture, which is defined in the framework as ‘cultural participation’. In some circumstances, the ‘immigrants’ may maintain their own original culture, despite their interactions with people belonging to other culture(s), and this situation is also defined as ‘cultural maintenance’. Overall, the process involved in the cultural change or maintenance is termed, ‘acculturation’.

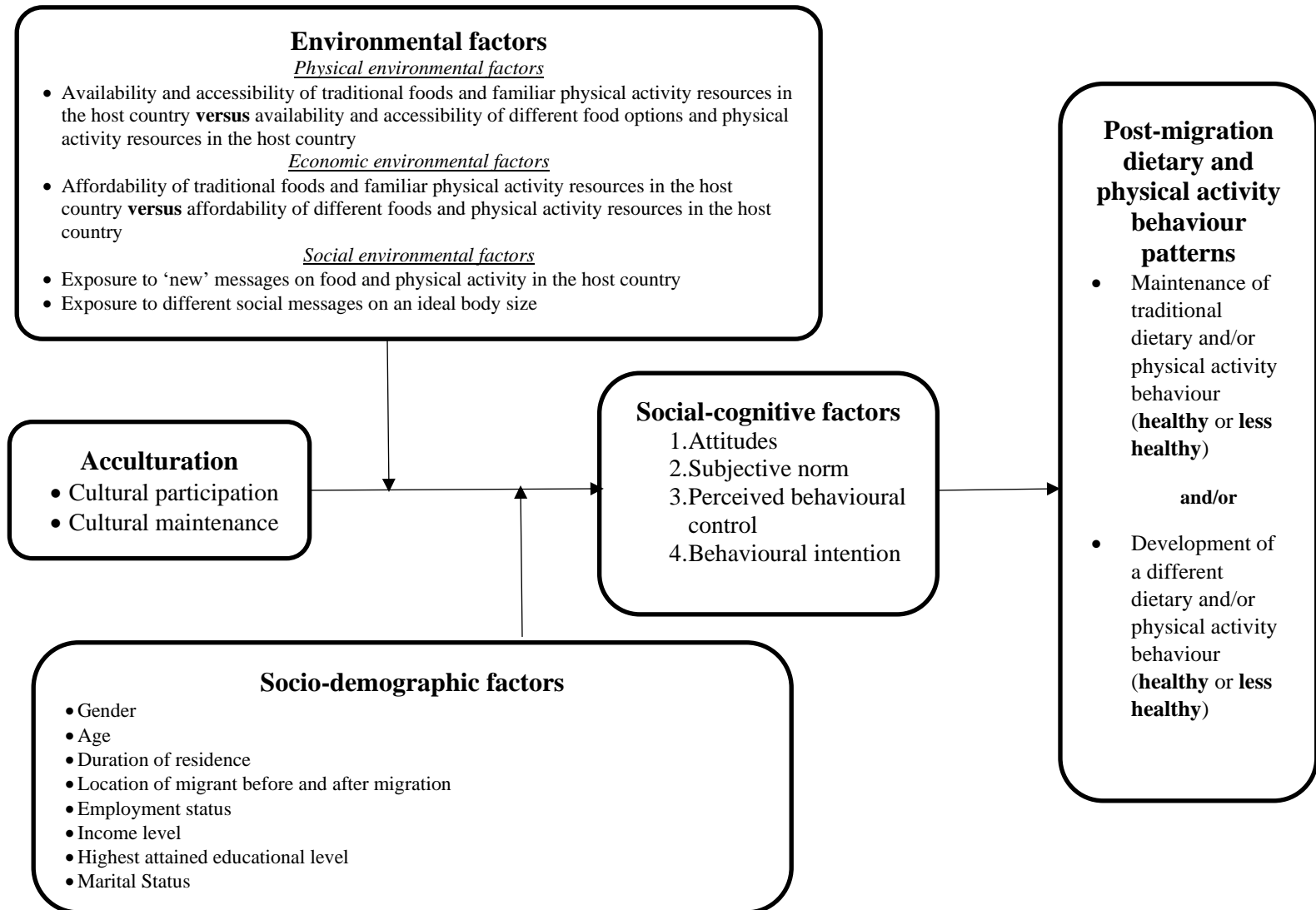
One aspect of an immigrant’s life that may be shaped by this acculturation process is his/her dietary and physical activity behaviour. More specifically, cultural participation may be associated with post-migration changes in dietary and physical activity behaviours. However, the chances that cultural participation will result in changes to dietary and physical activity behaviours may be contingent on other environmental, socio-demographic, and social-cognitive factors.

Environmental factors, in this context, refer to physical, economic and social conditions that are experienced by the immigrant in the host country. The physical environment encompasses the availability and accessibility of traditional foods and physical activity resources in the host country. Even if an immigrant’s traditional foods and familiar physical activity resources are readily available and accessible in the host country, the chances of using them may be affected by their affordability against other options. Exposure of immigrants to ‘new’ messages on food, physical activity, and body size expectations in the host country can also affect their decisions to maintain or change their dietary and physical activity behaviours.

Furthermore, a group of people may acculturate differently after immigration, partly, due to variations in their socio-demographic characteristics, such as gender, age, duration of residence in the host country, location, income level and educational level

(Berry, 1997). For instance, it is believed that young people acculturate more easily than elderly people because their parents' culture (e.g. food traditions) may be insufficiently developed by the time they arrive in the new country (Berry, 1997). The interplay between acculturation and these socio-demographic factors is considered in the framework as an important antecedent of post-migration changes in dietary and physical activity behaviours.

Lastly, the framework shows that the effects of acculturation, environmental factors, and socio-demographic factors on post-migration dietary and physical activity behaviours are likely to be mediated by social-cognitive factors. More specifically, social-cognitive factors, such as beliefs about the likely results of maintaining or changing a dietary and physical activity behaviour (attitude), beliefs about the expectations of significant others in regards to the dietary and physical activity behaviour (subjective norm), and beliefs that one can change his/her own dietary and physical activity behaviour regardless of discouraging situations in the host country (behavioural control), may shape an individual's intention to maintain or change his/her dietary and physical activity behaviour. In turn, the person's intention to maintain or change his/her dietary and physical activity behaviour will most likely result in the performance of the behaviour. Social-cognitive factors are therefore considered as the most proximal determinants of post-migration dietary and physical activity behaviours.



**Figure 1: Proposed framework of factors associated with post-migration dietary and physical activity behaviours**

**Source:** Informed by Flay et al. (2009), Berry (1997), Ajzen (1985), Bronfenbrenner (1979), and Vygotsky (1978)

## **Research Objectives**

The main purpose of this thesis was to investigate the factors associated with the post-migration dietary and physical activity behaviours of the Australian residents born in SSA and provide evidence-based recommendations.

More specifically, the study aimed to:

1. examine associations between post-migration dietary and physical activity behaviours and acculturation among Australian residents born in SSA;
2. assess the specific socio-economic and environmental factor(s) that are associated with the post-migration dietary and physical activity behaviours among the Australian residents born in SSA;
3. investigate body size beliefs among the Australian residents born in SSA, and examine the extent to which such beliefs affect post-migration dietary and physical activity behaviours;
4. test whether socio-demographic characteristics of the Australian residents born in SSA moderate the effects of acculturation on their post-migration dietary and physical activity behaviours;
5. appraise the extent to which social-cognitive factors mediate the influence of acculturation on post-migration dietary and physical activity behaviours among the Australian residents born in SSA.

## **Research Questions**

Given the limited research conducted on the post-migration dietary and physical activity behaviours of the Australian residents born in SSA, the following questions were addressed:

1. To what extent does acculturation affect the post-migration dietary and physical activity behaviours among Australian residents born in SSA?
2. Which specific socio-economic and environmental factor(s) are associated with the post-migration dietary and physical activity behaviours of the Australian residents born in SSA?
3. What body size beliefs exist among the Australian residents who were born in SSA and to what extent do these beliefs relate to post-migration dietary and physical activity behaviours?
4. What socio-demographic factors moderate the effects of acculturation on post-migration dietary and physical activity behaviours among the Australian residents born in SSA?
5. To what extent do social-cognitive factors mediate the influence of acculturation on post-migration dietary and physical activity behaviours among the Australian residents born in SSA?

### **Significance of the study**

This thesis is important for several reasons and makes noteworthy contributions to knowledge in several respects. Firstly, it is widely recognised that the SSA community is one of the fast-growing culturally and linguistically diverse groups in Australia (Hugo, 2009). For instance, between 2001 and 2009, the population of Australian residents born in Sudan increased from 4,900 to 24,796, partly, due to conflict in their home country (Hugo, 2009).

In 2014, a screening project organised by Western Melbourne Regional Development Australia showed that 68 % of African Australians were overweight, obese or morbidly obese which was higher than the national average of 61.3% (Western Melbourne Regional Development Australia, 2014). Despite this important information from the screening project (Western Melbourne Regional Development Australia, 2014), little empirical research has been conducted to understand the contribution of dietary and physical activity behaviours to this weight-related challenge. Findings in this study may inform the application of evidence-based interventions to effectively promote good health in this ethnic group with the hope of reducing the risk of adiposity and weight-related diseases (Glanz, Rimer, & Viswanath, 2008; González-Rodríguez et al., 2017).

Furthermore, there is a persistent assumption that persons of SSA backgrounds admire large body types (Ettarh et al., 2013; Hugo, 2009; Renzaho, 2004) and the opposite is thought to be true among persons of Western cultures (Humenikova & Gates, 2008; Tiggemann, 2012). Interestingly, there is a dearth of research about the extent to which this assumed admiration for large bodies, if true, may change after people migrate from SSA to Western countries. There is also a need to understand whether this assumed body size preference influences dietary and physical activity behaviours among people of SSA



backgrounds. This study contributes to bridging these knowledge gaps by providing empirical evidence on body size beliefs among Australian residents who emigrated from SSA. It further examines the extent to which admiration for large body types may change after immigration and discusses the relationship between body size beliefs and post-migration dietary and physical activity behaviours.

Moreover, prior studies that examined factors associated with post-migration dietary and physical activity behaviours have mostly employed acculturation theory as the conceptual basis and sometimes included socio-demographic characteristics of the participants as descriptive variables. However, research has shown that socio-demographic factors may contribute to variations in acculturation itself and therefore should be studied as such (Berry, 1997; Mendoza, 1989; Nelson-Jones, 2002).

Emerging evidence further indicates that post-migration dietary and physical activity behaviours may be associated with a broader range of factors that are not specified in the acculturation theory (Gebel et al., 2005; Satia-Abouta, 2003). A conceptual contribution from this study is the combination of different theories from various disciplines, including health psychology and sociology into an integrated framework that offers a broader understanding of post-migration dietary and physical activity behaviours. In this study, for example, socio-demographic characteristics of migrants have been examined in terms of the extent to which they moderate the relationship between acculturation and post-migration dietary and physical activity behaviours (Gebel et al., 2005; Satia-Abouta, 2003).

Furthermore, age at migration can influence variations in acculturation, and acculturation, in turn, can affect variations in post-migration dietary and physical activity behaviours (Kimbrow, 2009; Nshom & Croucher, 2018; Wilkinson et al., 2005). However,

many previous studies, for example, (Banna, Kaiser, Drake, & Townsend, 2012; Ngongalah et al., 2018), have commonly looked at participants' current age rather than their age at migration in the study of associations between health-related behaviour and acculturation. Differentiation of age at migration from participants' current age when designing studies is therefore important. This study strictly focused on people who were born and attained at least 18 years of age in SSA before they migrated to Australia.

### **Organisation of this thesis**

This thesis has been written in a publication format and it contains seven chapters. In this first chapter, an overview of the study has been provided, relevant literature related to the topic has been reviewed, a conceptual framework has been proposed, objectives of the study have been stated, research questions have been listed, and the significance of the study has been highlighted. Chapter Two consists of a description of the study design and the research assumption underpinning this study. Information on the study population, study setting, participant recruitment, data collection, data analyses, and ethical considerations is also provided in the second Chapter. The third chapter presents a published manuscript on the social, economic and physical environmental factors associated with post-migration dietary and physical activity behaviours. Chapter Four contains another published manuscript on the socio-cultural beliefs about an ideal body size and implications of these beliefs for post-migration weight gain. In Chapter Five, the interaction effects of acculturation and socio-demographic characteristics on post-migration dietary and physical activity behaviours have been examined. Chapter Six presents a manuscript under peer review on the association of post-migration dietary and physical activity behaviours with acculturation and social-

cognitive factors. A general discussion of the results, strengths, and limitations of the study, recommendations, and conclusions are presented in the seventh Chapter.

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## **CHAPTER TWO: RESEARCH APPROACH AND METHOD**

The various approaches and methods used to elicit and analyse data for this study are presented in the subsequent peer-reviewed manuscripts. Typically, the method section in manuscripts should suffice for a thesis by publication. This chapter, therefore, does not aim to repeat the methods described in the manuscripts but to provide an overview of how the study was conducted. The chapter begins with a description of the philosophical assumption underpinning this study. An account of the research method, study setting, target population, participant recruitment strategies, data collection, data analyses, and ethical considerations are also provided in this chapter.

### **Philosophical foundation of the study**

Over the years, various philosophical assumptions have informed data collection, analyses, and interpretation in social research (Williams, 2006). According to Blaikie (2007), philosophical assumptions differ by two main characteristics: assumptions made about the nature of social reality being investigated (ontological assumptions) and assumptions made about the way in which knowledge of this reality can be obtained (epistemological assumptions). In line with Blaikie's statement of the two philosophical assumptions characterising social research, Morgan (2014) and Dewey (2008) have noted that positivists assume the world exists separately from our understandings of it, while constructivists view the world as created by our conceptions of it.

Morgan (2014) and Dewey (2008) propose that a different philosophical assumption that is commonly known as 'pragmatism' should be recognised in social research. Pragmatism assumes that our experiences are controlled by the nature of our world, and in



turn, our understanding of the world is limited to our interpretations of our experiences (Bryman, 2012; Creswell, 2003; Dewey, 2008; Morgan, 2014). Researchers in support of pragmatism paradigm posit that truth is what works at a time; and that truth is not based on a stringent contrast between the mind and an independent reality (Creswell, 2003; Morgan, 2014).

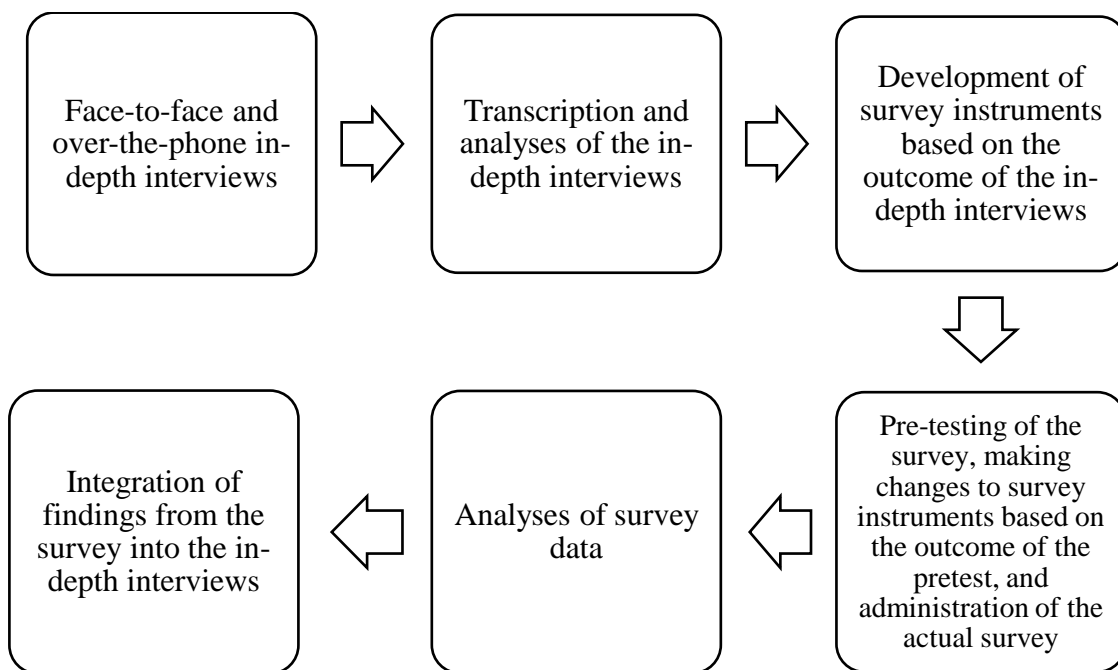
The philosophical assumption underlying this study is grounded in the pragmatism paradigm. This study assumes that factors associated with post-migration dietary and physical activity behaviour patterns exist in a synthesis of people's interpretations of their experiences as well as an independent reality.

### **Research method**

This thesis employed a mixed-methods approach which refers to “a single study based on the pragmatism paradigm, comprising qualitative and quantitative data” (Halcomb & Hickman, 2015, p. 3). There is a school of thought that assumes that combining a number of methods of inquiry reduces the chances of bias in findings and makes the inquiry more reliable (Creswell, 2003; Grix, 2010; Neuman, 2011; Sarantakos, 2013).

An exploratory sequential design that allows for the collection of qualitative data, followed by quantitative data was employed in this study (Creswell, 2014). Justification for the use of exploratory sequential method revolves around the idea that the current dietary and physical activity behaviours were unexplored among Australian residents born in SSA (Berry, 2008; Fourat & Lepiller, 2015; Kim & Popkin, 2006; Popkin, 1993; Satia-Abouta, 2003; Satia-Abouta, Patterson, Neuhouser, & Elder, 2002). As qualitative techniques allow participants to discuss a range of issues in an in-depth and unconstrained manner, this method

was deemed most suitable to explore, describe, and understand the current eating patterns and physical activity behaviour of the study population. Insights from the qualitative data guided the development of a survey instrument which was then used for examining the interplay of the dietary and physical activity behaviours with other independent factors. Figure 2 briefly illustrates the design of this study.



**Figure 2: Study design**

### **The research setting and study population**

There is a long history of population movement between Africa and Australia (Hugo, 2009a). It is known that most Australian residents of African ancestry are concentrated in metropolitan areas, because of the search for job opportunities upon arrival in the country (Hugo, 2009a). In his study analysing the history of migration between Africa and Australia, Hugo (2009a) further highlighted that Sydney and Melbourne, which are the respective

capital cities of the states of New South Wales (NSW) and Victoria, are the main metropolis hosting the largest population of Australian residents of SSA ancestry (Hugo, 2009a). It is estimated that about 380,000 Australian residents were born in Africa (Australian Bureau of Statistics, 2016), with people emigrating from over forty SSA countries. The proportional distribution of the SSA population in Australia varies widely across nationalities, with South Africans, Zimbabweans, Sudanese, Mauritians, and Somalians identified as the majority groups (Australian Bureau of Statistics, 2016).

Study participants were recruited from two states in Australia: NSW and Victoria. Official data from the Australian Bureau of Statistics suggests that more than half of Nigerians (60%), Ghanaians (51%), Eritreans (65%), Tanzanians (64%), South Sudanese (64%), Ethiopians (54%), Somalians (60%), among others, were living in either Melbourne or Sydney in the year 2015 (Australian Bureau of Statistics, 2016).

The criteria for study participation were as follows:

1. persons currently living in Australia;
2. persons who have resided in Australia for at least 12 months, to ensure that participants have settled in the Australian environment and could offer meaningful responses;
3. persons born in a SSA country;
4. persons who have lived in a SSA country until at least 18 years of age.

The study excluded the following category of people:

1. white Australians of SSA ancestry as their food culture is known to be similar to Western food culture (MAZBahr, 2007);

2. persons who do not understand English language, as employing multiple interpreters for the numerous SSA languages was unrealistic. However, given that Australia is an English-speaking country (English language is commonly used at work and in other livelihood transactions), exclusion of non-English speakers had minimal effect on the study.

### **Qualitative phase (in-depth interviews)**

#### ***Participant recruitment***

Using flyers, posters, and word-of-mouth, the qualitative phase of the study was advertised at community gatherings (e.g., churches, mosques, weddings, and food centres) for interested and eligible persons to be identified. A list of eligible and interested participants was compiled, and these participants were called over-the-phone to confirm their time availability. To minimise participant selection bias due to ethnic and demographic diversity, quotas were set for recruitment based on four characteristics: SSA sub-region of origin, gender (men and women), living arrangement (living alone or with persons of familial relationships) and current state of residence (living in NSW or Victoria). Using the United Nations' classification of African regions and sub-regions as a guide (The United Nations, 2017), four sub-regions of origin were distinguished: Western Africa, Eastern Africa, Central Africa, and Southern Africa. A similar recruitment strategy was used in the previous work of Renzaho (2006).

### ***Sample size***

Graff (2014) has noted that a qualitative phase of a mixed-methods study comprises typically 30 or fewer cases. In his analysis of sample size saturation in Ph.D. studies employing qualitative interviews, Mason (2010) also argued that on average, little that is ‘new’ comes out of transcripts after interviewing 20 people. Given the lack of adequate consensus on a desirable sample size for a qualitative phase of a mixed-methods study, a data saturation strategy was employed. A continuous comparison of interviews was conducted until a point where additional data did not generate any new information. Data saturation was achieved after interviewing the 24th participant.

### ***Data collection***

Eligible and interested participants were given options to provide either written or orally recorded consent after detailed information about the study had been presented to them. Interviews were conducted face-to-face or by telephone, depending on a participant's preference. Twenty participants preferred a telephone interview whereas four opted for a face-to-face interview. With assistance from some SSA community organisations (particularly, Carers of Africa Inc. and God’s Power Ministries), a safe and comfortable meeting place was arranged for participants who preferred face-to-face interviews. Interviews took between 20 and 80 minutes to complete and were only recorded after receiving consent from the participant. Nevertheless, one participant who opted for a face-to-face interview did not want to be recorded and preferred the interviewer to take notes instead. Participants were given the opportunity to freely withdraw at any time from the study

without affecting their relationship with the interviewer or any other organisation supporting the study.

An in-depth interview guide (see APPENDIX VI), open-ended questions and probing techniques were used to elicit responses from participants. The interviews mainly focused on dietary intake, food preparation and purchasing patterns as well as participants' engagement in physical activity (leisure-time activities, transportation, occupation, household chores, play, sports, and other planned exercise). At the start of the interview, participants were asked to provide a background story of their migration to Australia. They were then asked to give an account of their dietary and physical activity behaviour prior to migrating. Next, participants were requested to provide a 24-hour account of their current dietary and physical activity behaviour. Using probing technique, participants were asked to describe aspects of their current dietary and physical activity behaviour that were uncommon to them before migrating to Australia. Further questions were asked to elicit a deeper understanding of how these behaviour patterns have changed over time, and the underlying individual, interpersonal, cultural, economic, and environmental factors accounting for the behaviour change.

### ***Data management, coding, and analysis***

Pseudonyms were assigned to each participant, and the interviews were transcribed verbatim. Half of the data were transcribed by a transcription agency and the other half was transcribed by the interviewer. The anonymous data have been stored at the University of New South Wales' (UNSW) one drive storage system. Using NVivo (version 11) qualitative data analysis software, transcripts were coded, and thematic content analysis was undertaken.

Transcripts were thoroughly read thrice, and similar ideas were assigned unique colour codes. Based on the recurrence of an idea, the sequence within which ideas were reported, and the extent to which one idea appeared to be associated with another, the coded transcript was reorganised into themes and sub-themes. Inspired by Blaikie's (2007) constructionist approach to analysing qualitative data, the data were examined based on participants' own interpretation of their experiences. Nevertheless, participants' opinions were carefully distinguished from their lived experiences.

### **Quantitative phase (survey)**

After the qualitative interview data were transcribed and analysed, the outcome was used to inform the development of a questionnaire for the quantitative phase of this study (see APPENDIX VII). The questionnaire was also informed by some previous studies on this topic, such as the work of Block (2000). The questionnaire was sent to the Human Research Ethics Committee of the UNSW for approval before the commencement of data collection.

### ***Participant recruitment***

After receiving approval from UNSW's Human Research Ethics Committee, the survey was advertised at African community gatherings, particularly, in churches, mosques, weddings and food centres. Flyers, posters, and word-of-mouth were the main modes of advertisements. To increase awareness of the study among the targeted population, some non-governmental African community organisations (e.g. Carers of Africa Inc., God's Power Ministries, Ghana Association of NSW, Ghana Association of NSW, Ethiopia Community Association, and Eritrean Community in NSW) were consulted to assist with advertising and

promoting the research. Through the social communication platforms (e.g. email, WhatsApp and community meetings) of these organisations, eligible persons were invited to voluntarily participate in the study. Participants were self-selected to ensure the inclusiveness of persons from diverse backgrounds.

### ***Sample size calculation***

After exploring the Australian Bureau of Statistics' website and contacting some key people, with the goal of gathering data on the study population, it was realised that the desired data were limited. The lack of adequate data on the target population constrained the development of a sample frame for the survey. Given the lack of adequate data on persons who meet all the criteria for participating in the study, Cohen's idea for estimating a desirable sample size was adopted (Chuan & Penyelidikan, 2006; Cohen, 1992).

Cohen's analysis is based on four factors used in making statistical inferences: significance level or criterion, population effect size, desired power, and estimated variance (Chuan & Penyelidikan, 2006; Cohen, 1992). The statistical level of significance for most studies is fixed at  $\alpha = .05$  (Chuan & Penyelidikan, 2006; Cohen, 1992). Alpha is the probability of wrongly rejecting the null hypothesis, thus committing Type I error. A population effect size refers to an estimated degree to which the issue being studied is present in the population or the degree to which the null hypothesis is false (Cohen, 1992). Desired power means the probability that a statistical significance test will lead to the rejection of the null hypothesis for a specified value of an alternative hypothesis (Cohen, 1992). Cohen (1992) has suggested fixing the statistical power at .80 ( $\beta = .20$ ), which is also a convention proposed for general use. Cohen (1992) has also proposed that a medium effect size is



desirable, as it would be able to approximate the average size of observed effects in various fields.

To make work easy, Cohen (1992) has determined desirable sample sizes for several statistical tests and their respective significant levels in research. For instance, to detect a medium degree of association in a quantitative study at  $\alpha = 0.05$ , a sample size of at least 76 is needed for a multiple regression analysis involving 3 degrees of freedom (Cohen, 1992). Table 1 displays Cohen's recommendations for desirable sample sizes for correlation and multiple regression analyses.

Participants were conveniently sampled for the survey as the target population is a hard to reach group and there was no available list of all the members. As convenient sampling method stands at a high risk of not representing the target population, quota sampling strategy was also employed to address this limitation. A minimum quota of 50 samples was allotted to each sub-Saharan African (SSA) sub-region of origin (i.e. Western, Eastern, Central, and Southern Africa) to enhance an adequate representation of persons from the different SSA sub-regions. A similar quota sampling strategy was successfully applied in a previous study (Renzaho, 2006). Based on Cohen's (1992) sample size recommendations for multiple regression analyses, a minimum sample size of 107 was set for each of the two Australian states: NSW and Victoria. Additionally, qualitative in-depth interview data were used to complement the quantitative results.

**Table 1: desirable sample sizes for medium effect, at .80 power, and for .05 alpha**

Test	Recommended sample size for a medium effect
<i>Correlations</i>	85
<i>Multiple Regression</i>	
$2k^b$	67
$3k^b$	76
$4k^b$	84
$5k^b$	91
$6k^b$	97
$7k^b$	102
$8k^b$	107

$k$ = number of cells;  $b$ =number of independent variables; **Source:** Cohen (1992)

### ***Pre-testing of questionnaire***

A pre-test of the questionnaire was conducted before the main data collection, in order to ensure that the questions were easy to understand by the respondents from the different SSA countries. The pre-test was conducted among 10 volunteers from the Australian cities of Perth and Adelaide who visited Sydney for an African community programme. Upon receiving feedback from these volunteers, some questions were reworded to increase their clarity to participants.

### ***Data collection***

Data were collected from November 2017 to September 2018. The survey was distributed in hard copy and was self-complete; however, participants were assisted when required. Interested and eligible persons who could not complete the survey instantly were directed to an online version developed using Qualtrics software. The survey questions focused on retrospective, current, and prospective dietary and physical activity behaviours. Fat intake and fruits/vegetables/fibre intake were used as indicators of dietary behaviour (see APPENDIX VII). Physical activity was assessed based on activity at work, activity during travel, and activity during recreational events (see APPENDIX VII). Acculturation was measured using two sub-scales: cultural maintenance and cultural participation (see APPENDIX VII). Social-cognitive factors were measured based on attitudes, subjective norms, behavioural control, and intention. Details of the various measures used in the study have been provided in the manuscripts presented in the subsequent chapters. Of the 304 paper surveys that were distributed, 221 were completed and returned by participants. In addition, 32 surveys were completed online making a total of 253 completed surveys. Based on Cohen's power analysis, the sample size of 253 was deemed sufficient for examining significant associations among the variables of interest (Cohen 1992).

### ***Data coding, analysis, and management***

After the fieldwork, the anonymous questionnaires were serially numbered for easy identification. The data were scrutinised and cleaned. Using the Statistical Product for Service Solutions (SPSS) version 25 software, a data coding template was developed, and the data were fed into the computer for analyses.

Data were analysed using univariable and multivariable statistics. Where appropriate, means, standard deviations, and frequency distributions have been used to describe the data. Correlation and multiple regression analyses were conducted to explore associations among the several variables of interest. Internal consistency for all scales was measured using Cronbach's alpha and Hayes' (2018) PROCESS macro Version 3 for SPSS was used to test for interaction effects among the variables of interest.

The data in printed format have been kept at the Centre for Social Research in Health (CSRH), UNSW, whereas the soft copy has been stored on UNSW's OneDrive data storage system. Further details of the data analyses have been presented in the manuscripts presented in the fifth and sixth chapters of this thesis.

### **Ethical considerations**

Copies of the research proposal, questionnaire, interview guide, and other required documents were forwarded to the Human Research Ethics Committee of the University of New South Wales for approval. After receiving approval from the ethics committee (Reference Number: HC17018), a letter highlighting the purpose, content, ethical aspects and rights of participants was sent to the African community organisations that supported the study.

Participation in the study was entirely voluntary and eligible persons were provided with adequate information highlighting the purpose and content of the study. Participants were not required to provide any identifying information and interviews were only audio-recorded upon receiving consent from participants. Participants were not required to answer questions they did not wish to answer.

Participants were informed about the storage and usage of data in the thesis and for publications. The data collected were anonymous. Electronic files containing participant responses were encrypted with a password during data transfer or storage.

Although this study was classified as a low-risk type, it was possible that some participants would show emotional discomfort during the interviews. Participants were informed about their rights to withdraw from the study and a list of free phone counselling services were provided orally and on the participant information sheet. However, no participant showed emotional discomfort during the interviews.

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# **CHAPTER THREE: DETERMINANTS OF POST-MIGRATION CHANGES IN DIETARY AND PHYSICAL ACTIVITY BEHAVIOURS AND IMPLICATIONS FOR HEALTH PROMOTION: EVIDENCE FROM AUSTRALIAN RESIDENTS OF SUB-SAHARAN AFRICAN ANCESTRY**

## **Introduction**

This chapter consists of a published manuscript on factors associated with post-migration changes in dietary and physical activity behaviours. The manuscript was based on outcomes from the qualitative in-depth interviews.

**Determinants of post-migration modifications to dietary/physical activity behaviour and implications for health promotion: evidence from Australian residents of sub-Saharan African (SSA) ancestry**

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**Data accessibility statement**

The data supporting this study has been deposited in the OneDrive system of the University of New South Wales. Interested persons might require permission to access the data.

## **Abstract**

**Issue addressed:** Several studies have attributed excess weight gain after immigration to changes in dietary and physical activity behaviours. However, recognising the main factors that are associated with post-migration changes in dietary and physical activity behaviours is less clear, particularly among Australian residents of sub-Saharan African (SSA) ancestry. Drawing on acculturation theory, this study examines main factors driving changes in dietary and physical activity behaviours among Australian residents who were born in SSA and provides insight into the extent to which the factors are related to immigration.

**Methods:** A qualitative design based on a phenomenological approach was employed and a quota sampling technique was used to recruit 24 study participants for in-depth interviews.

**Results:** The study found significant self-reported changes in dietary and physical activity behaviours after immigration that increase the risk of excess weight gain. The changes in dietary and physical activity behaviours were mainly driven by issues related to availability, accessibility, and affordability of dietary and physical activity products. Time management and factors related to convenience also emerged as key determinants of change in dietary and physical activity behaviours. Apparently, some factors noted by participants shape dietary and physical activity behaviours irrespective of immigration, and these factors include tastes and cravings for foods; friends and family influence on behaviour; and misconceptions about food and exercise.

**Conclusion:** Migration from SSA to Australia contributed to changes (mainly less healthy) in dietary and physical activity behaviours. To a large extent, post-migration changes in dietary and physical activity behaviours were driven by socio-economic and environmental factors.

**So what?** Health promotion programmes that address the risky behaviours associated with excess weight gain among Australian residents of SSA ancestry should pay more attention to socio-economic and environmental factors.

**Keywords:** behaviour change, culturally and linguistically diverse people, nutrition, obesity, physical activity

## **Introduction**

Over the years, there has been an increasing interest in understanding the impact of immigration on population health, as many countries host immigrants from various regions across the world (Zimmerman, Kiss & Hossain, 2011). The past decade has seen numerous studies suggesting that immigrants are, on average, healthier than native-born residents due to pre-migratory health screening and selectivity, commonly termed the “healthy immigrant effect” (Moullan & Jusot, 2014; McDonald, Farnworth & Liu, 2017; King, Feeley, Gold, Hayton & Zelkowitz, 2018). In recent years, a number of studies have argued that the supposed health advantage of foreign-born over locally born residents of a country decreases with time, and post-migration weight gain has been proposed as one of the main indicators of immigrants’ health status decline (Jatana, Pasupuleti & Richardson, 2014; Anikeeva, Bi, Hiller, Ryan, Roder, & Han, 2015). For instance, an analysis of data drawn from the Australian Bureau of Statistics found that Australian residents born overseas initially had lower rates of adiposity than those born in Australia, but they gained significant weight as their duration of residency increased (Australian National Preventive Health Agency, 2014).

Several studies have attributed post-migration weight gain to the consumption of less healthy diets in host countries, especially in situations where the migration flows from a lower to a higher income country (Dassanayake, Gurrin, Payne, Sundararajan, & Dharmage, 2011; Faskunger, Eriksson, Johansson, Sundquist, & Sundquist, 2009; Hauck, Hollingsworth, & Morgan, 2011). However, what factors are associated with immigrants’ consumption of less healthy diets is less clear, particularly among Australian residents who were born in sub-Saharan Africa (SSA) (Ding & Gebel, 2012; Satia-Abouta, 2003). Additionally, the distinction between immigration-induced factors influencing changes in

dietary and physical activity behaviours and factors influencing dietary and physical activity behaviours irrespective of immigration is unclear in the empirical literature (Renzaho, 2006). Furthermore, whereas several studies have emphasised dietary change as the main reason for post-migration weight gain, the potential contribution of physical inactivity to post-migration weight gain has received less attention (Renzaho, 2006; Goff, Timbers, & Style, 2015; Holmboe-Ottesen, Wandel, Knight, 2012).

Research has shown that using theory to understand behaviour and develop interventions can generate better outcomes than interventions developed without theoretical bases (Fishbein, 2006; Glanz & Bishop, 2010). Several previous studies have employed acculturation theory to explain changes in weight-related behaviour after migrating to a new country (Renzaho, 2006; Martinez, 2013; Satia, 2010; Terragni, Garnweidner, Pettersen, & Mosdol, 2014; Blanchet, Nana, Sanou, Batal, & Giroux, 2018). Berry defines acculturation as “the dual process of cultural and psychological change that takes place as a result of contact between two or more cultural groups and their individual members” and has proposed a framework applicable to acculturation-related studies (Berry, 1997). The framework suggests that cultural maintenance and cultural participation are essential in the process of acculturation. Based on a person’s attitude towards their own culture and the culture(s) in the host country, one of four acculturation strategies may be employed: assimilation, separation, integration, or marginalisation (Berry, 2005). Assimilation denotes that a person or group of people adopt the usually dominant culture of a host country over their own culture (Berry, 2005). Separation refers to a person or group of people preserving their original culture and avoiding the (dominant) culture of the host country (Berry, 2005). Integration refers to a person or group of persons preserving parts of their own culture and adopting parts of the

dominant culture of the host country (Berry, 2005). Marginalisation occurs when a person or group of people do not maintain their original culture nor integrate into the dominant culture in a host country (Berry, 2005). In the long term, a relatively stable change, termed adaptation, may take place due to demands of the new environment and/or attitudes towards other culture(s) (Berry, 1997). The framework proposes that adaptation is a gradual process that takes place with time and is associated with moderating factors that exist prior to acculturation (e.g., personality) as well as moderating manifesting factors during acculturation (e.g., social support from host community members). These moderating factors are further categorised as individual or group-level factors (Berry, 1997). Individual-level factors also called “person variables,” include a person’s age, gender, educational level, motivation for migrating, and personality. Group-level factors, which are also known as “situational variables,” comprise conditions in the society of origin and/or the society of settlement, such as the political context, economic situation, and ethnic attitudes (Berry, 1997).

Drawing on acculturation theory, previous studies have suggested that post-migration changes in dietary behaviours are associated with the extent of an immigrant's assimilation into the host society culture(s) (Renzaho, 2006; Satia, 2010; Terragni et al., 2014, Blanchet et al., 2018; Osei-Kwasi et al., 2017). However, it is unclear what the main factors are that influence a person or group of people to adopt a new dietary and physical activity behaviour after migrating to a new country. This qualitative study examines the dietary and physical activity behaviours of Australian residents who were born in SSA and explores self-reports of factors that may be associated with their post-migration dietary and physical activity behaviours. Insights into factors that are associated with post-migration dietary and physical

activity behaviours in this ethnic minority group may provide important information for health promotion responses that address less healthy dietary and physical activity behaviours and related non communicable diseases (NCDs).

## **Methods**

### ***Design***

This study employed a qualitative cross-sectional design. Using a phenomenological approach, data were collected regarding participants' experiences and perceptions. More specifically, semi-structured interviews were conducted in the study.

### ***Research setting and study participants***

The interviews were conducted in two major Australian states: New South Wales (NSW) and Victoria. These two states host the largest population of Australian residents of SSA ancestry (Australian Bureau of Statistics, 2016). The inclusion criteria for study participation were as follows:

1. currently living in Australia;
2. resided in Australia for at least 12 months, to ensure that participants had settled in the new environment and could offer meaningful responses;
3. born in a SSA country; and
4. lived in SSA country until at least 18 years of age.



### ***Participant recruitment***

Using flyers and word-of-mouth, the study was advertised at community gatherings (e.g., churches, mosques, weddings, and food centres) for interested and eligible persons to be identified. A list of eligible and interested participants was compiled, and these participants were called over-the-phone to confirm their time availability. To minimise the participant selection bias due to ethnic and demographic diversity, quota sampling was conducted. Quotas were set based on four characteristics: SSA sub-region of origin, gender, living arrangement and current state of residence. Using the United Nations' classification of African regions and sub-regions as a guide (The United Nations, 2017), four sub-regions of origin were distinguished: Western Africa, Eastern Africa, Central Africa, and Southern Africa. A maximum quota of eight participants was allotted to each SSA region of origin. The selection of participants from each sub-region also paid specific attention to gender balance (men and women); living arrangements (living alone or with persons of familial relationships); and place of residence (living in NSW or Victoria).

### ***Data collection***

Eligible and interested participants were given options to provide either written or orally recorded consent after detailed information about the study had been presented to them. Interviews were conducted face-to-face or by telephone, depending on a participant's preference. A safe and comfortable meeting place was arranged for participants who preferred face-to-face interviews. Interviews took between 20 and 80 minutes to complete and were only recorded after receiving consent from the participant. Nevertheless, one participant did not want to be recorded and preferred the interviewer to take notes instead.

Participants were given the opportunity to freely withdraw at any time from the study without affecting their relationship with the interviewer or any other organisation supporting the study. Questions were open-ended and probing was used, when required, to promote in-depth responses. Participants were asked questions about their migration history, their demographic characteristics, and issues related to their settlement in Australia. The questions also covered the extent to which participants' dietary and physical activity behaviour patterns changed over time and their views on underlying factors accounting for any behaviour change. Continuous comparison of interviews was conducted until a point where additional data did not generate any new information. Data saturation was achieved after interviewing the 24th participant.

### ***Data management, coding, and analysis***

Pseudonyms were assigned to each participant, and the interviews were transcribed verbatim. Using NVivo (version 11) qualitative data analysis software, transcripts were coded, and thematic content analysis was undertaken. Transcripts were thoroughly read thrice, and similar ideas were assigned unique colour codes. Based on the recurrence of an idea, the sequence within which ideas were reported, and the extent to which one idea appeared to be associated with another, the coded transcript was reorganised into themes and sub-themes. A "constructionist" strategy of data analysis was employed which involved analysis of results based on participants' own interpretation of their experiences (Blaikie, 2007). Nevertheless, participants' opinions were carefully distinguished from their lived experiences.

### ***Ethical considerations***

Ethical approval (Reference Number: HC17018) was received from the Human Research Ethics Committee of the University of New South Wales (branded as UNSW Sydney). The study was conducted in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research. Informed consent, anonymity, privacy, and confidentiality were ensured with respect to data collection, storage, and reporting.

## **Results**

### ***Participant characteristics***

An overview of participant socio-demographic characteristics is presented in Table 1. Of the 24 participants, more than half ( $n = 14$ ) were men and 10 were women (Table 1). The average age of participants was 36 years. The oldest participant was 54 years, while the youngest was 21 years. All participants had attained at least high school education and most ( $n = 17$ ) had tertiary level education. At least three participants originated from each SSA sub-region (Western, Southern, Eastern or Central Africa). More than half ( $n = 14$ ) were living in New South Wales (NSW) and 10 were residents of Victoria (Table 1). The longest period a participant had lived in Australia was 24 years, while the shortest was 1 year.

**Table 1: Summary of participants socio-demographic characteristics**

Socio-demographic Characteristics	N=24
<i>Gender</i>	
Male	14
Female	10
<i>Current Age (years)</i>	
20-29	6
30-39	11
40-49	4
50+	3
<i>Age before migration (years)</i>	
18-27	15
28-37	4
38-47	4
48+	1
<i>Highest attained educational level</i>	
Basic	-
High School	2
Tertiary	17
Other forms of formal education	5
<i>Religious affiliation</i>	
Christianity	12
Islam	1
Non-assigned	11
<i>sub-Saharan African region of origin</i>	
Western Africa	6
Eastern Africa	7
Southern Africa	8
Central Africa	3
<i>State of residence</i>	
New South Wales	14
Victoria	10
<i>Duration of stay in Australia (years)</i>	
<2	1
2-5	5
6-10	8
11-15	8
16-20	1
20+	1

### *Changes in dietary behaviour*

Nearly all participants reported significant changes in dietary behaviour after migrating from SSA to Australia, though some aspects of their local African dietary practices continued. The reported changes in dietary behaviour mainly include regular eating out-of-home; modifications to food preparation methods; changes in eating periods; changes in eating frequency; replacement of organic foods by processed and genetically modified options; and replacement of local African foods by “new” products.

Eating at restaurants nearly every week, regular consumption of fast food and snacking between meals emerged as some of the newly acquired dietary behaviours in Australia. Three participants described their newly developed dietary behaviours as follows: *“when I was back home (in DR Congo),... I never grew up going to eat out at a restaurant...It has never really been part of my culture”* (Boala, male, 29 years).

...I've found that in Australia, I eat a lot more fast foods than I used to when I was in Kenya. A lot more chips, a lot more burgers and a lot more fast foods than I used to.... (Kubatine, male, 33 years)

...because there are so many fast food outlets (in Australia), I would go and have maybe an English breakfast, which would be like eggs, bacon, and toast. Maybe hash browns if I'm really hungry...Later on, I may have a snack. (Daniel, male, 32 years)

Modifications to cooking methods, to make meal preparation quicker and less boring, also recurred in the interviews. Some participants used “ready-made” sauces and spices purchased from supermarkets and Asian food shops for meal preparation, in contrast to the

period before immigration when they seasoned foods with “organic” vegetables. One participant said:

...A lot of the foods are cooked from scratch (*referring to cooking in SSA*). If you wanted to make a sauce, for example, there wasn't such a thing as the Coles and you get a premium sauce and all you had to do is just cook your meat and then put the sauce into it. No! You had to make everything from scratch... (Boala, male, 29 years)

Moreover, late eating and skipping breakfast were commonly reported in the interviews. Two participants described their experiences in the following words: “*instead of having breakfast,...I can just drink a bit of water...*” (Baba, male, 41 years); “*...sometimes you come from work late. Even if you eat, you won't settle down to eat well*” (Awo, female, 27 years).

With respect to changes in eating frequency, many participants shifted from their traditional routine of eating three to four meals a day to eating twice and eating during free times at work or school.

For instance, one participant noted:

... I was living in my parents' house which involved breakfast at a certain time, usually around 06:30, lunch at around 12:30 then dinner by 19:00. Whereas in Australia, because I'm now more independent, sometimes I can eat my dinner a bit late or usually around 21:00... So, I found that in Kenya, I had a routine, or a fixed time for my meals, whereas, in Australia, it is mainly dependent on how busy the day is... (Kubatine, male, 33 years)

Additionally, while a number of participants continued to eat their local African foods, they noted an increase in the frequency of eating carbohydrates (particularly rice) as well as soft drinks. Two participants explained in the following quotes:

In Uganda, my major food is bananas and (to) some extent rice. Now, my major food here is to eat rice...Basically, rice and maybe chicken are the main things that I eat here” (Yaro, male, 38 years);

“...back home (DR Congo), it’s not every day that I got to drink Coke. It’s not every day that I got to drink Fanta. Again, these were things I would consume on certain occasions” (Boala, male, 29 years).

Furthermore, participants noted a change in the quality of food they consume. More precisely, they perceived Australian foods as lower, in terms of quality, than foods in SSA. Australian foods, particularly vegetables and dairy products, were described by participants as “genetically modified,” as Ajo (female, 54 years) claimed: *“although we are trying to make some good choices, we are not guaranteed the sources of these foods,... given the fact that most of these present or current foods are GM (genetically modified).”*

Participants also believed that foods in Australia taste differently from foods in SSA. For instance, Olu (male, 49 years) said: *“...over there (referring to Nigeria), they (foods) are more natural...the tastes of food here is a little bit different. Because they (foods) are more organic over there (Nigeria).”*

Lastly, some participants reported that they consume “Australian” food products in place of local African foods. According to them, consumption of “Australian” products was partly associated with limited availability or accessibility of local African foods. For example, Ali (male, 32 years) said: *“... not getting all the necessary ingredients and stuff, or the right stuff to prepare them ... So, instead of having corn or something, you have to eat semolina.”*

### ***Factors related to changes in dietary behaviour***

When asked to explain why their dietary behaviours had changed after immigration, participants noted various factors. In line with the acculturation framework, factors raised by participants are categorised as either personal or situational (Table 2). The main situational factors reported by participants include: high cost of local African foods in Australia; more time needed to prepare local African foods compared with Australian foods; easy accessibility of fast and processed foods in Australia; limited availability or accessibility of some local African foods in Australia; and longer working hours in Australia compared with SSA. Some personal factors noted by participants appear to influence dietary behaviour irrespective of immigration, and these factors are: tastes and cravings; motivation to eat healthy foods; ageing; changes in responsibility for meal preparation; reluctance to explore new foods; cultural preference for large body size; request for particular foods by family and friends; and exposure to social media advertisements (Table 2).



**Table 2: A summary of reported factors related to dietary behaviour**

Main factors and categories	Example of quotes/explanations from participants
<i>Personal factors</i>	
reluctance to explore new foods	"...I think I have a weakness. I don't usually explore so many kinds of different foods." (Yaro, male, 38 years)
tastes and cravings	"You just ask your body what you want to eat. Like... something yummy and something good in your mouth" (Barbara, female, 25 years)
motivation to eat healthy foods	"... I need to be strong, healthy and fit, pretty much... So that's what influences all those elements of food I eat" (Baba, male, 41 years)
ageing	"I think as I grow older, I'm becoming more sensitive to what I eat..." (Kubatine, male, 33 years)
changes in responsibility for meal preparation after migrating to Australia	"Eating back home (Zimbabwe), because my mother would cook, ..., we would eat earlier. So, we'd have our breakfast in the morning, probably say between 8 to 10, or 11...And then in the afternoon for lunch itself, that would be anywhere from 12, 12:30 to maybe 2 o'clock. And then for dinner that could be anywhere from 5:30, 6 o'clock, to 8. Whereas now my eating varies. Like... I can eat anytime. Also, because I live by myself and I cook for myself, I tend to eat when I'm available to eat." (Faya, male, 37 years)
cultural preference for large body size	"I think when I met her, she wanted me to gain weight and she succeeded. ( <i>laughter</i> )...I think maybe it is a cultural thing where if I gain weight, then it means she is doing a good job as a wife" (Don, male, 31 years)
request for particular foods by family and friends	"I would say that actually, my husband is the one who is more cautious about what he eats.... Some things I can't cook because of him." (Abigail, female, 36 years)
social media advertisements	"Now, I'm watching television, you Google. From where I came from (Nigeria), Google was not rapid ( <i>slow internet</i> ). Now with your mobile phone, you can actually find what information you need about your health... By getting information, you make choices." (Olu, male, 49 years)

Table 2 continued.	
<i>Situational factors</i>	
high cost of local African foods in Australia	“... in Australia, I find that I don't eat as much fruit as I used to back home. Fruit was more readily available and a lot more affordable. I also used to love, and I still do love, avocado, but in Australia, they are almost a luxury” (Kubatine, male, 33 years)
more time needed to prepare local African foods compared with Australian foods	“I found that most of our meals ( <i>local African meals</i> ), they take a bit of time to cook. So, I've adapted to the Australian..., so if I'm in a hurry I'll just do some noodles, put some vegetables which I don't have to boil. It doesn't take much time.” (Abigail, female, 36 years)
easy accessibility of fast and processed foods in Australia	“...coming to Australia,...because fast foods are all accessible, you would have to put in a lot of effort if you want to eat clean ( <i>eat healthy</i> )” (Lovia, female, 39 years)
limited availability or accessibility of some local African foods	<p>“... due to the lack of, you know, African stores selling a lot of the ingredients if I would need to make my African meals, or my Kenyan meals, I've found that I've had to do without them.” (Kubatine, male, 33 years)</p> <p>“...The truth of the matter is that my eating habits in Australia have been different. Because some of those foods I was mentioning, you get it because you are in the village (<i>in Nigeria</i>). You don't buy them...You just go to the forest and just get it...” (Olu, male, 49 years)</p>
longer working hours in Australia compared with SSA	“My eating behaviour has changed... because back home, I used to eat as normally as three times, or four times a day. But, since I came here ( <i>Australia</i> ), I've been eating only twice a day because of the job I'm doing. You have to leave the house in the morning. You only have to take breakfast. When you go to work, you only have a cup of tea, maybe when it's break time...You just take something light, like biscuits, cakes ... Then, when I go back in the evening, I eat my dinner and then it's time
low cost of some familiar food products in Australia	“... I realized when I came here ( <i>Australia</i> ), I would drink a lot of these Coca-Colas, Fantas, energy drinks, because they were really cheap for me” (Boala, male, 29 years)

### ***Changes in physical activity behaviour***

When asked to report any changes in their physical activity behaviour between the periods in SSA and Australia, participants noted changes in amount and type of physical activity. With respect to changes in the amount of physical activity, almost all participants said their physical activity levels reduced after they settled in Australia. For instance, one participant said: “... *I don’t exercise as much as I used to in Ghana. I used to do a lot of exercise back in Ghana, but I’m not able to do that much exercise here*” (Nat, male, 37 years).

Regarding changes in the type of physical activity, participants reported that physical activity in SSA was usually spontaneous whereas a deliberate plan, such as gym attendance is required in Australia to remain physically active. Faya (male, 37 years) explained: “*so back home, I’d walk more. And even just playing with friends and running around, I’d do that quite a lot. But here, I will go to the gym, so I’m active in that sense... but I feel like it’s very different.*”

### ***Factors related to changes in physical activity behaviour***

A summary of factors that participants thought had influenced changes in their physical activity behaviour after immigration is shown in Table 3. These factors (mainly situational factors) include availability and easy accessibility of convenient or mechanised resources in Australia (e.g., cars, elevators and laundry machines); high registration and gym membership fees in Australia; colder weather conditions in Australia; and relatively structured and rigid schedules in Australia.

Similar to that observed for changes in dietary behaviour, some personal factors raised by participants appear to be associated with physical activity behaviour irrespective of

immigration. As shown in Table 3, these personal factors are as follows: misconceptions about physical activity, sedentariness after immigration, feeling insecure when engaging in “outdoor” physical exercises, invitation from friends to join routine physical exercises, lacking physical strength to exercise, prioritising work over physical activity, family support and exposure to social media messages about physical activity.

**Table 3: A summary of reported factors related to physical activity behaviour**

<b>Main factors and categories</b>	<b>Example of quotes/explanations from participants</b>
<b><i>Personal factors</i></b>	
misconceptions about physical activity	“Exercise is not my priority because I don’t think I’m obese or I’m fat, so I think exercise is to maintain and tone, so in that instance, I don’t really need to make it a priority”. (Cheska, female, 28 years)
sedentariness after migration	“I used to be a sports' girl, every kind of sports, tennis, netball, swimming, everything ( <i>in SSA</i> )... When I came to Australia, I got lazy, I don't play sports anymore.” (Cheska, female, 28 years)
feeling insecure when engaging in ‘outdoor’ exercises in Australia	“...I’ve had some unpleasant experiences. I used to go for walks. On two occasions and two different paths, while walking by the street, people threw things ( <i>e.g. eggs</i> ) at me.” (Ajo, female, 54 years)
invitation from friends to join routine physical exercises	“... they would invite you either to join a gym or some sort that they are attending, so you go together to a gym...” (Yaro, male, 38 years)
lacking physical strength to exercise	“But the thing is because you’ve put on weight, you get injuries. And so, my physical activity reduced as a result of injuries that I had in my sports.” (Ali, male, 32 years)
prioritizing work over physical activity	“...I would rather go and earn money than do exercise...” (Yaro, male, 38 years)
family support	“...if I’m going to the 1000 steps, for example, I will need my husband to be watching over the kids. I will actually need that support and I happen to have a supportive husband...” (Renee, female, 37 years)
exposure and influence of media messages on physical activity	“... I’m one person who does listen to a lot of news networks and stuff like that. It does influence you, as you do tend to think about it a bit more” (James, male, 39 years)
<b><i>Situational factors</i></b>	
availability of more convenient or mechanised resources in Australia than SSA (e.g.: cars, elevators, laundry machines, etc.)	“What I find interesting is that in Africa, you are not aware that you're exercising but you're exercising. We were exercising unconsciously. Because there's a lot of walking. I wasn't driving back then, so there was a lot of walking ...here ( <i>in Australia</i> ) ... I am always driving,...” (Abigail, female, 36 years)

<b>Table 3 continued.</b>	
high registration and gym membership fees in Australia	“Like jogging, it was a normal way of life as you don't have money to afford transport ( <i>in Nigeria</i> )... When I came here ( <i>Australia</i> ), when I try to go to the gym and I was asked to pay \$700 to register to start ‘gyming’, I said, ‘this was a free thing that I was getting back home. Now, why should I be paying for it?’” (Olu, male, 49 years)
differences in weather conditions between SSA and Australia	“... in Africa, it was always warm. So just walking...back and forth and doing things, you just sweat, you’re burning things,...( <i>in Australia</i> ) winter comes, too cold..., you postpone it ( <i>planned exercise</i> ) to the next day, you postpone it ( <i>to</i> ) the other day. It’s just kind of start getting harder, as you get colder, it gets harder...” (Baba, male, 41 years)
structured and rigid schedules in Australia	“Time flows differently here ( <i>Australia</i> ). Everything is scheduled, everything is tick tock, tick tock, clock, clock, and everything works clockwise. You find that you always have to schedule things, whereas back home (DR Congo) time flows in a different way.” (Boala, male, 29 years)

## Discussion

This study aimed to investigate post-migration changes in dietary and physical activity behaviours among Australian residents who were born in SSA, explore factors that may account for their behaviour change patterns, and examine the extent to which the factors are related to immigration. Though the study mainly focused on post-migration changes in dietary and physical activity behaviours, maintenance of dietary and physical activity behaviours was also noted by participants. Maintenance of some aspects of participants’ own dietary and physical activity behaviours in combination with some significant changes suggests that participants have employed the integration strategy of Berry's acculturation scheme.

The findings more specifically show a complex pattern of change in dietary behaviours that mainly relate to eating period, eating location, food preparation method, quality of food and frequency of food consumption. There is some evidence to suggest that before participants migrated from SSA to Australia, they followed routine and well-planned eating schedules, hardly ate out-of-home, and usually prepared home meals with unprocessed ingredients. Consistent with previous studies (Renzaho, 2006; Sarmugam & Worsley, 2015; The Intermedia Group Pty Ltd, 2017; Thomson & McFeeter, 2016), participants noted that skipping breakfast, eating out-of-home, snacking between meals, and using readymade sauces for home meals have become common for them in Australia. However, findings from the present study further suggest other newly developed dietary behaviours that were not clearly seen in a previous study focused on this ethnic minority group (Renzaho, 2006). Notably, some participants reported that they started eating dinner late, eating only twice a day, and eating genetically modified foods, after they settled in Australia. Despite these complex reports from participants, one common point that has been reached is that changes in dietary behaviours certainly occurred after immigration.

Regarding the question, why dietary behaviours changed after immigration, a number of situational factors were noted by participants. When viewed through the lens of acculturation, the situational factors given by participants mainly relate to changes in their socio-economic and physical environment. For example, given that all local African foods were readily available in Australia, the replacement of local African foods by similar Australian foods may not have occurred. An earlier study also recognised environmental and economic factors as key determinants of change in dietary behaviours after immigration (Renzaho, 2006). However, the current study seems to present more insights into the role

played by some socio-economic factors. For instance, participants in the current study explained in detail that jobs in Australia are more structured (little flexibility) and have longer working hours compared with jobs in SSA. The relatively long working hours in Australia appear to affect meal preparation at home. Therefore, there is a strong possibility that some dietary behaviours such as eating dinner late evolved in response to the challenges associated with the socio-economic and physical environment of Australia.

Although studies suggest that migration to a new and different country may affect a person's physical activeness (Afrifa-Anane, De-Graft, Dodoo & Agyemang, 2018; Kukaswadia, Pickett, & Janssen, 2014) recognising changes in physical activity behaviour after immigration is complicated (Michie, Abraham, Whittington, McAteer, & Gupta, 2009; Ngongalah, Rankin, Rapley, Odeniyi, Akhter, & Heslehurst, 2018). Unsurprisingly, previous studies have reported inconsistent findings about the relationship between immigration and changes in physical activity behaviour (Blanchet et al., 2018; Ngongalah et al., 2018). Explanations for the inconsistent findings may be situated in the differences in ethnic backgrounds of participants, varying research methods, and differences in migration contexts (Kukaswadia, et al., 2014; Ngongalah et al., 2018). In this study, however, findings show that participants reduced their engagements in low and moderate-intensity physical exercises (e.g., long walks to public transport stations) after they settled in Australia. While recognising that self-report of physical activity behaviour may be unreliable (Rosenman, Tennekoon, Hill, 2011), the common report from participants of diverse ethnic backgrounds suggests a need to take their concerns seriously.



Similar to the factors that affected participants' dietary behaviours, a number of situational factors emerged as reasons for the changes in participants' physical activity behaviours. There is reason to suggest that these situational factors are related to participants' socio-economic and physical environment. For instance, it has commonly been reported by participants that relatively cold weather conditions in Australia discourage engagements in outdoor physical activities, such as long-distance walks. In addition, participants have noted that the availability of more convenient and mechanised resources in Australia (e.g., easy and numerous modes of transport, elevators, and laundry machines) contributes to reductions in some common physical exercises (e.g., climbing staircases) that incidentally occurred in SSA. According to some participants, one possible strategy to address their reduced physical activity levels is to develop a routine physical activity plan. However, it appears that adherence to a physical activity plan is mainly challenged by difficulty of managing time in Australia and unaffordability of gym membership fees for some participants. Evidence in this study suggests that though some participants seemed interested in physical exercises, challenges associated with their socio-economic and physical environment affected their physical activity behaviour.

Though unrelated to immigration, factors such as consistent cravings for a favourite food and misconception that routine physical exercise is for people who are overweight also affected participants' dietary and physical activity behaviours. In a broader view, it appears that the factors unrelated to immigration were mostly personal or individual-level issues whereas those related to immigration were situational or group-level factors. The body of research on post-migration changes in dietary and physical activity behaviours among SSA residents in Australia has paid less attention to these distinctive factors. Recognition of these

complex factors can assist health promoters to develop appropriate interventions that focus on less healthy dietary and physical activity behaviours related and/or unrelated to immigration.

### ***Strengths and limitations***

Available literature shows that this study is among the first to employ a qualitative design in the exploration of changes in dietary and physical activity behaviours, especially among Australian residents who were born in SSA. The use of a qualitative design enabled participants to provide more detailed insights into their dietary and physical activity behaviours; and as a result, yielded rich responses. Despite the strengths associated with the use of a qualitative design, it was difficult to explore the detailed interplay between background characteristics of participants (e.g., duration of residence) and post-migration changes in dietary and physical activity behaviours. Additionally, findings cannot be extrapolated to all immigrants of SSA ancestry. In the future, a quantitative assessment of the correlations between participant background characteristics and changes in dietary and physical activity behaviours will provide additional understanding of changes in the health status of this ethnic minority group.

Another strength of the study is that the employment of quota sampling increased the representation of persons from different SSA regions (Western, Eastern, Central, and Southern Africa). Quota sampling also allowed for inter-group comparisons of dietary and physical activity behaviours. A similar strategy was used in a previous study (Renzaho, 2006). Though quotas allotted for each SSA sub-region were small, data saturation was achieved.

One more limitation that needs to be considered is that responses from participants may contain exaggerations which is a weakness attributed to self-reported methods (Rosenman, Tennekoon, & Hill, 2011). However, given that this study is a low-risk type, participants freely expressed their thoughts and experiences; hence the data are compelling.

### ***Implications of findings for health promotion***

Though some positive dietary behaviours (e.g., adoption of new fruits and vegetables in Australia) were reported by participants, most of the newly acquired behaviours put them at risks of excess weight gain and weight-related diseases (Fayet-Moore, Kim, Sritharan, & Petocz, 2016; Kesztyus, Traub, Lauer, Kesztyus, & Steinacker, 2017; Gallant, Lundgren, O'Loughlin, et al, 2015). For instance, skipping breakfast, snacking between meals and late eating can impact negatively on participants' health, as studies have identified an association between such behaviours and weight-related problems (Fayet-Moore, et al., 2016; Kesztyus, et al., 2017; Gallant, et al., 2015). Increase in the consumption of fast foods and regular eating out-of-home could also be a risk factor for weight gain and related NCDs (Romieu, Dossus, Barquera, et al., 2017). Replacement of organic foods by genetically modified foods may also result in poor health in the long term (Pashkov, Batyhina, & Leiba, 2018; Johansson, Hussain, Kuktaite, Andersson, & Olsson, 2014).

Furthermore, reduction in low and moderate-intensity physical activities after immigration may increase risks of excess weight gain (Demakakos, Hamer, Stamatakis, & Steptoe, 2010; Cadilhac, Cumming, Sheppard, Pearce, Carter, & Magnus, 2011). In line with the findings from this study, public health interventions need to focus on the socio-economic

and environmental factors that are associated with less healthy dietary and physical activity behaviours.

One potential strategy to enhance positive dietary behaviours among the participants and people in similar circumstances is to make local African foods more accessible, available, and less costly in Australia. In addition, Australia's food environment can be improved by the provision of more healthy food options, particularly in restaurants. With respect to physical activity, one key recommendation given by a participant is to incorporate physical activity breaks into Australian occupational structure. Creation of free community gym centres could also assist in promoting physical activeness among participants and people of similar circumstances.

## **Conclusions**

This study has shown complex patterns of maintenance and change in dietary and physical activity behaviours among Australian residents who were born in SSA. It mainly concludes that migration from SSA to Australia is associated with changes in dietary and physical activity behaviours. However, the extent and nature of change in dietary and physical activity behaviours mainly depend on situational factors within the socio-economic and physical environment of the host country. The study has further revealed that some personal factors affect dietary and physical activity behaviours irrespective of immigration and more research is required to measure the impact of these factors on behaviour change. Given that the changes in dietary and physical activity behaviours found in this study were significantly less healthy, there is a need for urgent strategies for promoting healthier dietary and physical activity behaviours in this immigrant group.

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## **CHAPTER FOUR: SOCIO-CULTURAL BELIEFS ABOUT AN IDEAL BODY SIZE AND IMPLICATIONS FOR RISK OF EXCESS WEIGHT GAIN AFTER IMMIGRATION: A STUDY OF AUSTRALIAN RESIDENTS OF SUB-SAHARAN AFRICAN ANCESTRY**

### **Introduction**

This chapter consists of a published manuscript on body size beliefs among the participants and how these beliefs are associated with dietary and physical activity behaviours. The manuscript was based on outcomes from the qualitative in-depth interviews.

**Socio-cultural beliefs about an ideal body size and implications for risk of excess weight gain after immigration: a study of Australian residents of sub-Saharan African ancestry**

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## **Abstract**

### **Objectives**

Although several studies have focused on risk factors associated with excess weight gain, little is known about the extent to which socio-cultural beliefs about body sizes may contribute to risk of excess weight gain, especially in non-Western migrant communities. Drawing on socio-cultural and attribution theories, this study mainly explored socio-cultural beliefs about an ideal body size among Australian residents born in sub-Saharan Africa (SSA). The implications of body size beliefs for risk of excess weight gain after immigration have also been discussed.

### **Design**

Employing a qualitative design, 24 in-depth interviews were conducted with Australian residents born in SSA. Thematic content analysis was undertaken to ensure that participants' experiences and views were clearly captured.

### **Results**

According to the participants, a moderately large body size (neither big nor small) is idealised in the SSA community and post-migration weight gain is commonly regarded as evidence of well-being. While desirability of a moderately large body size was noted by some participants, others were concerned about health risks (e.g. high blood pressure) associated with excess weight gain. Moreover, body size ideals seemed to be different for men and women in the SSA community and these ideals were mainly promoted by family and friends. Participants reported that women with very slim (skinny) body sizes are often regarded as persons suffering from health problems, whereas those with 'plump-shaped' body types are

often considered beautiful. Participants also noted that men are expected to look well-built and muscular while those with big bellies are often seen as financially rich.

### **Conclusions**

Participants' interpretation of post-migration weight gain as evidence of well-being calls for urgent intervention as risk of excess weight gain appears to be high in this immigrant group.

**Keywords:** idealisation of body size; weight gain; socio-cultural and attribution theories; sub-Saharan African immigrants in Australia

## **Introduction**

### ***Migration and risk of excess weight gain***

Excess weight gain, defined as a condition whereby the body contains too much fats or lipids that are medically considered surplus and unrequired (IFB Adiposity Diseases, 2018; Komaroff, 2016; Thomson et al., 2016; World Health Organisation, 2018), is a major risk factor for many non-communicable diseases (NCDs), such as diabetes, some cancers, chronic respiratory diseases, and cardiovascular diseases (World Health Organisation, 2018). A number of studies have suggested that migration from low to high income countries may increase risk of excess weight gain, mainly due to possible modifications to dietary and physical activity behaviours (Delavari, Sonderlund, Swinburn, Mellor, & Renzaho, 2013; Holmboe-Ottesen & Wandel, 2012; Menigoz, Nathan, & Turrell, 2016; Murphy, Robertson, & Oyebode, 2017). Empirical evidence shows that the risk of excess weight gain after immigration can be reduced through healthy eating and engagement in regular physical activity (Colagiuri & Buckley, 2007; World Health Organisation, 2018). However, interventions that address less healthy dietary and physical activity behaviours associated with excess weight gain are likely to be unsuccessful, unless individuals understand the health implications associated with excess weight gain and develop positive attitudes toward dieting and physical activity (Chan & Woo, 2010; Madigan et al., 2015).

Attitudes toward dieting and physical activity may be partly determined by a person's perception of ideal body size (Toselli, Rinaldo, & Gualdi-Russo, 2016). However, ideal body size is a complex concept that is understood differently across diverse cultures. Notably, in many contemporary Western societies, slimness (particularly for women) is one main indicator of good appearance (Humenikova & Gates, 2008; Tiggemann, 2012), whereas a

large body size seems to be an indicator of well-being in some sub-Saharan African (SSA) culture(s) (Australian Bureau of Statistics, 2013; Ettarh, Van de Vijver, Oti, & Kyobutungi, 2013; Hugo, 2009; Renzaho, 2004). The assumed cultural admiration for a large body size among people of SSA ancestry is an important concern, as this may result in a high risk of excess weight gain. However, this topic has not been adequately explored among immigrants of SSA ancestry. To date, not much is known about the extent to which socio-cultural beliefs about body sizes are associated with weight-related behaviours among SSA-born migrants in Western countries. It is also less clear whether the socio-cultural environment of Western countries is associated with changes in body size beliefs among immigrants of SSA ancestry. In the context of potentially differing cultural beliefs about body size and weight, this study examined the self-reported weight status of SSA-born residents in Australia, evaluated their perceptions of factors that contribute to post-migration weight gain, explored their socio-cultural beliefs about an ideal body size, and appraised the extent to which body size ideals contribute to risk of excess weight gain after immigration.

### ***Theoretical perspectives of body image***

Socio-cultural theory of body image provides an important framework for understanding not only socio-cultural beliefs about body sizes, but also how people may respond to changes in their bodies (Dakanalis et al., 2014; Vygotsky & Cole, 1978; Wang, Bruce, & Hughes, 2011). Socio-cultural theory of body image proposes that human cognition develops through social interaction with people, objects, and events (Dakanalis et al., 2014; Vygotsky & Cole, 1978; Wang et al., 2011); and by this interaction individuals integrate socio-cultural beliefs about body sizes into their reasoning (Wang et al., 2011). The theory suggests that the notion of

ideal body size is established and enforced by the culture of a particular society (Wang et al., 2011). Each culture develops its own specific ideals of body size and individuals internalise these cultural ideals (Dakanalis et al., 2014; Wang et al., 2011). Individuals may feel pressured to conform to the cultural ideals about body size and as a result engage in behaviours that meet the cultural standards (Dakanalis et al., 2014). Depending on the extent to which the bodies of individuals meet the cultural standards, they may either become satisfied or dissatisfied with their own bodies (Dakanalis et al., 2014; Wang et al., 2011). The theory further posits that family, peers, and mass media are the main agents that promote the internalisation of cultural ideals about body size (Tiggemann, 2012). Direct or indirect pressure from family, peers, and the media (also known as tripartite influence) in pursuance of making individuals meet cultural standards of body size can lead to body image dissatisfaction and disorderly weight-related behaviours among targeted individuals (Yamamiya, Shroff, & Thompson, 2008).

In addition to the socio-cultural theory of body image, attribution theory helps to explain how people may understand the causes of post-migration weight gain (Heider, 1958; Kim, Austin, Subramanian, & Kawachi, 2018; Moskowitz, 2005). According to the theory, people assign causal explanations for events (Heider, 1958; Reeder, 2013), and establish causality to factors either external (causes beyond a person's control) or internal (causes emanating from the individual) (Heider, 1958; Malle, 2011). External attributions to the causes of events denote environmental factors accounting for unintentional happenings while events believed to be caused by an individual's personal characteristics are classified under internal attributions (Heider, 1958; Malle, 2011). Some attribution theorists have suggested the need to consider the role played by a person's intention when explaining internal factors

that cause events (Malle & Korman, 2013; Reeder, 2013). Therefore, internal factors ascribed to the causes of events are categorised into personal or impersonal (Reeder, 2013). Personal causality refers to a situation where an event is believed to be caused by a person with the intention of reaching a target or goal whereas impersonal causality implies behaviour outcomes caused by a person's unintentional actions (Reeder, 2013). Furthermore, the theory suggests a potential bias in the attribution of causes to events (Heider, 1958; Malle & Korman, 2013; Reeder, 2013). People may easily overemphasize or underrate the contribution of situational or personal factors as causes of events (Heider, 1958; Malle & Korman, 2013; Reeder, 2013). Supposing the outcome of a behaviour is seen as a failure, people may easily deny personal responsibility, but may easily attribute a successful behavioural outcome to themselves. Employing socio-cultural and attribution theories to understanding body size perceptions among Australian residents who were born in SSA, this study may inform health promotion responses aiming at reducing weight-related problems in this immigrant group.

## **Materials and Methods**

### ***Design***

A qualitative design based on a phenomenological approach was employed to ensure that participants could freely discuss their own experiences and perceptions. Using a semi-structured in-depth interview guide, participants' socio-cultural beliefs about body sizes were explored.



### ***Research setting and study participants***

The interviews were conducted in two Australian states that host the largest population of African Australians: New South Wales (NSW) and Victoria (Australian Bureau of Statistics, 2013). Participants were selected based on the following criteria:

1. persons born in a SSA country, but currently living in Australia;
2. persons who stayed in SSA until at least 18 years of age;
3. persons who have resided in Australia for at least 12 months (to ensure that participants had settled in the new environment and could offer meaningful responses).

### ***Ethical considerations***

Ethics approval (Reference Number: HC17018) was received from the Human Research Ethics Committee of the University of New South Wales (UNSW) on March 14, 2017. The study was conducted in accordance with the Australian National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research. Informed consent, anonymity, privacy, and confidentiality were ensured in the data collection, storage, and reporting.

### ***Participant recruitment***

Quota sampling was employed to reduce participant selection bias emerging from potential demographic and ethnic diversities. Four main characteristics were considered when determining quotas for the selection of the participants: SSA sub-region of origin, gender, living arrangement, and current state of residence. Based on the United Nations'

classification of African regions and sub-regions (The United Nations, 2017), four main regions of origin were distinguished: Western Africa, Eastern Africa, Central Africa, and Southern Africa. A maximum of 8 participants were targeted for each region of origin. The selection of participants from each region also considered gender balance (men and women); living arrangements (living with familial relationships or not); and place of residence (living in NSW or Victoria).

### ***Data collection***

The study was advertised at various social gatherings (e.g. churches, mosques, weddings, and food centres) within the African community. Flyers and word-of-mouth were used for the advertisement. Persons who showed interest in the study were checked for eligibility and a list of eligible participants was compiled for interview schedules. Each person was allowed to book a day and time for the interview based on his/her own availability. Participants were also asked to indicate whether they preferred over-the-phone or face-to-face interviews. An interview took between 20 and 80 minutes to complete and was recorded after receiving oral consent from the participants. Nevertheless, one participant did not want to be recorded and preferred the interviewer to take notes instead. All questions were open-ended and probing skill was employed, when required, to elicit in-depth responses. The questions covered participants' demographic characteristics, migration history, settlement in Australia, socio-cultural beliefs about body sizes, and weight-related behaviours (dieting and physical activity). More specifically, participants were asked to express how they felt about their own body weights and suggest factors accounting for their post-migration weight statuses. Participants were also allowed to elaborate on their body size ideals and probing method was

used to establish the sources of these ideals. Analysis was conducted daily until a point where additional data were not generating any new information. Data saturation was achieved after interviewing the 24<sup>th</sup> participant.

### ***Data management, coding, and analysis***

Data analysis was informed by Blaikie's 'constructionist' strategy which involves the examination of responses from the position of participants' own understandings, experiences, and perceptions (Blaikie, 2007). Pseudonyms were used instead of participants' real names to protect their confidentiality. The interviews were transcribed verbatim and NVivo 11 software was used to manage the data. A thematic content analysis approach was used to code the responses of participants. Attention was given to shared responses within and across groups and the emergence of new theoretical concepts. The emerging themes were proofread thrice to ensure accuracy of findings.

### ***Research team and participant recruitment support***

The study was overseen by a team of four researchers with three members originating from SSA. One team member of SSA background conducted the interviews under the supervision of the other three team members. About half of the interviews were transcribed by a transcription agency ([www.rev.com](http://www.rev.com)) and the remaining interviews were transcribed by the interviewer. The interviewer reviewed all the transcripts and identified emerging themes under the supervision of a more experienced team member. The other two team members undertook a review of the emerging themes to reduce potential bias and to provide additional insights into the interpretations.

With regards to recruitment of participants, assistance (in the form of advertisement) was given by representatives of numerous African community organisations in NSW and Victoria (e.g. Carers of Africa, God's Power Ministries, the Ghana Association of NSW and Victoria, Ethiopia Community Association, Congolese Community Association, just to mention a few).

## **Results**

### ***Participants' socio-demographic characteristics***

An outline of the participants' socio-demographic characteristics is presented in Table 1. Table 1 shows that 14 of the 24 participants were men, and the average age was 36 years. The majority (n=17) had attained tertiary level education, with about 1 out of every 2 participants (n=12) self-identifying as a Christian. Each sub-region (Western, Southern, Eastern, or Central) of sub-Saharan Africa (SSA) had at least 3 participants, and the majority of them (n=14) stayed in New South Wales (NSW) at the time of the interview (Table 1). The participant with the longest duration of stay in Australia had stayed in the country for 24 years while 1 year was the least amount of time a participant had stayed in the country. Half (n=12) of the participants were staying with either a friend or relative with whom they shared meals, and one-third (n=8) were living alone (Table 1).

**Table 1: Summary of participants' socio-demographic characteristics**

Background characteristics	N=24
<i>Gender</i>	
Male	14
Female	10
<i>Current average age (years)</i>	
20-29	6
30-39	11
40-49	4
50+	3
<i>Age before migration (years)</i>	
18-27	15
28-37	4
38-47	4
48+	1
<i>Highest attained educational level</i>	
Basic	-
High School	2
Tertiary	17
Other forms of formal education	5
<i>Religious affiliation</i>	
Christianity	12
Islam	1
Non-assigned	11
<i>Sub-Saharan African region of origin</i>	
Western Africa	6
Eastern Africa	7
Southern Africa	8
Central Africa	3
<i>State of residence</i>	
New South Wales	14
Victoria	10
<i>Duration of stay in Australia (years)</i>	
<2	1
2-5	5
6-10	8
11-15	8
16-20	1
20+	1

It is important to note that participants were recruited based on living arrangements (living with persons of familial or non-familial relationships), gender and place of residence with the assumption that these factors would show variations in body size beliefs, but these issues did not emerge clearly as important themes during the analyses.

### *Self and social perceptions of change in body size*

Participants were asked to describe any changes in their own body size (weight) after migrating from SSA to Australia. The majority (n=16) of them reported that they had gained significant weight after immigration whereas a few (n=2) mentioned post-migration weight loss. One of the 2 participants who noted post-migration weight loss gave the impression that her weight loss was unusual: ‘In my case, it’s been a reverse. I came to Australia bigger than I am now. I have clothes I brought from Ghana 13 years ago: ‘slit’ and ‘kaba’ (traditional dress from Ghana) that I can still fit in. I have a 19-year-old top that is still hanging in my wardrobe’ (Ajo, female, 54 years). The remaining participants believed that their body sizes had either fluctuated (n=5) or remained nearly the same (n=1). This finding suggests a high likelihood of weight gain after migrating from SSA to Australia.

In addition to the self-perceptions of change in body size, participants noted that they had heard comments about their changed body sizes from significant others (e.g. friends, family, health workers). An example can be seen in this participant’s comment: ‘There’s been a very big change. When I came to Australia, I weighed 74 kilograms. In ten years, I now weigh 115 kilograms. My doctor tells me I’m not even obese, I’m morbid’ (Daniel, male, 32 years). Furthermore, participants noted differences in the freedom to say thoughts about body sizes between SSA-born persons and Australian-born residents as exemplified below:

...I'm realising over the past one year, I've put on a lot of weight and it became more apparent when I went back to Uganda. People told me: 'you've put on weight'. Frankly, they will tell you and they wouldn't take it the way people take it here (in Australia), ... People here (in Australia) will fear to tell you that you've put on weight, but there (in Uganda), they will tell you directly...  
(Yaro, male, 38 years)

Given the relative freedom to express views about one another's body size among SSA-born persons, individuals of authority and significance are likely to play a key role in the construction of body size ideals among participants.

### ***Perceived factors that contribute to post-migration weight gain***

In line with attribution theory, three main themes emerged from the participants' narratives when they were asked to explain factors that accounted for their post-migration weight gain. The themes were: significant reduction in physical activity after immigration and post-migration consumption of foods containing high calories of fats, sugars, and hormones; decline of body metabolism due to ageing; and inheritance of 'fatty' genes from family.

Firstly, most participants ascribed their post-migration weight gain to changes in diet and physical activity behaviour after immigration. For instance, Dada (male, 54 years) said: 'The foods I eat here (Australia) are oily compared to Africa. We don't exercise as much as we do when we were in Africa. The foods here (Australia) are also different. They contain hormones and make you grow big...' (Dada, male, 54 years).

In addition to the dietary and physical activity-related factors, some participants said that ageing is naturally accompanied with a reduction in body metabolism and that explains why they have gained more body weight after immigration. One participant illustrated this in the following words: 'I think age plays a very important part. I think the older you get, the

more your metabolism goes down, so you obviously gain a bit more weight when you get older...' (Cheska, female, 28 years).

Lastly, one participant demonstrated how inherited genes may be associated with changes in body size by using his own family characteristics as an example:

To me, I also believe that your body size depends on the family that you were born. For me, all my brothers have weight (referring to large body size). We almost look the same when it comes to body size and our height is a little bit different but similar... (Olu, male, 49 years)

This finding reflects participants' awareness of factors that contribute to changes in body size as they linked post-migration weight gain to poor dieting, reduction in physical activity, and nature. However, attribution of ageing as a singular cause of post-migration weight gain (as reported by some participants) underscores possible attributional bias as some participants had reportedly lost weight or remained nearly the same years after immigration.

### ***Socio-cultural beliefs and perceptions of an ideal body size***

One of the main objectives of this study was to explore the socio-cultural beliefs about an ideal body size and appraise how such beliefs may be associated with risk of excess weight gain. The main theme that emerged in relation to this objective was that a moderately large body size is significantly idealised in the SSA community. Additionally, beliefs about body sizes were associated with perceived affluence of destination country, gender, and personal wealth. Findings show that migration from SSA to Western countries was accompanied with expectation of weight gain as weight gain was seen by many as an evidence of well-being:



...And you know when you're like me, ... culturally... I remember going back to Zimbabwe, my brother-in-law said: 'how come you're still thin?' Being big is the desired sort of thing. Then, I was like: 'hello! whatever! ... (Renee, female, 37 years)

For the majority of the people, putting on more weight, especially if somebody has recently come from the rural area to the city, that would be a good thing. It would be indicating that they've started making some money and they have some peace of mind, so they've started gaining weight... (Yaro, male, 38 years)

Concerning the 'genderisation' of body size ideals, women with very slim body sizes were classified as ill while those with moderately large body sizes were regarded as beautiful. For men, weight gain in the belly region was attributed to financial riches while muscular body types were viewed as indicators of strength/security. One participant said:

Mainly for females (*women*), but I know the men also have their level of, I guess..., they have their own thing, but mainly for females (*women*)... It's seen as if you're too slim or you're too skinny, it's seen as maybe, one, you're not healthy, two, you've got issues: emotional issues, mental issues, or if you're married, your husband is not taking care of you, or your parents are not taking care of you...,whereas if you're on the bigger size, or the larger size, it's been assumed that you've got a great life, and you're just living your life as it is. For the men, it can be perceived, .... if you've put on a bit of weight, especially around your midsection area, it's perceived that you are rich, or you've kind of made it in life. (Lovia, female, 39 years)

Participants' assertion that men with waist/belly fats are regarded as financially rich emphasizes the association of socio-economic status with the formation of body size ideals. The following account from a highly educated participant further confirms how social status may play a significant role in the construction of body size ideals:

... There's always been, especially in my culture as well or maybe when I was growing up, there's always been that underlining idea that if somebody is fat or he has a big belly, he's the boss (rich)...But I wouldn't say there is a preference as to body size. You get a variety and people would either like ... I know for men, for example, I could either like a slim chic (slim sexual partner) or I could either like somebody who has a bit more fat on her body. I think it just comes down to an individual... (Boala, male, 29 years)

Furthermore, the analysis yielded another sub-theme which reflected the agents responsible for the promotion of body size ideals. To many participants, weight gain ideals are often promoted by family members (especially spouses) and other significant persons in their community. Many participants reinforced the idea that their families, friends, and communities regarded weight gain as 'well-being', as noted by two participants: 'Just my personal trainer and my wife. I think when I met her, she wanted me to gain weight and she succeeded. Laughter' ... (Don, male, 31 years)

...I think they (family) appreciate me gaining weight, but as of late, my mom has said that I've gained a bit too much weight. So, she always teases me, but from our cultural background, I guess the bigger you are, the more you're considered beautiful, so I would say that they would appreciate weight gain, overweight loss. (Lovia, female, 39 years)

In contrast, some participants noted that friends and family members discouraged the internalisation of large body ideals mainly because of their perceptions of health risks associated with large bodies. Examples can be seen in the following expressions:

My wife is trying to tell me to lose my weight because even though I am not sick or obese, when your weight is more than your body size, or when your weight is more than your height, according to science, that means things need to be done... (Olu, male 49 years)

Those who knew me when I got to Australia. Now I'm getting a bit of tummy and they keep telling me, you need to lose weight, you need to work on your tummy. (Nat, male, 37 years)

The results show that while body fats are culturally valued and seen as an indicator of success, there is also a growing concern among participants about health implications associated with large bodies.

### ***Responses to post-migration weight gain***

Participants were asked to express how they felt about their own body weight and the themes that emerged showed mixed feelings. Many participants reported that they were content with their body sizes; some stated a desire to gain more body weight through dieting and/or physical exercise; whereas a few preferred bodies that are medically regarded as healthy. Though some participants expressed intentions to gain more body weight, they further clarified that their preferred body standards exclude extremely big and morbid body types. The participants (both men and women) perceived a moderately large body size as ideal for looking good in clothes as exemplified by two participants:

I prefer thick. I prefer being fit but being thick as well...I think clothes fit you better when you're a bit thicker. Not obese, but fit and thick. I feel like clothes suit you better when you have a bit of meat on there, not too skinny. (Cheska, female, 28 years)

I like the size I am now, so I think ... I weighed myself, I'm currently like 73 Kgs.' And, want to get up to 80. (Faya, male, 37 years)

Participants who expressed dislike for a large body size based their reason on a perception that large bodies are associated with ill-health. Two participants illustrated how they felt in the following quotations: 'I don't want to be overweight, to get blood pressure, cholesterol' (Vic, female, 43 years); 'Medium built is good, I don't believe in being excessively fat because of the associated health issues.' (Ajo, female, 54 years)

Overall, the results show various beliefs about body sizes that are mainly associated with socio-economic status, gender, health beliefs, and perceived wealth status of migrants' destination country. However, desirability of a moderately large body size emerged as the common voice that was heard across participants' narratives.

## **Discussion**

The body of research on body image has mainly focused on the desirability of a small body size, particularly for women in Western and post-communist countries (McCreary, 2012; Tiggemann, 2012). In the past few decades, a number of studies have documented potential differences in body size ideals across various ethnicities, with some writers suggesting that a large body size may be culturally admired by people of SSA (Australian Bureau of Statistics, 2013; Ettarh et al., 2013; Hugo, 2009; Renzaho, 2004), whereas the opposite is believed to be true for people of Western cultures (Humenikova & Gates, 2008; Tiggemann, 2012). What is less clear is the extent to which this cultural admiration for a large body size is maintained after migrating from SSA to a Western country. The rationale behind body size preferences

after immigration and the extent to which these factors are related to the risk of excess weight gain are also uncertain in the literature. In order to better understand these issues, this study investigated the self-reported weight status of Australian residents who were born in SSA, evaluated their perceptions of the causes of post-migration weight gain, explored their socio-cultural beliefs about an ideal body size, and examined the extent to which these factors contribute to the risk of excess weight gain.

Findings from this current study indicating that most participants had gained significant weight after settling in Australia are consistent with those reported in a previous study by the Australian National Preventive Health Agency (Australian National Preventive Health Agency, 2014). The reasons given by participants for their post-migration weight gain suggest that they had adequate knowledge of risk factors associated with weight increment. The participants attributed their post-migration weight gain to factors related to behaviour (post-migration modifications to dietary and physical activity behaviours), biology (ageing and genetics), and the environment (unavailability of local African foods and physical activity products).

In line with the attributional bias component of the attribution theory (Heider, 1958; Kim et al., 2018; Moskowitz, 2005), the participants mainly underscored the Australian environment (external locus of causality) as the main reason for their post-migration weight gain rather than their own behavioural choices (internal locus of causality). To many participants, available foods in Australia are predominantly less healthy (fatty and genetically modified); and they believed that accounted in large part for their post-migration weight gain. In contrast to this observation from participants, research shows that healthy organic foods are available in Australia indicating that there may be other undisclosed factors (e.g. high

costs of organic foods) influencing their food choices (National Health and Medical Research Council, 2013).

Regarding the biological factors, the data on participants' socio-demographic characteristics show that most of them migrated to Australia when they were young (between 18-27 years old). As indicated in some studies, a natural reduction in body metabolism was expected as they grow older, and this may have contributed to weight gain after immigration (Barzilai, Huffman, Muzumdar, & Bartke, 2012; St-Onge & Gallagher, 2010). However, a number of studies have also argued that proper management of dietary and physical activity behaviours could reduce age-induced risk associated with weight gain (Jaaskelainen et al., 2011; Shimokata & Kuzuya, 1993). In addition to the age factor, research has shown that the genetic composition of some individuals is associated with a high risk of excess weight gain (Jaaskelainen et al., 2011). Irrespective of the age and genetic factors, findings from this study show that some participants made conscious efforts to gain more body weight after immigration through dieting and physical exercise.

Concerning socio-cultural beliefs about an ideal body size, most participants, regardless of their ethnic backgrounds, reported that a moderately large body size is admired in their culture(s). This admiration of moderately large bodies contradicts the widely documented desirability of a small body size in many Western societies (Dakanalis et al., 2014; McCreary, 2012; Vygotsky & Cole, 1978; Wang et al., 2011). Thus, participants' perceptions of ideal body size were consistent with the assumption that people of SSA ancestry share a culturally constructed idealisation of large (Australian Bureau of Statistics, 2013; Ettarh et al., 2013; Hugo, 2009; Renzaho, 2004). However, this current study suggests a unique interpretation of what is commonly referred to as 'large or thick body size'

compared with previous observations (Renzaho, 2004; Tiggemann, 2012). The preferred large body was described by participants as ‘not too slim’, ‘fit’, ‘full’, ‘medium’, or ‘thick’ and expressions of dislike for underweight, obese and morbidly obese body types were clearly noted. Though it appeared that participants pursued a moderately large body size, there is a need for a more critical assessment of the extent of body largeness that is idealised in this immigrant population.

It is important to take note that the participants’ exposure to the Australian environment had less impact on their perceptions of an ideal body size. Previous studies have shown that ‘a small body size’ is increasingly portrayed especially in the Australian media as a marker of beauty (particularly for women) (Park, 2007; Tiggemann & Miller, 2010), but it appears that most participants selectively maintained their cultural admiration for moderately large bodies. According to the participants, migration to more affluent destinations is understood in the SSA context as an opportunity for well-being, and immigrants living particularly in Western countries were expected to demonstrate affluence in the form of weight gain. This cultural expectation of weight gain after immigration appeared to be associated with post-migration weight-related behaviours, as some participants reported that they had gained more desire for food and had intentionally tried to gain more weight. A critical implication drawn from this finding is that socio-economic status and pre-migration history may play a crucial role in post-migration weight gain. Participants of poor socio-economic backgrounds, particularly those who had experienced extreme poverty prior to immigration, may desire to respond to their previous sufferings by means of intentional weight gain. To the families of such participants, post-migration weight gain symbolises an increase in wealth while a reduction or maintenance of pre-migration body

size reflects disappointment. This finding confirms a growing hypothesis (resource scarcity) in the literature which suggests that intentional gaining of more body fats may be a physical and psychological response to previously threatened food supply that occurred among individuals of low socio-economic status (Dhurandhar, 2016).

The maintenance of large body ideals by participants also challenges some earlier studies suggesting that immigrants often adopt cultural trait(s) of the host culture(s) (Matera, Stefanile, & Brown, 2012; Remennick, 2014). Nevertheless, a small number of participants seemed to have disconnected themselves from the cultural expectation of weight gain. Although this group of participants indicated that a large body size is admired in their cultures, they downplayed the association of this cultural belief with their own weight-related behaviours. To them, a large body size is associated with increased risk of diseases/illnesses (e.g. high blood pressure) and for that reason, they separated themselves from weight gain ideals. The implication of this finding is that idealisation of body sizes may not be exclusively associated with cultural beliefs or socio-economic status, but also health beliefs.

Another significant finding from this study is the differences in body size expectations for women and men. While many participants reported that women with very slim body sizes are often seen through cultural lenses as persons suffering from emotional, mental and/or physical health problems, those with ‘plumpy’ bodies were regarded as beautiful. For men, whereas those with muscular body types were perceived to be strong, those with big bellies were regarded as financially rich. These distinctive cultural interpretations of body sizes for men increased desirability of weightlifting and was associated with an intake of more foods than the usual. Nevertheless, the interpretation of big bellies as evidence of riches reinforces the relationship between poor socio-economic status



and expectation of weight gain. Though the reported body size ideals differed for men and women, the differences are however reconciled in the general preference for a moderately large body size across both genders.

In support of the tripartite (family, peers, and media) influence component of the socio-cultural theory (Tiggemann, 2012), it was reported by participants that family and friends play a significant role in promoting weight gain ideals. Participants reported that family and friends often make direct commentaries (e.g. teasing remarks) about the body size of one another and negotiate the extent to which members in their social networks can increase or decrease in body weight. From the participants' perspective, it was also easier for Australian residents born in SSA to make body size references about one another than Australian-born residents. The cultural freedom to express thoughts about one another's body size can be utilised as an empowering resource for weight-related interventions in this immigrant group.

### ***Strengths and limitations***

Understanding that body size beliefs have been less studied in non-Western communities (particularly in a migration context and among people of SSA ancestry), this study provides important contributions to knowledge. Methodologically, the approaches used in this study have a number of strengths. Firstly, the use of a phenomenological approach allowed for exploration of participants' lived experiences and enabled revisions as new perspectives emerged. This approach also enabled participants to freely discuss their socio-cultural beliefs and perceptions about body size in their own words which would have been difficult to elicit from a quantitative study. Moreover, the use of quota sampling enhanced inclusion of persons

from different SSA regions, allowing for inter-group comparisons. While acknowledging that findings from this study cannot be extrapolated to all immigrants of SSA ancestry, the data are compelling, and most participants in this study constitute a hard to reach section of the Australian population.

Though the study approach provided compelling data, possible bias associated with self-reports cannot be overlooked. For instance, participants may have misremembered their exact weight levels before and after immigration. Therefore, employment of clinical indicators in the assessment of changes in participants' body weight after immigration would have added more strengths to the study.

Lastly, while the selection of participants paid attention to some demographic variables, the proportion of participants for men and women was unequal after achieving data saturation. Nevertheless, there were significant similarities in body size beliefs across the various ethnic and demographic characteristics.

### ***Implications of findings for public health interventions and future research***

Overall, findings from this study indicate a cultural admiration for a moderately large body size among the Australian residents who were born in SSA. The interpretation of a very slim body as a sign of ill-health for women and the understanding of belly fats as an indication of riches may promote excess weight gain in this ethnic minority group. While recognising that large body sizes which are often referred crudely as overweight and/or obese body types e.g. (Denke, Sempos, & Grundy, 1994; Huang, Frangakis, & Wu, 2006) do not always correlate with health problems (Hainer & Aldhoon-Hainerova, 2013), the extensively documented point that excess body fats may increase risk of non-communicable diseases (such as

diabetes, stroke, and heart problems) should be a concern for participants and people in similar circumstances (World Health Organisation, 2018). Therefore, public health interventions are needed to monitor and address culturally motivated desirability of excess weight gain in this ethnic minority group. The public health interventions may consider promoting ‘healthy’ weight-related behaviours through the engagement of significant persons in the SSA community.

Furthermore, ageing and genetics were mentioned by participants as factors contributing to risk of excess weight gain. Given that weight gain vulnerability associated with ageing and genetics may be reduced through proper dieting and vigorous physical activity (Jaaskelainen et al., 2011; Shimokata & Kuzuya, 1993; Sowa, Tobiasz-Adamczyk, Topór-Mądry, Poscia, & la Milia, 2016), dietary and physical activity interventions for the aged and people who have inherited ‘fatty’ genes will be important. Drawing on the methodological limitations of this study, research in the future can quantitatively assess significant associations between socio-demographic characteristics of participants and cultural beliefs about body sizes. A consideration of more critical definitions of body sizes and an exploration of chronic health conditions in this population would be also important in future studies.

## **Conclusions**

Migration from SSA to Western and post-communist countries symbolises increased expectation of weight gain. To a large extent, a moderately large body size is mainly idealised in the SSA community, but this idealised body size is sensitive to participants’ gender, socio-economic status, health beliefs, and place of destination. Lastly, friends and family are the

two main agents that promote body size ideals among the Australian residents of SSA ancestry. Public health interventions need to consider cultural factors when addressing weight-related issues, particularly among immigrants of SSA backgrounds.

**Declaration of interest statement**

The author(s) declare that they have no conflict of interest.

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## **CHAPTER FIVE: INTERACTION EFFECTS OF ACCULTURATION AND SOCIO-DEMOGRAPHIC CHARACTERISTICS ON POST-MIGRATION DIETARY AND PHYSICAL ACTIVITY BEHAVIOURS**

### **Introduction**

This chapter consists of a manuscript under peer review on the interplay of post-migration dietary and physical activity behaviours with acculturation and socio-demographic factors.

The manuscript was based on outcomes from the quantitative surveys.

## **Interaction effects of acculturation and socio-demographic characteristics on dietary and physical activity behaviours in Australia**

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### Original Article

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### **Competing interests**

The authors declare that they have no competing interests

## **Abstract**

Research has shown that several immigrants develop less healthy dietary and physical activity behaviours after settling in a new country which in turn puts them at risk of weight-related diseases. Evidence further suggests that post-migration dietary and physical activity behaviours are often related to acculturation and vary by immigrants' socio-demographic characteristics. To help develop health promotion interventions tailored toward specific characteristics of immigrants, this study examined the interaction effects of acculturation and socio-demographic characteristics on post-migration dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa (SSA). Two hundred and fifty-three (253) participants were self-selected from two Australian states: New South Wales and Victoria. Fat intake and fruits/vegetables/fibre intake were used as indicators of dietary behaviour. Activities at work, travel, and recreation represented physical activity behaviour. Acculturation was measured by two sub-scales: cultural maintenance and cultural participation. Multiple linear regression was employed in the data analyses. Findings show that none of the interactions between acculturation and socio-demographic characteristics were significantly related to fat intake. Fruits/vegetables/fibre intake was significantly related to cultural maintenance among unemployed participants. A significant relationship was also found between fruits/vegetables/fibre intake and cultural participation among those who resided in urban areas in SSA before immigration as well as those with lower and average duration of residence in Australia. Physical activity was significantly related to cultural maintenance among younger and middle-aged participants. Except for fat intake, findings confirm the hypothesis that associations between post-migration dietary and physical activity behaviours and acculturation are moderated by socio-demographic characteristics.

**Keywords:** determinants of health; community health promotion; ethnic; health behaviour; global health

## **Introduction**

The impact of immigration on population health is fast becoming a very important public health issue (Wickramage et al., 2018). Using incidence of post-migration weight gain and non-communicable diseases (NCDs) as indicators, several studies have reported that the health status of immigrants tends to decline over time (Kim et al., 2013, Kearns et al., 2017, Murphy et al., 2017). Evidence further suggests that the risks of gaining excess weight and developing NCDs after immigration are related to less healthy changes in dietary and physical activity behaviours (O'Driscoll et al., 2014). For example, a study of Australian residents born overseas found that the participants, on average, had healthier weights than native-born residents but gained much weight over time due to less healthy eating and reduction in physical activity in Australia (Thomson and McFeeter, 2016). Another example can be drawn from a study about dietary change among immigrants from low-income countries in Europe which concluded that the immigrants increased their consumption of fats and refined carbohydrates after immigration; resulting in high risks of obesity, type 2 diabetes, and cardiovascular diseases (Holmboe-Ottesen and Wandel, 2012).

Given that less healthy dietary and physical activity behaviours contribute to risks of excess weight gain and NCDs, it is crucial to understand the factors that account for these behaviours after immigration. To a large extent, post-migration changes in dietary and physical activity behaviours are recognised in the literature as effects of acculturation (Renzaho, 2008, Perez et al., 2017). Acculturation is a complex concept defined as “a dual

process of cultural and psychological change that takes place as a result of contact between two or more cultural groups and their individual members” (Berry, 1997). Berry’s acculturation framework provides an important guide for the conceptualisation of factors associated with post-migration changes in dietary and physical activity behaviours (Berry, 1997). Notably, the framework suggests that the tendency to maintain and/or modify one’s own culture(s) after immigration is mainly moderated by group or individual-level factors. The group-level factors are situational factors existing before and/or after immigration that affect an entire immigrant group and can change their shared cultural values (Berry, 1997). The framework further suggests that post-migration behaviour change patterns may not be uniform, due to moderating individual-level factors, such as differences in educational level and age (Berry, 1997). For example, young people are thought to acculturate more easily than elderly people as it is hypothesised that internalising parents’ culture(s) may be relatively small during early years, hence reducing cross-cultural conflicts after immigration (Berry, 1997). Further details of factors associated with acculturation have been presented in past works of Berry, Mendoza and other acculturation theorists (Berry, 1997, Mendoza, 1989).

In line with Berry’s acculturation framework, studies have highlighted that group-level moderating factors are associated with post-migration dietary and physical activity behaviours (Ngongalah et al., 2018, Akande et al., 2015). For instance, unavailability of familiar dietary and physical activity products in a host country has been commonly cited as a key environmental determinant of post-migration change in dietary and physical activity behaviours (Renzaho and Burns, 2006, Gordon-Larsen, 2014, Osei-Kwasi et al., 2016). While several studies have attributed post-migration dietary and physical activity behaviour change to group-level moderating factors, very little attention has focussed on the potential

moderating role played by individual-level factors. According to Berry (1997), the likelihood that a person's behaviour or culture will change after settling in a new country is shaped by moderating individual-level socio-demographic factors (e.g. age at first migration, duration of stay in the host country, a migrant's educational level, among others). Thus, moderating factors shape the nature of a person's psychological acculturation (i.e. whether a person will think of adopting the mainstream culture of the host country and/or maintain his/her pre-migration cultural values). In turn, psychological acculturation may result in practical behavioural outcomes, such as the consumption of traditional foods of the host country.

The lack of adequate attention to socio-demographic characteristics as potential moderators suggests a gap in current research, given that immigrants from the same ethnic group may acculturate differently (Nelson-Jones, 2002, Mendoza, 1989). For example, a study of Canadian immigrants from Hong Kong showed that younger immigrants acculturated toward the host culture faster than older immigrants (Cheung et al., 2011). In a recent systematic review about immigrants in high income countries, different patterns of acculturation were found in relation to different durations of stay in the host countries (Alidu and Grunfeld, 2018).

Understanding the possible interactions between acculturation and socio-demographic characteristics and their effects on post-migration dietary and physical activity behaviours may help to develop more appropriate health promotion interventions tailored towards more specific population characteristics. Using fat intake, fruits/vegetables/fibre intake, and physical activity as indicators of weight-related behaviour, this study explored interactions between acculturation and socio-demographic characteristics and the extent to

which the interactions relate to post-migration dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa (SSA).

## **Methods**

### ***Study design***

A cross-sectional community-based survey was undertaken. The survey was administered online and in hard copy.

### ***Ethical considerations***

Ethics approval was received from an authorised institution. Ethics information has been concealed in line with the journal's requirement of blind reviews.

### ***Study setting and participants***

The survey was conducted in two Australian states: New South Wales (NSW) and Victoria. These two states host the largest population of Australian residents of SSA ancestry (Australian Bureau of Statistics, 2013). Inclusion criteria for study participation were as follows: currently living in Australia; resided in Australia for at least 12 continuous months; born in a SSA country; and lived in a SSA country until at least 18 years of age.

### ***Participant recruitment***

Using flyers, posters, and word-of-mouth, the study was advertised at community gatherings (e.g. churches, mosques, weddings, and food centres). Non-governmental African community organisations (e.g. Carers of Africa Inc.) assisted with advertising the study.



Participants were self-selected. Interested and eligible persons were well informed about the study objectives and a detailed participant information sheet was given before the surveys were administered. To minimise participant selection bias due to ethnic diversity, a minimum quota of 50 participants was conveniently set for the four distinguished SSA regions of origin: Western Africa, Eastern Africa, Central Africa, and Southern Africa. In the absence of data showing residents in NSW and Victoria who meet all the eligibility criteria, at least 100 participants were recruited from the two Australian states (NSW and Victoria).

### ***Data collection***

Data collection started in November 2017 and ended in September 2018. An initial pre-test of the survey was conducted among 10 volunteers from Perth and Adelaide who visited Sydney for African community programmes. After pre-testing the survey and making minor corrections, the survey was extended to the target population. The survey administration was self-completion; however, a researcher was available to help if required. Interested and eligible persons who could not complete the survey immediately were directed to the online version developed using Qualtrics software. Of the 304 paper surveys distributed, 221 were completed and returned by participants. In addition, 32 surveys were completed online making a total of 253 completed surveys. Based on Cohen's power analysis, a sample size of 253 was deemed sufficient for a significant result (Cohen, 1992).

### **Measures**

#### ***Socio-demographic characteristics***

Ten socio-demographic characteristics of participants were considered as potential independent moderators of the relationship between acculturation and the weight-related

behaviours. These were: gender, age (in years), duration of residence in Australia (in years), place of residence before immigration, Australian state of residence, sub-Saharan African region of origin, employment status, income level (in Australian dollars), highest attained educational level and marital status.

### *Acculturation*

Berry's acculturation theory is widely recognised and applicable to migrants of African ancestry. To the best of my knowledge, there was no acculturation instrument with measurement items and scales that was made available by Berry. Therefore, to assess acculturation, the Vancouver Index of Acculturation (VIA) which is a self-report bidimensional instrument for measuring acculturation was adapted (Paulhus, 2013). Vancouver Index of Acculturation (VIA). VIA is based on Berry's ideas on 'bidimensionality' and has comprehensive measurement items and scales. It is common that researchers use VIA to assess Berry's acculturation theory. An example can be seen in a study by Delavari, S nderlund, Mellor, Mohebbi, and Swinburn (2015). VIA has two subscales cultural maintenance (heritage dimension) and cultural participation (mainstream dimension). VIA is bi-dimensional and comprises 20 Likert-scale type items (1 = *disagree* to 9 = *agree*). The Likert-scale type items focused on several domains including cultural values, social relationships, and adherence to tradition. Higher or lower scores on an item indicate that the participant had stronger or weaker connections with either their heritage culture or Australian mainstream culture.

### *Dietary behaviour*

Based on the 2013 Australian Dietary Guidelines, fruits/vegetables/fibre intake was considered as indicator for a healthy dietary behaviour, whereas fat intake represented a less healthy dietary behaviour (National Health and Medical Research Council, 2013).

#### 1. Fat intake

Block's fat intake screener was adopted for measuring post-migration consumption of fat and cholesterol that put individuals at risk of developing heart diseases, some cancers, stroke, hypertension, diabetes, and excess weight gain (Block et al., 2000). This is a 17-item self-administered screener that asks participants for frequency of food intake (Block et al., 2000). Frequency of food intake was assessed with the following response options: (a) one month or less, (b) 2-3 times a month, (c) 1-2 times a week, (d) 3-4 times a week, and (e) 5 times a week or more (Block et al., 2000). In scoring fat intake, each response option was given a numeric value; one month or less= 0; 2-3 times a month= 1; 1-2 times a week= 2; 3-4 times a week= 3; 5 times a week or more= 4 (Block et al., 2000). The overall fat intake score can range from 0 to 68 per person, with 0 representing the lowest amount of fat intake and 68 representing the highest (Block et al., 2000). Scores at or below 7 indicate very low-fat intake, scores between 8 and 14 indicate average fat intake, scores between 15 and 22 indicate high fat intake, and scores above 23 indicate very high fat intake (Di Noia et al., 2008, Block et al., 2000).

#### 2. Fruits, vegetables and fibre intake

Block's fruits/vegetables/fibre intake screener was employed to capture post-migration intake of fruits, vegetables and fibre (Block et al., 2000). This is a 9-item self-administered screener that assesses food intake on a weekly or daily basis. Similar to the fat intake screener,

each food item was assigned various response options with associated numeric values: less than 1 week= 0; once a week= 1; 2-3 times a week= 2; 4-6 times a week= 3; once a day= 4; and twice or more a day= 5. The overall fruits/vegetables/fibre intake score should range from 0 to 45 per person with 0 representing the lowest amount of fruits/vegetables/fibre intake whereas 45 represents the highest (Block et al., 2000). Scores below 11 indicate low fruits/vegetables/fibre intake (Block et al., 2000).

### *Physical activity*

To measure physical activity behaviour, version 2 of the World Health Organisation's Global Physical Activity Questionnaire (GPAQ) was adopted (World Health Organisation, 2017). This comprises 16 questions that capture physical activity undertaken in different behavioural domains: activity at work, travel to and from places, recreational activities, and sedentary behaviour (World Health Organisation, 2017). It is important to note that 83 participants with physical activity data were excluded from the calculation of total physical activity based on the strict GPAQ guidelines. For instance, participants who did not provide number of days of engagement in physical activity at work but provided hours were exempted from the sample to enhance accuracy of the findings. Therefore, 170 out of the 253 participants were eligible for consideration in the calculation of total physical activity.

### *Data analysis*

Participants' socio-demographic characteristics were reported using descriptive statistics. Means and standard deviations were computed for cultural maintenance; cultural participation; fat intake; fruits/vegetables/fibre intake; and total physical activity.

Associations of fat intake, fruits/vegetables/fibre intake and physical activity with acculturation and socio-demographic characteristics were examined using univariable and multivariable linear regression analyses. Checks such as multicollinearity were conducted to ensure that data did not violate key assumptions. Multicollinearity tests displayed small correlations ( $r < 0.5$ ,  $N = 253$ ) among participant characteristics; none of the participant characteristics had tolerance ( $1 - r^2$ ) near zero. Outliers, normality, linearity, homoscedasticity, independence of residuals were inspected in residuals scatterplots as well as normal probability plots, which showed no serious violation of key assumptions.

Using Hayes (2018) PROCESS macro Version 3 (Model 1) for SPSS, multiple linear regression analysis was undertaken to assess the interaction effects of acculturation and socio-demographic characteristics on fat intake, fruits/vegetables/fibre intake, and physical activity. For significant interaction effects, conditional effects (simple slopes) of acculturation on the weight-related behaviours within socio-demographic characteristics were tested for statistical significance. For continuous moderator variables, simple slopes were assessed on 3 levels (i.e. one standard deviation below the mean, at the mean, and one standard deviation above the mean).

## **Results**

### ***Participant characteristics***

Self-identified males (55%) outnumbered their female counterparts (45%). Participants were predominantly middle-aged (51%) with an average age of 37 years. On average, duration of residence in Australia was 10 years. Three-quarters (75%) lived in an urban centre in sub-Saharan Africa (SSA) before migrating to Australia. More participants were recruited in New

South Wales (52%) than Victoria (48%) and persons of Western (30%) and Eastern (31%) African ancestries were mostly represented in the sample. The sub-Saharan African country with the highest representation in the sample was Zimbabwe (15.8%), followed by South Sudan (13%), Cameroon (9.5%) and Democratic Republic of Congo (8.3%). The majority (81%) were actively employed at the time of the survey and most of them (36%) earned between AUD 60,000 and AUD 99,999 annually. Participants were highly educated as more than half (69%) had completed tertiary level education. Slightly more than half (51%) lived with a partner. The mean and standard deviation (SD) for cultural maintenance (mean =7.11, SD= 1.63) was higher than that of cultural participation (mean = 5.25, SD= 1.59). Table 1 presents the participant characteristics.

**Table 1: Participant characteristics (N=253)**

	Mean (SD)	n (%)
<i>Gender</i>		
Men		139 (54.9)
Women		114 (45.1)
<i>Age (years)</i>	37.28 (10.18)	
<i>Duration of residency (years)</i>	9.69 (6.23)	
<i>Residence before immigration</i>		
Rural		62 (24.5)
Urban		191 (75.5)
<i>Australian State of residence</i>		
New South Wales		132 (52.2)
Victoria		121 (47.8)
<i>Sub-Saharan African region of origin</i>		
Western Africa		75 (29.6)
Eastern Africa		78 (30.8)
Southern Africa		50 (19.8)
Central Africa		50 (19.8)
<i>Employment status</i>		
Employed		206 (81.4)
Unemployed		47 (18.6)
<i>Income level (AUD)</i>		
<10000		32 (12.6)
10000-59999		89 (35.2)
60000-99999		90 (35.6)
100000+		42 (16.6)
<i>Highest attained educational level</i>		
Never attended school		5 (2.0)
Primary or Basic school		14 (5.5)
High school		59 (23.3)
Tertiary		175 (69.2)
<i>Marital status</i>		
Living with a partner		131 (51.8)
Living without a partner		122 (48.2)
<i>Cultural Maintenance</i>	7.11 (1.63)	
<i>Cultural Participation</i>	5.25 (1.59)	

Note. SD=Standard Deviation; Acculturation had two subscales cultural maintenance (heritage dimension) and cultural participation (mainstream dimension). VIA is bi-dimensional and comprises 20 Likert-scale type items (1 = *disagree* to 9 = *agree*)

### ***Dietary and physical activity behaviours***

Using Block's cut-off as a reference, fat intake can be described as very high (mean=25.25, SD=21.81) in the sample (Block et al., 2000). Regarding fruits/vegetables/fibre intake, consumption level (mean=16.37, SD=12.73) was well above Block's 11-point cut-off (Block et al., 2000). On average, participants spent 178 minutes (SD=176.76) a week on physical activity, which can be considered as moderate, according to the World Health Organisation (World Health Organisation, 2017).

As shown in Table 2, a significant relationship was found between fat intake and participants' characteristics [ $F(12, 240) = 3.20, p < 0.000$ ], with an  $R^2$  of 0.14. Fat intake was independently related to cultural participation ( $\beta = 0.26, t = 4.18, p < 0.000$ ), and income level ( $\beta = 0.17, t = 2.16, p = 0.032$ ). In terms of fruits/vegetables/fibre intake, a positively significant relationship [ $F(12, 240) = 3.50, p < 0.000$ ] was also found with participants' characteristics, with an  $R^2$  of 0.15. Fruits/vegetables/fibre intake was independently related to cultural participation ( $\beta = 0.14, t = 2.18, p = 0.030$ ), age ( $\beta = 0.20, t = 2.69, p = 0.008$ ), and place of residence before immigration ( $\beta = -0.16, t = -2.69, p = 0.008$ ). Regarding physical activity, a positively significant relationship [ $F(12, 157) = 3.54, p < 0.000$ ] was equally found with participants' characteristics, with an  $R^2$  of 0.21. Physical activity was independently related to cultural maintenance ( $\beta = 0.24, t = 3.18, p = 0.002$ ), gender ( $\beta = -0.24, t = -3.25, p = 0.001$ ), and employment status ( $\beta = -0.28, t = -3.36, p = 0.001$ ).



**Table 2: Multiple linear regression for dietary and physical activity behaviour by participant characteristics**

<i>Participant characteristics</i>	<b>Dietary and Physical Activity Behaviour</b>								
	Fat intake (N=253)			Fruits/vegetables/fibre intake (N=253)			Physical activity (N=170)		
	$\beta$	<i>t</i>	<i>p</i>	$\beta$	<i>t</i>	<i>p</i>	$\beta$	<i>t</i>	<i>p</i>
Gender	-.111	-1.819	.070	.125	2.054	.041*	-.235	-3.251	.001**
Age (years)	-.102	-1.357	.176	.201	2.689	.008**	-.039	-.440	.660
Duration of residency (years)	.031	.435	.664	.003	.040	.968	-.096	-1.133	.259
Residence before immigration	-.105	-1.723	.086	-.163	-2.692	.008**	.004	.060	.952
Australian State of residence	-.027	-.405	.686	.084	1.264	.207	-.147	-1.863	.064
Employment status	.014	.195	.846	-.131	-1.868	.063	-.280	-3.358	.001**
Income level (AUD)	.166	2.156	.032*	-.130	-1.701	.090	-.134	-1.477	.142
Cultural Maintenance	-.012	-.189	.850	-.018	-.283	.777	.241	3.178	.002**
Cultural Participation	.260	4.184	.000***	.135	2.179	.030*	-.076	-1.031	.304
<i>R</i> <sup>2</sup>		.138			.149			.213	
<i>F</i>		3.196***			3.498***			3.538***	

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ ; Note: Gender was coded as male (reference category)=0 and female=1; Residence before immigration was coded as rural (reference category)=0 and urban =1; Australian State of residence was coded as NSW (reference category)=0 and Victoria=1; Employment status was coded as employed (reference category)=0 and unemployed =1; Duration of residency was measured on a ratio scale at  $\geq 1$  year; Acculturation was measured using two sub-scales: cultural maintenance (i.e. maintenance of heritage culture) and cultural participation (i.e. adoption of Australian mainstream culture) with a Likert scale type items (1=disagree, 9=agree). Higher scores for cultural maintenance and cultural participation indicate that participants have stronger connections with heritage culture and host culture respectively and low scores suggest weaker connections

### ***Interactions between acculturation and socio-demographic characteristics***

None of the interactions between acculturation and socio-demographic characteristics was significantly related to fat intake. Table 3 shows that fruits/vegetables/fibre intake was significantly related to an interaction between cultural maintenance and age ( $\Delta R^2=0.02$ ,  $F(1, 249) = 4.69$ ,  $p=0.031$ ). A test of simple slopes indicated that there was no significant relationship between fruits/vegetables/fibre intake and cultural maintenance among younger participants,  $\beta = -0.06$ ,  $t(249) = -1.39$ ,  $p=0.165$ . There was also no significant relationship between fruits/vegetables/fibre intake and cultural maintenance among middle-aged participants,  $\beta = -0.01$ ,  $t(249) = -0.35$ ,  $p=0.725$ . Similarly, associations of fruits/vegetables/fibre intake with cultural maintenance and older participants showed no statistical significance,  $\beta=0.05$ ,  $t(249) = 1.25$ ,  $p=0.212$ . Figure 1.A. graphically depicts how effects of cultural maintenance on fruits/vegetables/fibre intake varied by age.

**Table 3: Multiple linear regression for dietary and physical activity behaviours by significant interactions between socio-demographic variables and acculturation**

Participant characteristics	Dietary and Physical Activity Behaviour					
	Fruits/vegetables/fibre intake			Physical activity		
	<i>b</i> (95% CI)	<i>t</i>	<i>P value</i>	<i>b</i> (95% CI)	<i>t</i>	<i>P value</i>
Cultural Maintenance	-.2259 (-0.44, -0.01)	-2.0639	.0401	80.7794 (27.33, 134.22)	2.9840	.0033
Age	-.0241 (-0.06, 0.01)	-1.2385	.2167	8.8934 (-1.14, 18.93)	1.7493	.0821
Cultural Maintenance*Age	.0059 (0.00, 0.01)	2.1657	.0313*	-1.5894 (-2.96, -0.21)	-2.2851	.0236*
Cultural Participation	.2369 (0.11, 0.36)	3.7688	.0002			
Duration of residency (years)	.1062 (0.04, 0.16)	3.6872	.0003			
Cultural Participation*Duration of residency (years)	-.0164 (-0.02, -0.00)	-3.1012	.0021**			
Cultural Participation	-.3059 (-0.57, -0.04)	-2.2704	.0240	73.5822 (-2.49, 149.66)	1.9096	.0579
Residence before immigration	-1.5893 (-2.41, -0.75)	-3.7695	.0002	223.0268 (-8.89, 454.95)	1.8986	.0594
Cultural Participation*Residence before immigration	.2274 (0.07, 0.37)	2.9847	.0031**	-43.1191 (-85.08, -1.15)	-2.0285	.0441*

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**Table 3 continued.**

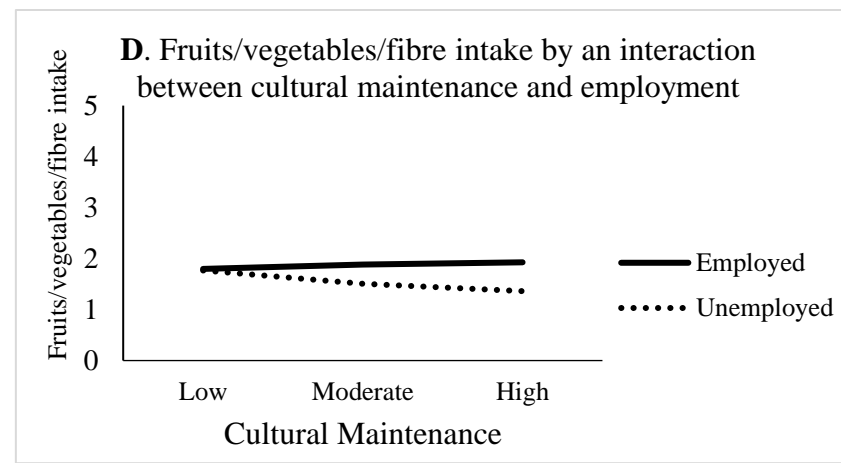
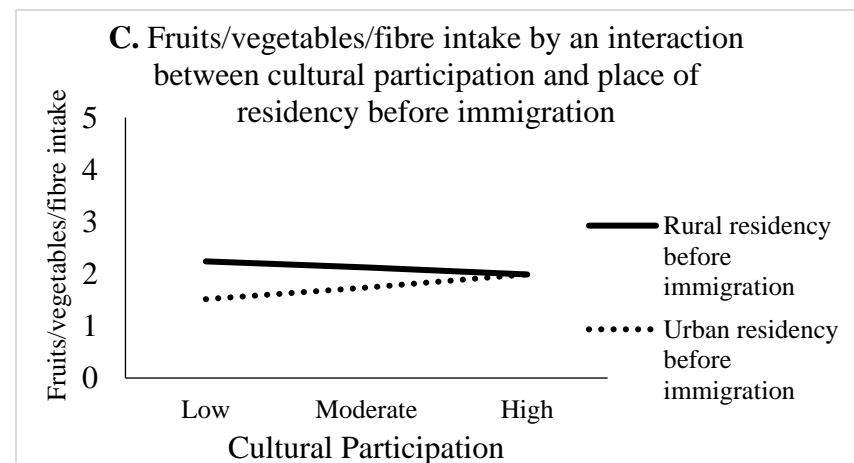
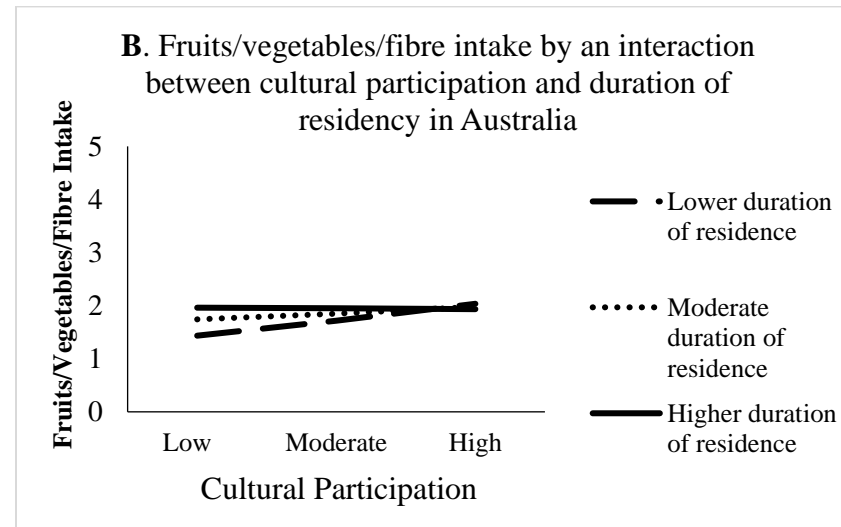
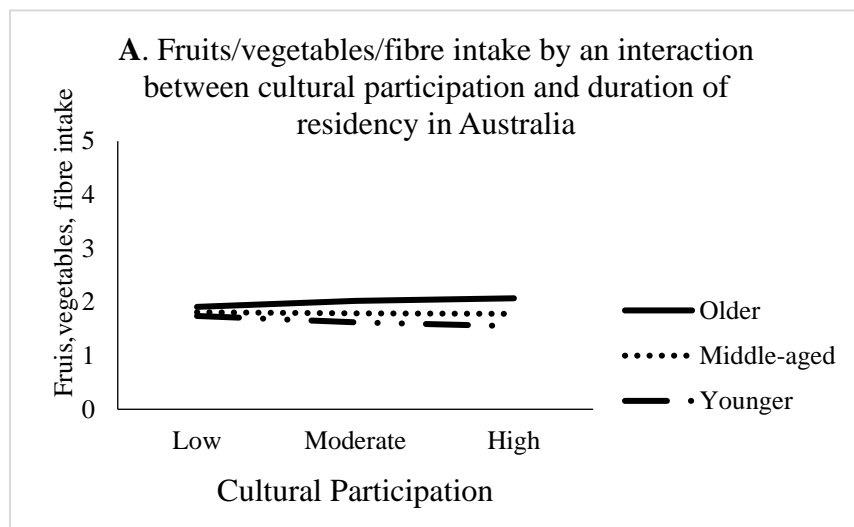
Cultural Maintenance	.2188 (0.01, 0.42)	2.0743	.0391
Employment status	.9505 (-0.11, 2.01)	1.7570	.0802
Cultural Maintenance*	-.1763	-2.3046	.0220*
Employment status	(-0.32, -0.02)		

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\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ \*\*\*; Note: Acculturation was measured using two sub-scales: cultural maintenance (i.e. maintenance of sub-Saharan African heritage culture) and cultural participation (i.e. adoption of Australian mainstream culture); Age was measured on a ratio scale at  $\geq 19$  years; Duration of residency was measured on a ratio scale at  $\geq 1$  year; Residence before immigration was coded as rural (reference category) and urban; Employment status was coded as employed (reference category) and unemployed

As shown in Table 3, fruits/vegetables/fibre intake was significantly related to an interaction between cultural participation and duration of residence in Australia ( $\Delta R^2=0.04$ ,  $F(1, 249)=9.62$ ,  $p=0.021$ ). More specifically, fruits/vegetables/fibre intake was significantly related to cultural participation among participants with lower duration of residence in Australia,  $\beta = 0.19$ ,  $t(249) = 3.72$ ,  $p < 0.000$ . Likewise, fruits/vegetables/fibre intake was significantly related to cultural participation among those with average duration of residence in Australia,  $\beta = 0.07$ ,  $t(249) = 2.09$ ,  $p = 0.004$ . However, there was no significant relationship between fruits/vegetables/fibre intake and cultural participation among those with longer duration of residence in Australia,  $\beta = -0.01$ ,  $t(249) = -0.20$ ,  $p = 0.843$ . As can be seen in Figure 1.B., at a low level of cultural participation, participants with lower and average duration of residence in Australia consumed less fruits/vegetables/fibre than those with a higher duration of residence.

**Figure 1: Line Graphs showing fruits/vegetables/fibre intake by significant interactions**



Fruits/vegetables/fibre intake was significantly related to an interaction between cultural participation and place of residence before immigration,  $\Delta R^2=0.03$ ,  $F(1, 249)=8.91$ ,  $p=0.031$ . There was no significant relationship between fruits/vegetables/fibre intake and cultural participation among participants who resided in rural areas before immigration,  $\beta = -0.08$ ,  $t(249) = -1.22$ ,  $p=0.222$ . In contrast, fruits/vegetables/fibre intake was significantly related to cultural participation among those who resided in urban areas before immigration,  $\beta = 0.15$ ,  $t(249) = 3.62$ ,  $p < 0.000$ . At low and moderate levels of cultural participation, intake of fruits/vegetables/fibre was lesser among participants who resided in urban areas before immigration than those who resided in rural areas. Figure 1.C. graphically shows how effects of cultural participation on fruits/vegetables/fibre intake varied by place of residence before immigration.

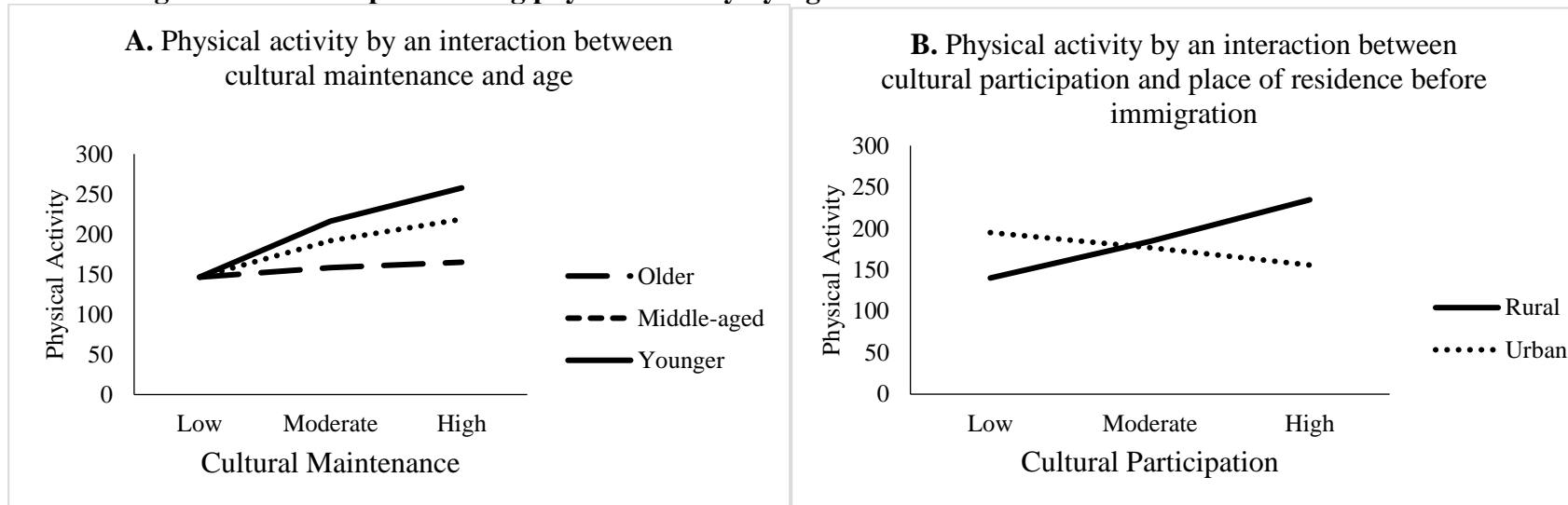
Fruits/vegetables/fibre intake was significantly related to an interaction between cultural maintenance and employment status ( $\Delta R^2=0.02$ ,  $F(1, 249) = 5.31$ ,  $p=0.022$ ). The relationship between fruits/vegetables/fibre intake and cultural maintenance was not statistically significant among employed participants,  $\beta = 0.04$ ,  $t(249) = 1.01$ ,  $p=0.311$ . In contrast, fruits/vegetables/fibre intake was significantly related to cultural maintenance among unemployed participants,  $\beta = -0.13$ ,  $t(249) = -2.09$ ,  $p=0.037$ . As shown in Figure 1.D., unemployed participants consumed less fruits/vegetables/fibre than those employed at moderate and high levels of cultural maintenance, but consumption level was similar for both employed and unemployed participants at a low level of cultural maintenance.

Physical activity was significantly associated with an interaction between cultural maintenance and age ( $\Delta R^2=0.03$ ,  $F(1, 166) = 5.22$ ,  $p=0.023$ ). Specifically, physical activity was significantly related to cultural maintenance among younger participants,  $\beta = 0.36$ ,  $t(249)$

= 3.50,  $p < 0.000$ . Physical activity was also significantly related to cultural maintenance among middle-aged participants,  $\beta = 23.56$ ,  $t(249) = 2.86$ ,  $p = 0.004$ . However, there was no significant relationship between physical activity and cultural maintenance among older participants,  $\beta = 6.08$ ,  $t(249) = 0.57$ ,  $p = 0.571$ . At moderate and high levels of cultural maintenance, younger participants engaged in more physical activity than middle-aged and older participants. Figure 2.A. graphically depicts how effects of cultural maintenance on physical activity varied by age.



**Figure 2: Line Graphs showing physical activity by significant interactions**



Physical activity was significantly associated with an interaction between cultural participation and place of residence before immigration ( $\Delta R^2=.02$ ,  $F(1, 249) = 4.12$ ,  $p=0.044$ ). A test of simple slopes showed that there was no significant relationship between physical activity and cultural participation among those who resided in rural areas before immigration,  $\beta = 30.46$ ,  $t(249) = 1.64$ ,  $p=0.102$ . Similarly, associations of physical activity with cultural participation and urban residency before immigration showed no statistical significance,  $\beta = -12.66$ ,  $t(249) = -1.22$ ,  $p=0.223$ . Figure 2.B. graphically displays how effects of cultural participation on physical activity varied by place of residence before immigration.

## Discussion

This study investigated the interaction effects of acculturation and socio-demographic characteristics on fat intake, fruits/vegetables/fibre intake, and physical activity among Australian residents born in sub-Saharan Africa (SSA). In support of Berry (1997) acculturation theory, the overall findings indicate significant associations of post-migration fruits/vegetables/fibre intake and physical activity with interactions between acculturation and socio-demographic characteristics. However, none of the interactions between acculturation and socio-demographic characteristics were significantly related to post-migration fat intake. Consistent with past studies (Yoshida et al., 2016, Paxton et al., 2016), findings of this study suggest that post-migration fat intake is independently associated with cultural participation on the one hand and income level on the other hand. The difference in findings for fat intake on the one hand and fruits/vegetables/fibre intake on the other suggests that the interplay between acculturation and socio-demographic characteristics may be

contingent on the specific food type under consideration. Future research could examine these relationships further.

While a number of studies have noted associations between health behaviour and age (Fayet-Moore et al., 2018, Poobalan et al., 2014), little is known about the interplay of fruits/vegetables/fibre intake, acculturation and age. Considering that internalisation of parents' culture may be small at early years in life (Berry, 1997), findings from this study that fruits/vegetables/fibre intake was low among younger participants with high cultural participation could mean that younger participants have adopted the common energy-dense foods and drinks in the Australian food market (Australian Institute of Health and Welfare, 2017). This finding supports an aspect of Berry's acculturation theory which suggests that when acculturation starts at an early age, the process is generally smooth and easier than in later years of life (Berry, 1997).

Another important age-related finding was that younger and middle-aged participants engaged in a greater amount of physical activity than older participants at moderate and high levels of cultural maintenance. There are two possible explanations for this result. Firstly, younger and middle-aged participants are naturally more energetic with better physical support for vigorous exercises than older persons (Crombie et al., 2004). Secondly, due to availability of more convenient and mechanised resources in Australia (e.g. easy and numerous modes of transport, elevators, and laundry machines), older participants may have lost some local physical activities (e.g. long-distance walks) that incidentally occurred when they lived in SSA (Addo et al., 2019). This present finding is consistent with a previous study which concluded that maintenance of traditional cultural orientation is associated with lower

rates of sedentary behaviour among young African immigrants in Australia (Renzaho et al., 2008).

One of the widely used indicators for examining the impact of immigration on population health is duration of residence in a host country (Koya and Egede, 2007, Lee et al., 2013). However, much uncertainty exists about the association of fruits/vegetables/fibre intake with acculturation and duration of residence in a host country. It is difficult to explain the finding from this study that intake of fruits/vegetables/fibre was low among participants with longer duration of residence in Australia at low level of cultural participation. The finding may however imply that as participants stayed longer in Australia their fruits/vegetables/fibre intake became largely irregular because of availability of other food options (Thomson and McFeeter, 2016).

Although dietary behaviour may vary between rural and urban residents of a country (Grobbee et al., 2019), available studies on post-migration dietary and physical activity behaviours have paid less attention to place of residence in the country of origin. Findings from this study that participants who resided in rural areas before immigration consumed higher amount of fruits/vegetables/fibre at low and moderate levels of cultural participation than urban dwellers confirms a growing hypothesis that migration to a more urbanised country often results in a less healthy change in dietary behaviour (Galbete et al., 2017). Food markets in many high-income countries are mostly industrialised with large supply of ‘cheap’ processed foods which are high in fats/sugars; hence participants with high level of cultural participation are likely to replace their relatively expensive local African fruits/vegetables/fibre by these processed foods (Berry, 1997, Holmboe-Ottesen and Wandel, 2012).

In terms of post-migration physical activeness, participants who lived in rural areas before immigration engaged in higher physical activity than those who resided in urban areas at high levels of cultural participation and the opposite was true when cultural participation was low. The reason for this result is less straightforward and may be related to the idea that participants who immigrated from rural places in SSA used less mechanised resources in Australia and have developed positive exercise behaviours (Addo et al., 2019).

Evidence from studies conducted over the past two decades suggests that a small number of studies have examined the effects of unemployment on dietary behaviour (Smed et al., 2018, Ruhm, 2005). In a recent study of the relationship between unemployment and diet composition, it was found that unemployment is directly associated with consumption of saturated fats, carbohydrates, and sugars whereas consumption of fresh vegetables was inversely related to unemployment (Smed et al., 2018). This present study extends findings in the previous study as it shows that at moderate and high levels of cultural maintenance, unemployed participants consumed less fruits/vegetables/fibre than those employed. Apparently, unemployed participants might have opted for cheaper foods (usually energy-dense foods) other than fruits/vegetables/fibre which are more expensive in Australia (Smed et al., 2018).

Overall, the findings show that the interplay between post-migration dietary and physical activity behaviours and acculturation was moderated by some socio-demographic characteristics of participants, such as age, duration of residence in Australia, place of residence before immigration (rural or urban), and employment status. However, most categorical socio-demographic variables, such as gender, sub-Saharan African region of origin, educational level, and marital status did not significantly moderate the interplay

between behaviour and acculturation. The most likely reason for this finding is that there were small number of responses for some levels of the categorical variables due to the study's small sample size. For instance, 175 participants had attained tertiary level education whereas only 14 had attained primary school education. This may have skewed the results in the regression analysis. Future studies on this topic may need to consider using a census method with a larger sample size rather than a convenient cross-sectional sampling method.

### ***Strengths and limitations***

Although the present study makes a noteworthy contribution to knowledge, a number of limitations need to be considered. Convenient sampling was used which affects the generalisability of the findings. To ensure diversity of the sample, participants were recruited from the two most populous Australian states that host the largest population of persons of African ancestry, using a range of recruitment strategies. Furthermore, the use of self-report measures may have resulted in memory and/or social desirability bias. To reduce the risk of reporting bias, widely used measures were included and the survey was carefully pre-tested and anonymously administered. Participants were also encouraged to skip questions if they were not sure of the answers. Another limitation is that some local African foods may be missing in Block's fat intake and fruits/vegetables/fibre intake measure. However, the measures adopted for this study have been applied to similar populations; are widely accepted; and had undergone validity and reliability checks (Di Noia et al., 2008, Tripathy et al., 2016). In future studies, measurement of physical activity behaviour may also consider objective methods, such as recordings using an accelerometer.

### ***Implications of findings for health promotion and conclusions***

Although the study has a number of limitations, it provides an important novel evidence about the interplay between acculturation and socio-demographic characteristics in understanding dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa. The findings also provide important empirical support to Berry's acculturation framework that suggests that socio-demographic characteristics may moderate the effects of acculturation on behavioural outcomes (Berry, 1997).

Notably, the evidence presented in this study suggests that health promotion interventions focused on dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa may need to consider specific population characteristics, particularly age, duration of residence in the host country, place of residence before immigration, and employment status. More specifically, special attention needs to be given to young and middle-aged persons when designing interventions seeking to promote fruits/vegetables/fibre intake as their participation in Australian mainstream culture(s) reflected less healthy dietary behaviours. Additionally, it may be useful to focus more attention on persons who are unemployed as well as those who lived in urban areas in SSA before migrating to Australia as fruits/vegetable/fibre intake was low among these groups of people. In terms of physical activity, separate attention can be focused on older persons as older age was inversely related to physical activeness. There is also an urgent need to develop strategies to reduce the high intake of 'fatty' foods in this population, especially among those with high income. Taking these implications and recommendations into account may become an important ingredient in designing successful prevention programmes aimed at reducing risks of weight-related diseases (e.g. diabetes, some cancers, cardiovascular diseases) in this

under-researched population. However, more research is needed to explain further about the interaction effects of acculturation and socio-demographic characteristics on dietary and physical activity behaviours in this immigrant population.



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## **CHAPTER SIX: ASSOCIATIONS OF POST-MIGRATION DIETARY AND PHYSICAL ACTIVITY BEHAVIOURS WITH ACCULTURATION AND SOCIAL-COGNITIVE FACTORS**

### **Introduction**

This chapter consists of a manuscript under peer review on the interplay of post-migration dietary and physical activity behaviours with acculturation and social-cognitive factors. The manuscript was based on outcomes from the surveys.

**Associations of post-migration dietary and physical activity behaviours with  
acculturation and social-cognitive factors: a cross-sectional study of Australian  
residents born in sub-Saharan Africa**

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## **Abstract**

Recent studies suggest that ‘immigrants’ often adopt less healthy dietary and physical activity behaviours after settling in host countries, which may lead to increased risk of weight-related diseases. Several studies have also reported that post-migration changes in dietary and physical activity behaviours are associated with acculturation. Given that social-cognitive factors are proximal determinants of behaviour, understanding their interplay with acculturation in the process leading to less healthy weight-related behaviours may help in developing more useful interventions. A cross-sectional survey was undertaken among Australian residents born in sub-Saharan Africa (SSA) to assess the interplay of post-migration dietary and physical activity behaviours with acculturation and social-cognitive factors. A total of 253 participants were self-selected from two Australian states: New South Wales and Victoria. Theory of planned behaviour variables were employed as social-cognitive factors. Fat intake and fruits/vegetables/fibre intake were used as indicators of dietary behaviour. Acculturation was measured using two sub-scales: cultural maintenance and cultural participation. Findings showed that both acculturation and social-cognitive factors significantly explained the variance in fat intake and physical activity. More specifically, the variance in post-migration fat intake was significantly explained by cultural participation and attitude. The variance in physical activity was also significantly associated with cultural maintenance and behavioural intention. It is therefore important to consider both acculturation and social-cognitive factors in weight-related interventions developed for Australian residents born in SSA.

**Keywords:** social-cognitive factors; acculturation; dietary and physical activity behaviours; sub-Saharan African migrants; migration



## **Introduction**

Several studies have reported that migration from a low to a higher income country often leads to less healthy changes in dietary and physical activity behaviours (Holmboe-Ottesen & Wandel, 2012; Renzaho & Burns, 2006). For example, a significant increase in fat intake was reported among European residents who emigrated from low-income countries (Holmboe-Ottesen & Wandel, 2012). In the United States, a study of residents who emigrated from Gulf countries also found a significant decrease in physical activity and a low intake of fruits/vegetables after immigration (Alyousif & Mathews, 2018). There is evidence to also suggest that the less healthy dietary and physical activity behaviours which often occur after immigration may put immigrants at risk of weight-related diseases, such as diabetes, some cancers, cardiovascular diseases, and chronic respiratory diseases (Greenberg & Deckelbaum, 2016).

Given that less healthy changes in dietary and physical activity behaviours have negative health implications for immigrants (Greenberg & Deckelbaum, 2016), it is important to understand the factors that influence post-migration dietary and physical activity behaviours. Several studies have attributed post-migration changes in dietary and physical activity behaviours to acculturation (Alyousif & Mathews, 2018; Holmboe-Ottesen & Wandel, 2012; Renzaho & Burns, 2006). Acculturation may be defined as “a dual process of cultural and psychological change that takes place as a result of contact between two or more cultural groups and their individual members” (Berry, 1997). A number of acculturation theorists have suggested that several behaviour trajectories can emerge after people migrate from their own countries of birth to new countries and these behaviour trajectories can be categorised into two dimensions: cultural maintenance (i.e. maintaining or neglecting one’s

own culture after getting in contact with other cultures) and/or cultural participation (i.e. adopting or neglecting the mainstream culture of the host country) (Magana et al., 1996; Mendoza, 1989; Nguyen & Benet-Martinez, 2007). It is however believed that the tendency for a person to maintain his/her own culture and/or adopt the culture of a different group of people is often influenced by group-level factors (i.e. social, cultural, economic, environmental and structural factors) (Berry, 1997; Fox, Thayer, & Wadhwa, 2017). For instance, a group of migrants can replace their familiar food by new food options, due to limited availability of the familiar food in the host country. On an individual level, social-cognitive factors (e.g. a person's intention and attitude), which are known to be proximal determinants of behaviour, may mediate the influence of acculturation on post-migration behaviour (Bandura, 2001; Flay & Petraitis, 1994; Norman, Conner, & Bell, 2000). Berry (1997) has emphasised that some 'mediating' factors may intervene directly between the process of acculturation and behavioural outcomes. However, Berry (1997) has noted that different empirical studies assign different roles to both moderating and mediating factors and it is not possible at this point in acculturation research to unambiguously claim them to be one or the other. Nevertheless, social cognitive theories (e.g. the theory of triadic influence) provide explanations to the pathways through which acculturation, moderating factors, and mediating factors may interact to shape behaviour trajectories (Conner & Norman, 2005). Social cognitive theories assume that moderating factors may shape the nature of a person's acculturation and the propensity for acculturation to influence an actual change in behaviour may be dependent on mediating proximal factors, such as behavioural control (self-efficacy), social normative beliefs, attitudes, and intentions (Conner & Norman, 2005). Despite the importance of social-cognitive factors in understanding the processes

leading to behaviour, little empirical research has been conducted to test their interplay with acculturation in understanding post-migration dietary and physical activity behaviours.

The theory of planned behaviour, which is a widely known social-cognitive theory has been employed in this study to help explain variations in post-migration dietary and physical activity behaviours (Ajzen, 2012; Harris & Hagger, 2007). According to the theory of planned behaviour, human behaviour is influenced by three main factors: beliefs about the likely results of a behaviour (behavioural beliefs), beliefs about the expectations of significant others (normative beliefs), and beliefs that people can perform a behaviour in the presence of discouraging situations (control beliefs) (Ajzen, 2013). Behavioural beliefs produce favourable or unfavourable attitudes toward the behaviour (attitude); normative beliefs often result in behaviours that are supported by significant others (subjective norms); and control beliefs produce the power to perform the behaviour (perceived behavioural control (Ajzen, 2012). Together, attitude, subjective norm, and perceived behavioural control lead to the formation of a behavioural intention, and this intention is considered the immediate determinant of behaviour (Ajzen, 2013).

Examining the association of post-migration dietary and physical activity behaviours with acculturation from an approach that considers the potential influence by social-cognitive factors may be important for developing community-endorsed interventions. Using fat intake, fruits/vegetables/fibre intake and physical activity among Australian residents born in sub-Saharan Africa as indicators of post-migration weight-related behaviours, this quantitative study examined whether the interplay between the weight-related behaviours and acculturation is mediated by attitudes, subjective norm, perceived behavioural control and intention. The study also investigated the extent to which variations in post-migration

dietary and physical activity behaviours can be explained by acculturation and social-cognitive factors.

## **Methods**

### ***Study design***

A cross-sectional community-based survey was conducted in two Australian states: New South Wales (NSW) and Victoria. These two states host the largest population of Australian residents of sub-Saharan African (SSA) ancestry (Australian Bureau of Statistics, 2013). The survey was administered online and in hard copy.

### ***Ethical considerations***

Ethics approval was received from the Human Research Ethics Committee of an authorised university (the University information has been concealed in line with the journal's requirement of blind review). The study was conducted in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research.

### ***Study participants***

Participants were required to be current residents of Australia, to have resided in Australia for at least 12 continuous months, be born in a SSA country, and to have lived in a SSA country until at least 18 years of age. The study excluded white Australians of SSA ancestry as their food culture is known to be similar to Western food culture (MAZBahr, 2007).

### ***Participant recruitment***

The study was advertised at African community gatherings (e.g. in churches, mosques, and weddings). Flyers, posters, and word-of-mouth were the main modes of advertisements. To increase awareness of the study among the target population, some African community organisations (e.g. Carers of Africa Inc.) were consulted to assist with promoting the research. Using the social communication platforms (e.g. email, WhatsApp and community meetings) of these organisations, eligible persons were invited to voluntarily participate in the study. Participants were self-selected to ensure the inclusiveness of persons from diverse backgrounds. This self-selected method was considered best for this difficult-to-access population but may not yield a representative sample (Renzaho & Burns, 2006). To address this limitation, a minimum quota of 50 participants was allotted to each of four distinguished SSA sub-regions of origin: Western Africa, Eastern Africa, Central Africa, and Southern Africa.

### ***Data collection***

Data were collected from November 2017 to September 2018. After pre-testing the survey among 10 volunteers, the survey was extended to the target population. The survey was distributed in hard copy and was self-complete; however, a researcher was available to provide assistance if required. Interested and eligible persons who could not complete the survey instantly were directed to an online version developed using Qualtrics software. The survey questions focused on retrospective, current, and prospective fat intake, fruits/vegetables/fibre intake, and physical activity. Of the 304 paper surveys that were distributed, 221 were completed and returned by participants. In addition, 32 surveys were

completed online making a total of 253 completed surveys. Based on Cohen's power analysis, a sample size of 253 was deemed sufficient for a significant result (Cohen, 1992).

## ***Measures***

### **Acculturation**

Berry's acculturation theory is widely recognised and applicable to migrants of African ancestry. To the best of my knowledge, there was no acculturation instrument with measurement items and scales that was made available by Berry. Therefore, to assess acculturation, the Vancouver Index of Acculturation (VIA) which is a self-report bidimensional instrument for measuring acculturation was adapted (Paulhus, 2013). Vancouver Index of Acculturation (VIA). VIA is based on Berry's ideas on 'bidimensionality' and has comprehensive measurement items and scales. It is common that researchers use VIA to assess Berry's acculturation theory. An example can be seen in a study by Delavari, S nderlund, Mellor, Mohebbi, and Swinburn (2015). VIA has two subscales cultural maintenance (heritage dimension) and cultural participation (mainstream dimension). VIA is bi-dimensional and comprises 20 Likert-scale type items (1 = *disagree* to 9 = *agree*). The Likert-scale type items focused on several domains including cultural values, social relationships, and adherence to tradition. Higher or lower scores on an item indicate that the participant had stronger or weaker connections with either their heritage culture or Australian mainstream culture.

### Social-cognitive factors

Measures of the social-cognitive factors were developed using recommended guidelines provided by Ajzen (2013). It is important to note that separate social-cognitive measures were developed for fat intake, fruits/vegetables/fibre intake, and physical activity. Scores ranged from 1 to 7, with 1 representing ‘the lowest rating on an item’, 4 representing ‘indifference’, and 7 representing ‘the highest rating’.

#### *Attitude*

Attitude was measured using six items with each item comprising seven semantic differential scales (i.e. extremely bad-extremely good, extremely useful-extremely useless, extremely unreasonable-extremely reasonable, extremely pleasant-extremely unpleasant, extremely uncomfortable-extremely comfortable, very interesting-very boring). An example of the questions asked about attitude was: “How would you describe it, if you would be eating fruits/vegetables/fibre every day, for the next 3 months?”

#### *Subjective norm*

Subjective norm was measured using three items with seven semantic differential scales (i.e. perfectly correct-not correct at all, strongly agree-strongly disagree, extremely unlikely-extremely likely). An example of a statement about subjective norm was: “Most people who are important to me want me to eat meaty/oily/fatty foods”.

#### *Perceived behavioural control*

Perceived behavioural control was measured using two items with seven semantic differential scales (i.e. definitely true-definitely false, strongly disagree-strongly agree). An example of a statement about perceived behavioural control was: “I am confident that I can

do 150 minutes moderate-intensity exercise or 75 minutes vigorous-intensity exercise per week, in the forthcoming month”.

### *Intention*

Intention was measured using two items on a seven semantic differential scale (extremely unlikely-extremely likely, strongly agree-strongly disagree. An example of a statement about intention was: “I plan to do at least 150 minutes moderate-intensity exercise or 75 minutes vigorous-intensity exercise in the forthcoming month”.

### Dietary behaviour

#### *Fat intake*

Block’s self-reported fat intake screener was adopted for measuring post-migration consumption of fat and cholesterol (Block et al. 2000). This is a 17-item self-administered screener that asks participants for their frequency of food intake (Block, Gillespie, Rosenbaum, & Jenson, 2000). Frequency of food intake was assessed with the following response options: (a) one month or less, (b) 2-3 times a month, (c) 1-2 times a week, (d) 3-4 times a week, and (e) 5 times or more a week (Block et al. 2000). In scoring fat intake, each response option was given a numeric value; one month or less= 0; 2-3 times a month= 1; 1-2 times a week= 2; 3-4 times a week= 3; 5 times a week or more= 4 (Block et al. 2000). Scores at or below 7 indicate very low-fat intake (i.e., less than 25% of energy from fats), scores between 8 and 14 indicate average fat intake (i.e., between 30% and 35% of energy from fats), scores between 15 and 22 indicate high fat intake (i.e., above 35% of energy from fats), and scores above 23 indicate very high fat intake (i.e., 40% to 50% of energy from fats) (Block et al., 2000; Di Noia, Schinke, & Contento, 2008).



### *Fruits, vegetables and fibre intake*

Block's fruits/vegetables/fibre intake screener was employed to capture post-migration intake of fruits, vegetables and fibre (fruits/vegetables/fibre) (Block et al., 2000). This is a 9-item self-administered screener that assesses food intake on a weekly or daily basis. Similar to the fat intake screener, each food item was assigned various response options with associated numeric values: less than 1 week= 0; once a week= 1; 2-3 times a week= 2; 4-6 times a week= 3; once a day= 4; and twice or more a day= 5. Scores below 11 indicate low fruits/vegetables/fibre intake (Block et al., 2000).

### Physical activity

To measure physical activity behaviour, version 2 of the World Health Organisation's Global Physical Activity Questionnaire (GPAQ) was adopted (World Health Organisation, 2017). This comprises 16 questions that capture physical activity undertaken in different behavioural domains: activity at work, travel to and from places, recreational activities, and sedentary behaviour (World Health Organisation, 2017). Total physical activity was calculated as the sum of the total minutes of activity computed for each domain (World Health Organisation, 2017).

It is worthy to note that 83 participants with physical activity data were excluded from the calculation of total physical activity based on the strict GPAQ guidelines. For instance, participants who did not provide number of days of engagement in physical activity at work but provided hours were excluded from the sample to ensure accuracy of the findings. Therefore, 170 out of the 253 participants were eligible for consideration in the calculation of total physical activity.

### ***Data analysis***

Internal consistency for all scales was measured using Cronbach's alpha and the values ranged from .71 to .90 as shown in Table 1. Means and standard deviations were computed for acculturation; social-cognitive factors; and the dietary and physical activity behaviours. To identify potential mediators in the relationship between post-migration dietary and physical activity behaviours and acculturation, zero-order correlations were also conducted for all the variables.

Hierarchical linear regression was used to assess associations of the dietary and physical activity behaviours with acculturation and social-cognitive factors. In the first step, the acculturation variables (cultural maintenance and cultural participation) were entered. In step 2, the social-cognitive factors pertaining to the specific behaviours (fat intake, fruits/vegetables/fibre intake, physical activity) were added to the equation, after acculturation was controlled. After all sets of variables were entered separately for each specific behaviour, the overall model and each independent variable were assessed in terms of the extent to which they explained variance in the dietary and physical activity behaviours.

## **Results**

### ***Participant characteristics***

As shown in Table 1, a mean of 7.11 (SD=1.63) was recorded for cultural maintenance whereas cultural participation recorded a mean of 5.25 (SD= 1.59). With the exception of attitude towards fat intake (Mean=3.06, SD=1.29), subjective norm for fat intake (Mean=3.90, SD=1.62) and intention for fat intake (Mean=3.30, SD=1.54), none of the social-cognitive variables was below the midpoint of 4. Using Block's cut-off as a reference

(Block et al., 2000), the average fat intake can be described as high in the sample (Mean =25.25, SD=21.81). Fruits/vegetables/fibre intake (Mean =16.37, SD=12.73) was well above Block's 11-point cut-off (Block et al., 2000). The average amount of physical activity was 178 minutes (SD=176.76) a week, which can be considered as an acceptable physical activity level, according to the standard of the World Health Organisation (World Health Organisation, 2017).

**Table 1: Participant characteristics**

	<b><math>\alpha</math></b>	<b>Mean</b>	<b>SD</b>
<b><i>Acculturation</i></b>			
Cultural maintenance	0.90	7.11	1.63
Cultural participation	0.87	5.25	1.59
<b><i>Attitude</i></b>			
Attitude towards fat intake	0.86	3.06	1.29
Attitude towards fruits/vegetables/fibre intake	0.86	4.54	1.42
Attitude towards physical activity	0.80	4.24	1.25
<b><i>Subjective norm</i></b>			
Subjective norm for fat intake	0.74	3.90	1.62
Subjective norm for fruits/vegetables/fibre intake	0.71	4.76	1.62
Subjective norm for physical activity	0.72	4.22	1.51
<b><i>Perceived behavioural control</i></b>			
Perceived behavioural control for fat intake	0.75	4.72	1.48
Perceived behavioural control for fruits/vegetables/fibre intake	0.71	4.04	1.63
Perceived behavioural control for physical activity	0.71	4.29	1.45
<b><i>Intention</i></b>			
Intention for fat intake	0.71	3.50	1.54
Intention for fruits/vegetables/fibre intake	0.76	4.29	1.62
Intention for physical activity	0.71	4.06	1.51
<b><i>Dietary and physical activity behaviour</i></b>			
Fat intake	0.88	25.25	21.81
Fruits/vegetables/fibre intake	0.82	16.37	2.73
Physical activity	-	178.29	176.76

**Note:** Acculturation was measured on 20 Likert-scale type items (1 = *disagree* to 9 = *agree*); Scores for social cognitive variables (i.e. attitude, subjective norm, perceived behavioural control and intention) ranged from 1 to 7, with 1 representing ‘the lowest rating on an item’, 4 representing ‘indifference’, and 7 representing ‘the highest rating’.

### ***Potential mediating role of social-cognitive factors***

One of the objectives of this study was to assess whether the relationship between post-migration dietary and physical activity behaviours and acculturation is mediated by social-cognitive factors. According to Kenny (2018), in a mediation analysis, the independent variable should correlate with the mediator and dependent variables. As can be seen in Table 2, none of the social-cognitive factors were in line with Kenny's criteria; and as a result, could not be considered as potential mediators in the interplay between post-migration dietary and physical activity behaviours and acculturation.

**Table 2: Associations of dietary and physical activity behaviours with acculturation and social-cognitive factors**

Participant Characteristics	Acculturation		Dietary and Physical Activity Behaviours		
	Cultural maintenance	Cultural participation	Fat intake	Fruits/vegetables/fibre intake	Physical activity
	<i>r</i> ( <i>p</i> value)	<i>r</i> ( <i>p</i> value)	<i>r</i> ( <i>p</i> value)	<i>r</i> ( <i>p</i> value)	<i>r</i> ( <i>p</i> value)
<b><i>Acculturation</i></b>					
Cultural maintenance			0.022 (0.733)	-0.004 (0.955)	<b>0.194</b> <b>(0.011)</b>
Cultural participation			<b>0.286</b> <b>(0.000)</b>	<b>0.148</b> <b>(0.018)</b>	-0.020 (0.792)
<b><i>Attitude</i></b>					
Attitude towards fat intake	-0.08 (0.222)	0.01 (0.886)	<b>0.13</b> <b>(0.035)</b>		
Attitude towards fruits/vegetables/fibre intake	-0.05 (0.396)	0.11 (0.071)		0.03 (0.60)	
Attitude towards physical activity	0.02 (0.735)	<b>0.17</b> <b>(0.006)</b>			-0.07 (0.344)
<b><i>Subjective norm</i></b>					
Subjective norm for fat intake	0.04 0.498	0.01 (0.947)	<b>0.14</b> <b>(0.024)</b>		
Subjective norm for fruits/vegetables/fibre intake	0.12 (0.056)	<b>0.14</b> <b>(0.031)</b>		0.05 (0.43)	
Subjective norm for physical activity	0.10 (0.129)	<b>0.18</b> <b>(0.004)</b>			-0.08 (0.309)
<b><i>Perceived behavioural control</i></b>					
Perceived behavioural control for fat intake	0.03 (0.663)	0.08 (0.204)	0.05 (0.466)		
Perceived behavioural control for fruits/vegetables/fibre intake	0.02 (0.721)	0.10 (0.105)		0.02 (0.763)	
Perceived behavioural control for physical activity	-0.09 (0.162)	<b>0.16</b> <b>(0.011)</b>			-0.142 (0.065)

**Table 2 Continued.**

<b><i>Intention</i></b>			
Intention for fat intake	-0.13 (0.837)	-0.03 (0.607)	0.09 (0.138)
Intention for fruits/vegetables/fibre intake	-0.01 (0.875)	<b>0.15</b> <b>(0.016)</b>	-0.03 (0.655)
Intention for physical activity	-0.01 (0.886)	<b>0.15</b> <b>(0.015)</b>	<b>-0.20</b> <b>(0.010)</b>

Note: Acculturation was measured on 20 Likert-scale type items (1 = *disagree* to 9 = *agree*); Scores for social cognitive variables (i.e. attitude, subjective norm, perceived behavioural control and intention) ranged from 1 to 7, with 1 representing 'the lowest rating on an item', 4 representing 'indifference', and 7 representing 'the highest rating'.

### ***Association of weight-related behaviours with acculturation and social-cognitive factors***

Since there was no potential mediation, analysis that followed focused on the extent to which variations in post-migration dietary and physical activity behaviours were explained by acculturation and social-cognitive factors. As can be seen in Table 3, acculturation explained 8% of the variance in fat intake ( $F(2, 250) = 11.1, p < 0.000$ ), with cultural participation ( $\beta = 0.29, t(2, 250) = 4.71, p < 0.000$ ) emerging as a significant independent covariate in the equation. The addition of social-cognitive factors produced an additional 4% significant increment in the amount of variance explained in fat intake ( $R^2$  change = 0.04,  $F(4, 246) = 5.59, p = 0.000$ ), with attitude towards fat intake ( $\beta = 0.12, t(4, 246) = 2.00, p = 0.040$ ) emerging as a significant independent covariate in the equation.

Furthermore, acculturation explained 2% of the variance in fruits/vegetables/fibre intake ( $F(2, 250) = 2.8, p = 0.061$ ), with cultural participation emerging as a significant independent covariate in the equation. However, the addition of social-cognitive factors did not produce a significant increment in the amount of variance explained in fruits/vegetables/fibre intake ( $R^2$  change = 0.03,  $F(4, 246) = 2.82, p = 0.061$ ).

Table 3 also shows that acculturation significantly explained 4% of the variance in physical activity ( $F(2, 167) = 3.3, p = 0.038$ ), with cultural maintenance emerging as a significant independent covariate in the equation. The addition of social-cognitive factors produced an additional 5% significant increment in the amount of variance explained in physical activity ( $R^2 \text{ change} = 0.05, F(4, 163) = 2.56, p = 0.022$ ), with intention for physical activity ( $\beta = -0.17, t(4, 246) = 2.08, p = 0.039$ ) emerging as a significant independent covariate in the equation.



**Table 3: Hierarchical linear regression for dietary and physical activity behaviours by acculturation and social-cognitive factors**

Step	Dietary and Physical Activity Behaviour								
	Fat intake (N=253)			Fruits/vegetables/fibre intake (N=253)			Physical activity (N=170)		
	$\beta$	<i>t</i>	<i>p</i>	$\beta$	<i>t</i>	<i>p</i>	$\beta$	<i>t</i>	<i>p</i>
<b>1. Acculturation</b>									
Cultural Maintenance	0.01	0.07	0.954	-0.01	-0.20	0.840	0.20	2.57	0.011*
Cultural Participation	0.29	4.71	0.000***	0.15	2.37	0.018*	-0.03	-0.42	0.672
$R^2$		0.08			0.02			0.04	
$R^2_{change}$		0.08			0.02			0.04	
$F_{change}$		11.14***			2.82			3.35*	
<b>2. Social-cognitive factors</b>									
Attitude	0.12	2.00	0.040*	0.03	0.46	0.646	-0.02	-0.28	0.776
Subjective norm	0.12	1.93	0.055	0.04	0.62	0.534	-0.04	-0.55	0.585
Perceived behavioural control	0.02	0.23	0.773	0.02	0.22	0.829	-0.09	-1.13	0.262
Intention	0.05	0.72	0.476	-0.07	-1.05	0.296	-0.17	-2.08	0.039*
$R^2$		0.12			0.03			0.09	
$R^2_{change}$		0.04			0.01			0.05	
$F_{change}$		2.67*			1.16			2.10*	

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Acculturation was measured on 20 Likert-scale type items (1 = *disagree* to 9 = *agree*); Scores for social cognitive variables (i.e. attitude, subjective norm, perceived behavioural control and intention) ranged from 1 to 7, with 1 representing 'the lowest rating on an item', 4 representing 'indifference', and 7 representing 'the highest rating'.

## **Discussion**

As mentioned earlier, this study sought to examine whether social-cognitive factors mediate relationships between post-migration dietary and physical activity behaviours and acculturation among Australian residents born in sub-Saharan Africa (SSA). Additionally, the study aimed to investigate the extent to which acculturation and social-cognitive factors explain variations in post-migration dietary and physical activity behaviours. Contrary to what was hypothesised, the association of post-migration dietary and physical activity behaviours with acculturation was not mediated by social-cognitive factors. Although the social cognitive factors significantly explained some variance in behaviour, the effect size was quite low. This finding implies that the applicability of social cognitive factors as mediators between dietary and physical activity behaviours and acculturation may not be true for migrants of sub-Saharan African backgrounds. Several factors may have contributed to this unexpected finding. Possibly, the inability of the adapted questionnaire for measuring social-cognitive factors to capture past behaviour may have undermined the examined relationship. As noted in previous studies (Kley, 2009; McDermott et al., 2015), this present finding can also indicate the possibility of unmeasured confounding factors. Based on past studies, possible confounders may include acculturation stress (Tseng & Fang, 2011) and emotions that affect eating behaviour (Devonport, Nicholls, & Fullerton, 2019). Given this unexpected and uncertain result, it will be important for studies in future to re-assess the role of social cognitive factors in the interplay between post-migration dietary and physical activity behaviour and acculturation using different social cognitive measurement items.

Consistent with previous studies (Onuoha-Obilor, 2017; Renzaho, 2007; Sanou et al., 2014), findings from this present study emphasise the significant role played by acculturation

in the less healthy dietary and physical activity behaviours that often develop after immigration. More specifically, the significant association between post-migration fat intake and cultural participation in this present study suggests that participants are likely to consume more ‘fatty’ foods as they adopt Australia’s mainstream culture. In reference to past studies, possible reasons for this present result may include easy accessibility of fast foods in Australia, limited availability of familiar local African foods in Australia, lack of adequate time to prepare local African foods in Australia, and relatively low cost of ‘fatty’ foods in Australia (Renzaho & Burns, 2006).

There are limited documented studies about sub-Saharan African culture(s) and physical activity, but the available evidence suggests that local African games, plays, festivals, and dances often involve rigorous physical exercise (Amusa & Toriola, 2010; Ndee, 1996). As similarly noted in some previous studies (Ibe-Lamberts, 2016; Renzaho, Swinburn, & Burns, 2008), findings from this present study suggest that maintenance of these local African cultures that involve physical activity are important for ensuring physical activeness after immigration. There is, therefore, a need to promote commonly neglected African cultures that involve physical activities in this population.

Although the social-cognitive factors did not play a significant mediational role in the interplay between the dietary and physical activity behaviours and acculturation, there seems to be some evidence that social-cognitive factors contribute to variations in the behaviours. In particular, the significant association of attitude with post-migration fat intake suggests the presence of unique beliefs about fat intake among participants as attitude is theoretically recognised as a function of a person’s main behavioural beliefs (Conner & Norman, 2005). In line with our past study (Authors, 2019), high fat intake in Australia may be participants’

response to a previously limited accessibility of cheap fatty foods in SSA. High fat intake may also be a deliberate attempt to gain more body weight as post-migration weight gain is commonly thought to be an evidence of well-being in this population (Authors, 2019).

Furthermore, the significant relationship between post-migration physical activity and intention to exercise indicates that promotion of physical activity in this population may require a deliberate plan. In reference to the intention component of the theory of planned behaviour (Ajzen, 2013), developing a plan for physical exercise may however be a function of positive beliefs about the benefits of exercising, support from significant others to exercise and a self-ability to continue with a planned physical exercise in a course of a discouraging event.

Findings also suggest that associations of post-migration dietary and physical activity behaviours with acculturation and social-cognitive factors may be contingent on the type of behaviour under examination. The lack of significant associations of post-migration fruits/vegetables/fibre intake with both acculturation and the social-cognitive factors imply that either less change has occurred after immigration in terms of participants' fruits/vegetables/fibre intake or the significant change that occurred is unrelated to acculturation and the social-cognitive factors. To provide a better understanding of this finding, future studies may need to consider a place-comparative approach that tracks migrants' fruits/vegetables/fibre intake from their countries of birth to the destination countries.

### ***Strengths and limitations***

Although several studies have focused on dietary and physical activity behaviours among African migrants in Australia, to the best of our knowledge, this work is among the first to investigate the interplay of post-migration dietary and physical activity behaviours with acculturation and social-cognitive factors in this population. While the present study makes an important contribution to knowledge, a number of limitations cannot be overlooked. Caution should be taken when generalising the findings as participants were conveniently sampled. To reduce this sampling limitation, participants were recruited from the two Australian states that host the largest population of African migrants, using a range of recruitment strategies. Additionally, self-report measures were used; and this may have resulted in memory and/or social desirability bias. To reduce chances of any reporting bias, the survey was carefully pre-tested and anonymously administered. Participants were also encouraged to skip questions if they were not sure of the answers. Regarding dietary behaviour, some local African foods may be missing in Block's fat intake and fruits/vegetables/fibre intake measure. However, the measures adopted for this study have been applied to similar populations; are widely accepted; and had undergone validity and reliability checks (Block et al., 2000; Di Noia et al., 2008).

### ***Implication of findings for health promotion***

Research has shown that diet composition and level of physical activity are important modifiable behaviours that can help to reduce the risk of developing weight-related diseases in several populations (Ford, Bergmann, Boeing, Li, & Capewell, 2012; World Health Organisation, 2019). One of the widely recognised and important ways of promoting optimal

health across several populations is to encourage control of fat intake (National Health and Medical Research Council, 2013). Based on the present findings that attitude and cultural participation were significantly associated with fat intake, it may be useful for health promoters to encourage participants to develop more positive attitudes of adopting less fatty food options in the Australian food market. Moreover, as maintenance of local African culture(s) was significantly related to physical activity, encouraging a continuation of African cultural practises that involve physical activities after immigration may be important for promoting good health in this population.

## **Conclusions**

This study has demonstrated that acculturation and social-cognitive factors play important roles in the dietary and physical activity behaviours of Australian residents born in sub-Saharan Africa. Findings from this study encourage an extension of current research towards a more holistic approach that considers the association of social-cognitive factors in explaining the relationship between post-migration dietary and physical activity behaviours and acculturation. However, the disqualification of the social-cognitive variables as mediators in the interplay between post-migration dietary and physical activity behaviours and acculturation suggests that research of additional variables is needed to provide a better understanding of the processes leading to the behaviours.

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## **CHAPTER SEVEN**

### **GENERAL DISCUSSION AND CONCLUSION**

#### **Introduction**

Each of the manuscripts presented in the previous chapters has its own separate discussion section which contains an interpretation of the key findings; strengths and limitations of the study; practical implications of the key findings; recommendations for future research; and conclusions drawn from the study. In this sixth chapter, findings in the separate manuscripts are combined and discussed in relation to the broader study objectives. The chapter begins with a brief outline of the significance and purpose of conducting this research. Next, the key findings from this study are discussed in light of existing literature. This chapter also contains a summary of the original contribution of this project to knowledge, limitations of the study, suggestions for future research, and key recommendations for health promotion.

#### **Overview of this study**

A large and growing body of research has shown that excess weight gain can increase the risk of developing some non-communicable diseases (NCDs), such as diabetes and heart diseases (Akil & Ahmad, 2011; Dowling, Enticott, Kunin, & Russell, 2019; Popkin, 2015; World Health Organisation, 2018b). Evidence further suggests that post-migration changes in dietary and physical activity behaviours may be a major and modifiable explanation for weight-related health problems (Foster-Schubert et al., 2012; Murphy, Robertson, & Oyeboode, 2017; Philippou, Andreou, Menelaou, Hajigeorgiou, & Papandreou, 2012; Reile & Leinsalu, 2019; Renzaho, 2004; Renzaho & Burns, 2006; Renzaho, Swinburn, & Burns, 2008).

A review of the empirical literature has also demonstrated that multiple factors often affect post-migration dietary and physical activity behaviours (Brug et al., 2017; Buck et al., 2019; Holdsworth et al., 2017; Langoien et al., 2017; Satia-Abouta, 2003). However, available research on dietary and physical activity behaviours has focused on direct relationships between two factors thought to be associated with dietary and physical activity behaviours (Okafor, Carter-Pokras, & Zhan, 2014; Renzaho & Burns, 2006).

Given this research gap, a conceptual framework was developed to conceptualise the interaction of multiple factors in the process leading to post-migration dietary and physical activity behaviour among Australian residents born in SSA. The conceptual framework suggests that post-migration dietary and physical activity behaviours are mainly influenced by acculturation. Acculturation, in turn, is moderated by a person's social environment (e.g. interactions with significant people), economic environment (e.g. affordability of food and physical activity resources), and physical environment (e.g. availability of food and physical activity resources). Some socio-demographic characteristics of a person are also thought to moderate the extent of a person's acculturation. For instance, a longer duration of residence in a host country may be associated with an increase in a person's exposure to the host country culture and may subsequently lead to acculturation (Abraído-Lanza, Armbrister, Flórez, & Aguirre, 2006; Khawaja, Yang, & Cockshaw, 2016; Miglietta & Tartaglia, 2008). In addition, the association between acculturation and post-migration dietary and physical activity behaviour patterns is thought to be mediated by social-cognitive factors, such as a person's attitude, subjective norms, self-control and intention to perform or not to perform a behaviour. Together, the interaction of these multiple factors may result in a change in dietary or physical activity behaviour after immigration.

## **Study aims**

Employing mixed methods involving qualitative in-depth interviews and quantitative surveys, this thesis mainly aimed to examine factors associated with post-migration dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa (SSA). The thesis was focused on five specific objectives. The first was to examine associations between post-migration dietary and physical activity behaviours and acculturation among Australian residents born in SSA. Based on findings from both qualitative in-depth interviews and quantitative surveys, this first specific objective has been addressed in Chapters Three, Five and Six of this thesis. Secondly, the research aimed to examine environmental factor(s) associated with post-migration dietary and physical activity behaviours among the Australian residents born in SSA. This second objective was addressed using results from the qualitative in-depth interviews presented in Chapter Three of this thesis. The third specific objective was to investigate body size beliefs among the Australian residents born in SSA and assess the extent to which such beliefs affect post-migration dietary and physical activity behaviours. Findings presented in Chapter Four, which is based on the qualitative in-depth interviews, address this third specific objective. The fourth objective of this thesis was to test whether socio-demographic factors moderate the effects of acculturation on post-migration dietary and physical activity behaviours among the study population. Moderation effects of socio-demographic factors in the relationship between post-migration dietary and physical activity behaviours and acculturation have been examined in Chapter Five. The last specific objective of this research aimed to appraise the extent to which social-cognitive factors mediate the association of acculturation on post-migration dietary and physical activity behaviours among the Australian residents born in

SSA. Findings in Chapter Six of this thesis, which is based on the quantitative survey, address this objective.

## **Key findings**

### ***Factors associated with post-migration dietary and physical activity behaviours***

Overall, the findings of this study confirm the notion that a variety of factors are associated with post-migration dietary and physical activity behaviours among the Australian residents born in SSA. The factors can be categorised as: acculturation, environmental factors, socio-cultural factors, socio-demographic factors, and social-cognitive factors.

### **Acculturation**

Several studies have documented that post-migration changes in dietary and physical activity behaviours are associated with acculturation (Delavari, Sonderlund, Swinburn, Mellor, & Renzaho, 2013; Holmboe-Ottesen & Wandel, 2012; Lesser, Gasevic, & Lear, 2014; Tami, Reed, Boylan, & Zvonkovic, 2012). A major limitation in most of these previous acculturation-related studies, however, is the lack of an understanding of the process through which acculturation leads to behaviour change (Fox, Thayer, & Wadhwa, 2017a; Killian, 2011; Sanou et al., 2014; Schwartz, Unger, Zamboanga, & Szapocznik, 2010). This limitation, partly, could be due to difficulty in separating acculturation from environmental, socio-demographic and social-cognitive factors that are associated with the performance of behaviour (Fedi et al., 2019; Fox, Thayer, & Wadhwa, 2017b; Satia-Abouta, 2003). Additionally, acculturation is abstract in nature and understood as a psychological process

that operates within individuals; hence, making it hard to recognise its systematic occurrence among a group of people (Berry, 1997; Fedi et al., 2019).

In this study, the association of acculturation with post-migration dietary and physical activity behaviours was first noted in the qualitative results presented in Chapter Three. As the findings in Chapter Three indicate, participants reported five main alterations to their dietary behaviour after they settled in Australia: changes in eating periods, changes in eating locations, changes in food preparation methods, changes in the frequency of consuming some familiar traditional foods, and changes in food choices. Specific examples of these newly developed dietary behaviours include: eating late dinner; eating-out-of-home; preparing meals with ‘chemicalised’ ready-made sauces; regular snacking between meals; regular consumption of high-fat fast foods; and replacement of organic foods by genetically modified foods. These findings imply that the association of acculturation with post-migration dietary behaviours goes beyond food choices and include other behavioural aspects, such as methods of meal preparation and timing of food consumption.

In addition to the qualitative results presented in Chapter Three, the association of acculturation with post-migration dietary behaviours was also confirmed in the quantitative survey presented in Chapters Five and Six. The findings presented in Chapters Five and Six show that post-migration fat intake and fruits/vegetables/fibre intake among participants were significantly related to cultural participation (i.e. high involvement in Australian mainstream culture). These findings suggest that post-migration changes in participants’ fat intake and fruits/vegetables/fibre intake were significantly associated with the extent to which they engaged in the Australian mainstream culture. This also means that most



participants adopted less healthy dietary behaviours from the Australian mainstream culture, which can lead to adverse health outcomes.

Evidence of acculturation effect was not only found in the dietary behaviours of participants, but also in their post-migration physical activities. Findings from the qualitative interviews presented in Chapter Three indicate two dimensions of change in physical activity behaviour among participants: a post-migration decline in the amount of physical activity that was performed by participants when they lived in SSA and a change in their pre-migration approach to performing physical activity. To sustain physical activeness after migrating from SSA to Australia, it appears that one needed to intentionally develop and adhere to a physical exercise plan. According to participants, this approach of developing a specific physical exercise plan in Australia is quite different from the situation in SSA where they exercised incidentally. For example, some participants noted that they had little choice but to take long walks to transport stations and wash clothes by hand when they lived in SSA. However, they reported that they no longer perform such physical activities after they settled in Australia.

In parallel with the findings on physical activity behaviour in Chapter Three, evidence presented in Chapters Five and Six emphasises that post-migration physical activity is significantly related to cultural maintenance (i.e. high preservation of traditional African culture). This evidence suggests that participants who maintained their African traditional practises, especially those involving physical activities, were likely to be more physically active than those who abandoned their traditions after settling in Australia.

Findings from this present study that acculturation is associated with variations in post-migration dietary and physical activity behaviours, corroborate conclusions in some

previous studies on African migrants living in Europe (Ngongalah et al., 2018; Okafor et al., 2014; Paxton et al., 2016). In Australia, however, available evidence indicates that only one study has focused on dietary behaviour among residents born in SSA. In this previous study, it was also concluded that participants have adopted new foods, regularly ate out-of-home, skipped meals, and consumed high-fat foods; indicating a change in dietary behaviour after immigration (Renzaho & Burns, 2006). Regarding physical activity, findings from this study are also consistent with the findings of another previous study which noted that maintenance of traditional cultural orientation reduces the risk of physical inactivity among Australian residents of SSA ancestry (Renzaho et al., 2008). The combination of findings from this present study and the conclusions drawn from the related past research provides empirical support of the idea that acculturation is associated with variations in post-migration dietary and physical activity behaviours among African migrant populations.

#### Environmental factors

Along with acculturation, variations in post-migration dietary and physical activity behaviours among participants were associated with physical, economic, and social environmental factors. Consistent with the conceptual framework for this study, availability, and accessibility of familiar traditional food and physical activity products in Australia emerged as a physical environmental factor associated with post-migration dietary and physical activity behaviours.

In line with a number of studies (Barton, 2015; Padmanabhan, 2019; Thomson & McFeeter, 2016), it appears that many participants preferred their own traditional African foods. However, the extent to which they consumed their own traditional African foods was

dependent on the availability and accessibility of such foods in Australia. As demonstrated in Chapter Three, the lack of many traditional African foods in Australia led to either their replacements with close substitutes or adoption of completely different food. A good example of this food substitution strategy can be seen in the outcome of the qualitative interviews presented in Chapter Three, whereby semolina was used by a participant as a substitute for corn flour. An example of the adoption of a completely different food in Australia is the consumption of English breakfast (bread, bacon, and eggs) which was not common in many traditional African homes prior to migration. A similar finding was reported by Renzaho (2006) in his study of post-migration food habits among SSA migrants in Victoria, Australia.

Regarding physical activity behaviour, evidence from the qualitative interviews presented in Chapter Three indicates that the availability of convenient and mechanised resources in Australia, such as washing machines and elevators, resulted in a post-migration decline in familiar physical activities among participants. For instance, physical activities that commonly occurred when participants lived in SSA, such as washing by hand and long walks to public transport stations, reduced as participants adopted the use of mechanised products (especially household appliances) in Australia. The data further show that the decline in post-migration physical activities was also associated with the relatively cold weather condition in Australia, which prevented participants' engagement in their familiar out-door physical activities (e.g. long walks) that occurred when they lived in SSA. These findings suggest that maintenance of traditional African culture involving physical activity in the host country is important for ensuring optimal health after immigration. This finding is consistent with conclusions in a study of African migrants' children in Australia (Renzaho, 2008).

In addition, the affordability of food and physical activity resources in Australia was associated with variations in post-migration dietary and physical activity behaviours. Regarding the affordability of food resources, results from the qualitative interviews presented in Chapter Three has shown that some participants refrained from eating traditional African foods and healthy food options because such foods were relatively costly in the Australian food market. In the multiple linear regression results presented in Chapter Five, two dimensions of affordability effects can be noted: reports of unemployment leading to low intake of fruits/vegetables/fibre and significant association of high income with fat intake. It appears that the high cost of fruits/vegetables/fibre products in Australia was associated with the low intake of fruits/vegetables/fibre among unemployed participants. It is logical to think that as unemployment was significantly associated with low intake of fruits/vegetables/fibre; high income would be significantly associated with a high intake of fruits/vegetables/fibre. Ironically, the multiple linear regression results in Chapter Five indicate that high income was not significantly related to fruits/vegetables/fibre intake but rather a high intake of fats. This finding could be partially explained by the possible confounding effect of acculturation on post-migration fat intake. More specifically, findings in Chapters Five and Six show that cultural participation is also significantly associated with post-migration fat intake. It is, therefore, reasonable to suggest that high fat intake among participants with high income was associated with their adoption of less healthy aspects of Australian food culture.

In the case of affordability of physical activity resources, it emerged from the qualitative results in Chapter Three that participants had been less successful in engaging with the physical exercise norms in Australia, such as gym attendance, partly, due to costly

registration and gym membership fees. Additionally, the data seem to suggest that after settling in Australia, many participants ended their traditional cultural practises of engaging in physical exercise. Together, findings in Chapters Three, Five and Six of this thesis imply that affordability of food and physical activity products, as well as acculturation, affect post-migration dietary and physical activity behaviours.

Findings in this present study that dietary and physical activity behaviours are related to the affordability of food and physical activity resources are consistent with a number of previous studies conducted among African migrants living in Europe (Méjean et al., 2007; Osei-Kwasi, Powell, Nicolaou, & Holdsworth, 2017). Surprisingly, the issue of affordability of food and physical activity resources was not clearly seen as a significant associate with post-migration dietary and physical activity behaviours in the previous studies conducted among Australian residents of SSA ancestry (Renzaho & Burns, 2006; Renzaho et al., 2008).

Moreover, work-life and time factors emerged as additional environmental issues associated with post-migration dietary and physical activity behaviours among the Australian residents born in SSA. From the narratives presented in Chapter Three, preparing healthy meals, especially most healthy traditional African cuisines, requires not only adequate income but also adequate time for purchasing, preparing, consuming and cleaning after consuming the food. Unfamiliar work-related issues, such as having multiple jobs, shift work, inflexible working hours, and night work, seemed to have resulted in limited time and energy for food procurement and preparation. As a result, employed participants have developed several ways of dealing with changes in their lifestyles in Australia, such as eating-out-of-home, snacking between meals, and skipping meals.

Like the work and time issues that affect dietary behaviour, it seems that physical activity in Australia requires adequate time and prioritisation. As can be seen in the qualitative results presented in Table 3 of Chapter Three, work-life and lack of adequate time to exercise were mentioned as reasons for post-migration decline in physical activity among participants. It emerged in the qualitative interviews that several participants prioritised work benefits over physical exercise. For example, a participant claimed that he would rather make money working than spend time in the gym, not because physical exercise is not important, but because his financial needs are more pressing. Nevertheless, caution should be taken when interpreting the effects of work-life on post-migration physical activity as some occupations involve a good amount of physical exercise, although those involved in these occupations may not consider themselves to be exercising.

#### Socio-cultural factors

It emerged from the qualitative in-depth interviews in Chapter Four that post-migration dietary and physical activity behaviours among participants was also affected by socio-cultural factors. According to participants, living in an ‘affluent’ Western country like Australia is understood by many persons in SSA as a marker of wellbeing. To some extent, African migrants living in Western countries are expected to demonstrate affluence by means of weight gain. Analysis of results from the qualitative interviews further indicates that this expectation of post-migration weight gain may be associated with two main factors. Firstly, a moderately large body type (a body perceived as neither slim nor fat) is idealised in many SSA culture(s). This idealisation of a moderately large body type seems to be based on a cultural belief that large bodies are beautiful and a sign of wealth. This finding is consistent

with suggestions made in a number of previous studies (Ettarh, Van de Vijver, Oti, & Kyobutungi, 2013; Renzaho, 2004).

In this study, however, findings indicate that this idealisation of moderately large bodies varies by gender. While women with plump-shaped bodies are regarded as beautiful, moderately large men who look muscular are perceived as strong. In addition, very slim women are seen as suffering from health issues, whereas men with big protruding stomachs are regarded as financially rich. Consequently, this idealisation of moderately large bodies promotes weight-gain ideals in the SSA community.

The second factor is that migration from a lower to a higher income country is most likely associated with improvement in economic status and income; hence, foods that were initially difficult to access before immigration, due to financial constraints, can easily be eaten in abundance. This second factor is in line with a growing notion in the empirical literature that intentional weight gain may be a physical and psychological response to previous food deprivation and threatened food supply that occurred in some SSA countries before immigration (Dhurandhar, 2016).

Given that small body types are increasingly depicted in the Australian social environment as a marker of beauty, especially for women (Park, 2007; Tiggemann & Miller, 2010), it was expected that exposure to the Australian environment would generate cross-cultural conflicts, which in turn, may lead to a change in this cultural idealisation of moderately large bodies. Evidence from the qualitative results in Chapter Four, however, shows that participants expressed desires to gain body weight through an increase in food portion size. Interestingly, these weight gain ideals were usually promoted by friends and family. This implies that to effectively address this cultural idealisation of large bodies

among participants, it will be important to include their peer groups and significant persons within their families.

It is worthy to note that while this cultural expectation of post-migration weight gain was prevalent among participants, a few persons separated themselves from this weight gain ideal. Further analysis of the qualitative data indicates that this group of participants acknowledged the existence of a cultural expectation to gain weight but preferred to have a small body size. There is evidence in the data to suggest that these participants' preference for small body types may be associated with beliefs that a large body size is associated with increased risk of diseases/illnesses (e.g. high blood pressure). This implies that post-migration weight-related behaviour may also be associated with health beliefs.

#### Socio-demographic factors

In line with the conceptual framework for this study, the interplay between post-migration dietary and physical activity behaviours and acculturation was moderated by several socio-demographic characteristics of participants. As shown in Chapter Five, this assessment was based on multiple linear regression analyses which included a test of simple slopes. Specifically, it emerged that participants' age, duration of residence in Australia, place of residence before immigration (rural or urban), and employment status significantly moderated the association of acculturation with their dietary and physical activity behaviours. Placing these findings in the context of the current literature is difficult as previous studies on post-migration dietary and physical activity behaviours have mostly focused on direct relationships between two variables, notably, behaviour and socio-demographic factors; behaviour and acculturation; or acculturation and socio-demographic characteristics. In



addition, several of these previous studies have produced varied and sometimes conflicting results. For instance, while one study in the United States indicated that duration of residence is significantly associated with increment in physical activity (Tremblay, Bryan, Pérez, Ardern, & Katzmarzyk, 2006), an earlier study reported otherwise (Evenson, Sarmiento, & Ayala, 2004).

Despite the challenge in comparing findings from this study to previous studies, the reported significant association between post-migration physical activity and younger age in this present study supports previous research conducted in the United States (Evenson et al., 2004). As an addition to the previous study, this present study suggests that post-migration physical activeness is not significantly related to younger age alone but also to maintenance of pre-migration physical activity behaviours. This present finding, which is presented in Chapter Five, confirms the findings of Renzaho et al. (2008) which concluded that maintenance of traditional cultural orientation is associated with lower rates of sedentary behaviour among young African immigrants in Australia.

Although several studies have reported that post-migration health decline is associated with duration of residence in a host country (Jatrana, Pasupuleti, & Richardson, 2014; Joshi, Jatrana, & Paradies, 2017; Pasupuleti, Jatrana, & Richardson, 2016), findings about the association between duration of residence and food-related behaviour have been many and varied (LeCroy & Stevens, 2017; Lee, Gao, & Kim, 2015; Lesser, Danijela Gasevic, Scott & Lear, 2014; Rosenmoller, Gasevic, Seidell, & Lear, 2011; Talegawkar, Kandula, Gadgil, Desai, & Kanaya, 2016). Based on outcomes from the multiple linear regression analysis in Chapter Five of this present study, low intake of fruits/vegetables/fibre is significantly associated with shorter duration of residence in Australia as well as low

participation in Australia's mainstream culture. This finding suggests that newly settled residents who have not adequately interacted with Australian residents of diverse cultures are likely to consume low amounts of fruits/vegetables/fibre. Combined with the finding in Chapter Five that low intake of fruits/vegetables/fibre is significantly associated with unemployment, a possible explanation for this present result might be that newly arrived immigrants, who are also more likely to be unemployed, may have relatively little income to purchase the expensive fruits/vegetables/fibre foods in Australia.

The growing body of research investigating health behaviours in migrant communities have rarely considered the association of place of residence before immigration on migrants' weight-related behaviours. In Chapter Five of this study, the outcome of the multiple linear regression has shown a significant association between high intake of fruits/vegetables/fibre and rural residence before immigration at a low and moderate level of cultural participation. This implies that participants who lived in rural areas before immigration and who have shown low involvement in Australian mainstream culture are likely to consume high amounts of fruits/vegetables/fibre. Interestingly, regarding physical activity, the results indicate that those who engaged in a high amount of physical activity after immigration were highly involved in the Australian mainstream culture and resided in rural areas in their countries of origin. There is a lack of adequate empirical evidence to assist with the interpretation of these findings. However, a systematic review of dietary change after immigration among persons from low-income countries in Europe found that fat intake among persons in urban settings are often higher than persons living in rural settings (Holmboe-Ottesen & Wandel, 2012). Therefore, this present finding may mean that rural residence in SSA is associated with healthier dietary and physical activity behaviours. Similar

to the lack of previous research on the relationship between place of residence before immigration and weight-related behaviours, the relationship between post-migration dietary intake and employment status is not discussed in the existing literature. This present study has shown in Chapter Five that low intake of fruits/vegetables/fibre is associated with unemployment as well as moderate and high levels of cultural maintenance. This suggests that the maintenance of traditional African culture alone is not sufficient for healthy eating and that a person needs to have the financial means to purchase healthy food products.

#### Social-cognitive factors

Based on the conceptual framework of this study, a test of mediational effect by social-cognitive factors in the relationship between post-migration dietary and physical activity behaviours and acculturation was conducted in Chapter Six of this thesis. It was intended that Hayes (2018) process macro would be used to perform this mediational test. However, as shown in Table 2 of Chapter Six, a lack of adequate significant relationship between some social-cognitive variables, acculturation and the behaviours undermined the ability to conduct a mediational analysis. This decision was based on Kenny's (2018) criteria that, in mediational analysis, a significant relationship should exist among the independent, mediator and outcome variables. One implication that can be drawn from this finding is that the associations of post-migration dietary and physical activity behaviours with social-cognitive factors and acculturation were affected by unseen confounding factors. This suggests a need for future studies that can recognise these confounding factors. Based on past studies (Devonport, Nicholls, & Fullerton, 2019; Tseng & Fang, 2011), possible confounding factors may include acculturation stress and emotions that affect eating behaviour.

The lack of significant correlations among the variables, however, does not imply that social-cognitive factors played no significant role in post-migration dietary and physical activity behaviours among the participants. A test of the extent to which social-cognitive factors and acculturation explain variations in post-migration dietary and physical activity behaviours was conducted using hierarchical linear regression, as can be seen in Table 3 of Chapter Six. The data have shown that both social-cognitive factors and acculturation significantly explained variations in post-migration dietary and physical activity behaviours. However, while the cumulative effects of social-cognitive factors and acculturation on post-migration fat intake and physical activity were significant, their effects on post-migration intake of fruits/vegetables/fibre was not significant. A possible implication of this finding is that little has changed in the intake of fruits/vegetables/fibre among participants after they settled in Australia. Associations of post-migration dietary behaviour with social-cognitive factors and acculturation may, therefore, be contingent on the type of food being studied.

Apart from the significant cumulative effects of social-cognitive factors on post-migration fat intake and physical activity, findings in Chapter Six show that some individual variables, such as attitude and behavioural intention significantly explained variations in the behaviours. For instance, variations in post-migration fat intake were significantly explained by attitude towards fat intake and variations in post-migration physical activity were also significantly explained by intention to exercise. While these findings suggest that social-cognitive factors affect the association of acculturation with post-migration dietary and physical activity behaviours, there is a need to improve understanding of these complex relationships in future studies.

### **Critical reflection on the conceptual framework**

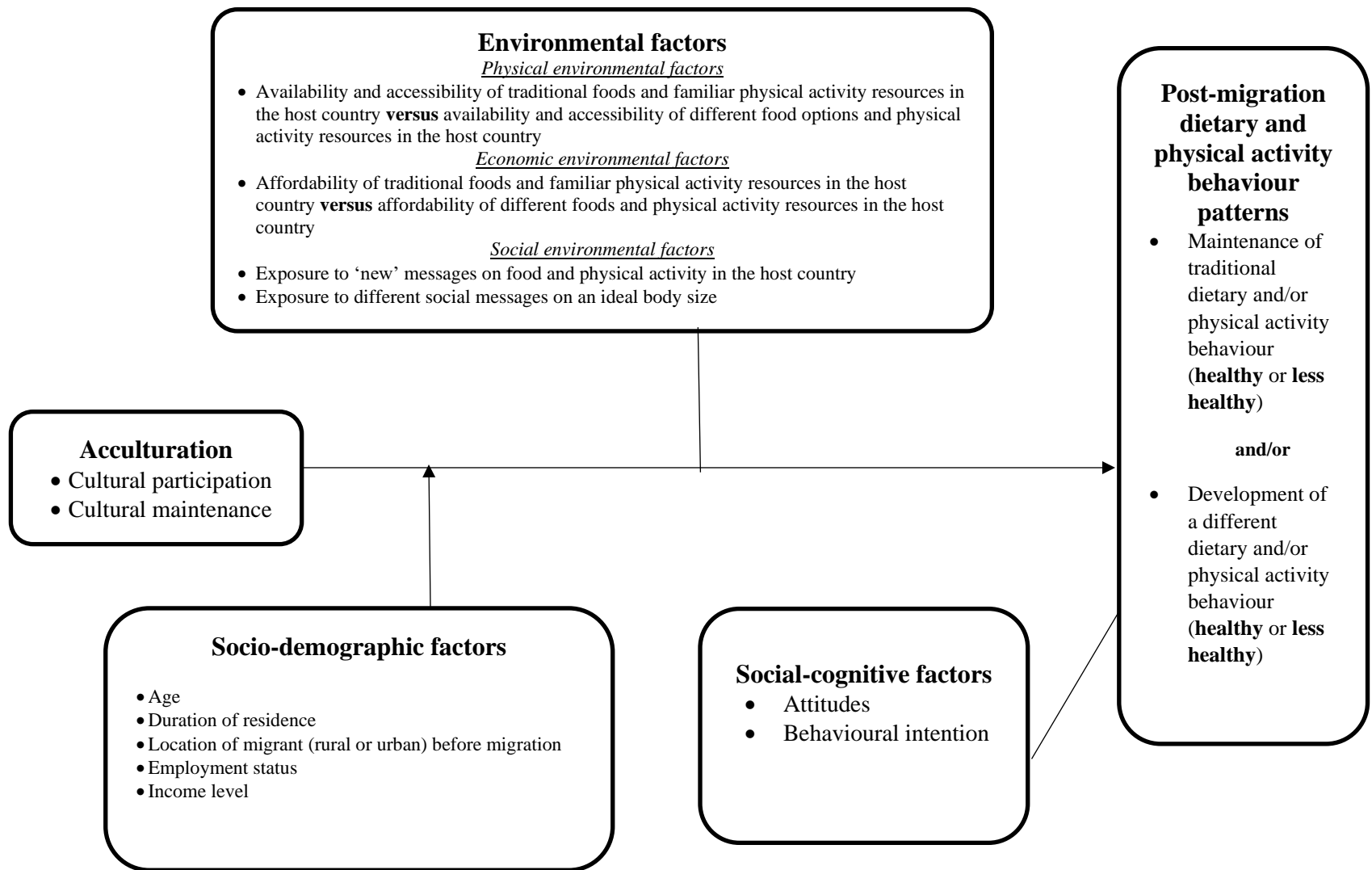
As noted in Chapter One, a conceptual framework showing several variables and their postulated pathways was developed to guide this study. Findings in Chapter Five confirm part of the postulated pathways among the variables whereas findings in Chapter Six provide basis for not accepting a part of the postulated pathways.

More specifically, it was hypothesised in the conceptual framework that the chances that acculturation will be associated with post-migration dietary and physical activity behaviours may be moderated by socio-demographic and environmental factors. In confirmation of this hypothesis, findings in Chapter Five show that the interplay of post-migration dietary and physical activity behaviours with acculturation is significantly moderated by socio-demographic factors, such as age, duration of residence in Australia, place of residence before immigration (rural or urban) and employment status. On the other hand, the assumed moderation effect of environmental factors in the interplay between post-migration dietary and physical activity behaviours and acculturation was not tested quantitatively as the hypothesis was addressed using qualitative in-depth interview data as shown in Chapter Three. Although no pathways were tested quantitatively, themes that emerged from the qualitative in-depth interview data in Chapter Three showed associations among these variables. For instance, the extent to which participants consumed their own traditional African foods was dependent on the availability and accessibility of such foods in Australia.

It was also hypothesised in the conceptual framework that the interplay of acculturation, environmental factors, and socio-demographic factors with post-migration dietary and physical activity behaviours are likely to be mediated by social-cognitive factors.

Unexpectedly, the assumed mediational role of social-cognitive factors in the interplay between post-migration dietary and physical activity behaviours and acculturation was not confirmed in Chapter Six. This is because the correlations among the variables of interest were weak and this prevented further testing of mediation. Possibly, ‘unseen’ confounding factors may have affected the strength of correlations among the variables of interest. For instance, the inability of the questionnaire on social cognitive factors to assess participants’ past dietary and physical activity behaviour may have contributed to this unexpected result. It is also possible that the assumed mediational role played by social cognitive factors in the interplay between post-migration dietary and physical activity behaviours and acculturation is inapplicable to persons of sub-Saharan African ancestry. However, given that some social-cognitive factors (e.g. attitude and intention) significantly explained some variations in post-migration dietary and physical activity behaviours, it is important for studies in future to consider using a different social cognitive model to test for mediational effects. Employing a questionnaire that incorporates participants’ past dietary and physical activity behaviours may also be useful.

A modified framework based on the confirmed and unconfirmed pathways is presented in Figure 7. Based on the findings in Chapter Six, the position of the social cognitive factors in the original framework in Chapter One has been changed from the mediator in the centre (i.e. intervening the relationship between acculturation and behaviour) to the base of the framework (Figure 7). The line connector between the social cognitive factors and post-migration dietary and physical activity behaviour patterns has also been changed from an arrow (showing an influence) in the original framework to a line (showing only an association) in the modified framework.



**Figure 7: Factors associated with post-migration dietary and physical activity behaviours**

Source: Fieldwork

### **Contributions of the study to knowledge**

As noted in Chapter One of this thesis, cases of weight-related problems continue to rise in Australia (Australian Institute of Health and Welfare, 2017). The prevalence of overweight and obesity among Australian adults increased from 57% in 1995 to 61% in 2007 and 2008 (Australian Institute of Health and Welfare, 2017). Evidence from a screening project organised by Western Melbourne Regional Development Australia further suggests that the weight-related problem may be bigger among African Australians than the Australian population in general (Western Melbourne Regional Development Australia, 2014). Given this information, it is important to find out whether Australian residents born in SSA are developing less healthy dietary and physical activity behaviours after they settled in the country. However, few empirical studies have focused on post-migration dietary and physical activity behaviours among Australian residents born in SSA. This study provides an important understanding of factors associated with less healthy dietary and physical activity behaviours among the Australian residents born in SSA, which in turn, may help in the development of evidence-based health promotion interventions.

It is assumed that persons of SSA backgrounds have a cultural admiration for large body types (Ettarh et al., 2013; Renzaho, 2004), whereas persons of Western cultures admire ‘small’ body types (Humenikova & Gates, 2008; Tiggemann, 2012). Although these assumptions may affect dietary and physical activity behaviours, little research has been conducted on this topic among African migrants. It was, therefore, less clear whether this assumed cultural admiration for large bodies among persons of SSA backgrounds, if true, will change after migration to Australia. Insights from the qualitative component of this thesis enhance understanding of this important issue.



While the previous studies that focused on weight-related behaviours among African Australians have employed acculturation theory (Renzaho & Burns, 2006; Renzaho et al., 2008), a limitation in these studies is the lack of adequate incorporation of environmental, social-cognitive and socio-demographic factors in explaining post-migration dietary and physical activity behaviours. Based on Berry's acculturation theory (Berry, 1997), the lack of adequate inclusion of these proposed influential factors in the acculturation-related studies presents a huge research gap. To the best of my knowledge, this is the first study that has employed an integrated framework to test the association of acculturation, environmental, socio-cultural, socio-demographic and social-cognitive factors with post-migration dietary and physical activity behaviours among Australian residents born in sub-Saharan Africa (SSA).

The previous study on dietary behaviours among Australian residents of African ancestry employed a quantitative approach and the analysis was largely descriptive (Renzaho & Burns, 2006). This present study is believed to be the first to employ a mixed-methods approach comprising both qualitative analysis of in-depth interviews and quantitative regression analysis to understand the dietary and physical activity behaviours of Australian residents born in SSA. The integration of different types of data has generated rich insights into the research topic (Tariq & Woodman, 2013; Zhang & Watanabe-Galloway, 2014).

Based on Ajzen (2013) guide on how to develop social-cognitive items for understanding psychological factors associated with behaviour, standard social-cognitive items have been successfully developed, validated and tested in this study. This provides an important initial step which future research can build on in order to develop a greater understanding of the association of dietary and physical activity behaviours with

acculturation and social-cognitive factors, particularly, among Australian residents born in SSA. However, it would appear, based on the results in Chapter Six of this thesis, that much work is still needed to elucidate possible confounding factors related to the interplay of post-migration dietary and physical activity behaviours with acculturation and social-cognitive factors.

Lastly, data have shown that Victoria and New South Wales are two states in Australia that host the largest population of Australian residents born in SSA (Hugo, 2009). Previous studies on post-migration dietary and physical activity behaviours among Australian residents of SSA ancestry have mostly focused on persons living in Victoria (Renzaho & Burns, 2006; Renzaho et al., 2008). This present study extends the research area to include immigrants living in New South Wales. Despite the fact that a place-comparative analysis was not performed in this study, extending the target population to New South Wales strengthens the existing database.

### **Limitations and future directions**

Despite the contributions of this study to knowledge, some limitations must be noted. The generalisability of findings from this study to other settings is subject to some restrictions. Although the recruitment of 253 participants for the survey is relatively large, especially for this hard-to-reach SSA-born Australian residents, derivation of this sample size was not based on the size of the general target population. This is due to limited access to data on Victoria and New South Wales residents who were born and turned at least 18 years of age in SSA. Nevertheless, the findings of the quantitative study were supplemented with data from the qualitative in-depth interviews and that reduces this limitation.

Secondly, the study excluded non-English speakers as it was not feasible to employ multiple interpreters to translate the interview questions and surveys into the different SSA languages. However, exclusion of non-English speakers may have minimal effect on the study findings as Australia is an English-speaking country (Mazrui, 2004). The study also excluded white Australians of SSA ancestry as their food culture is known to be similar to Western food culture (MAZbahr, 2007). To optimize the study sample given these limitations, a number of recruitment strategies were used. Participants were self-selected through a continuous advertisement of the research in two Australian states that host the largest population of African Australians. Inspired by the works of Renzaho (2006), the target population was also divided into four main groups: Western Africans, Eastern Africans, Central Africans, and Southern Africans, and limited quotas were allotted to each group.

A further limitation is that the cross-sectional nature of this study does not encourage the establishment of causality between distinct variables. To minimise this limitation, findings from the quantitative surveys were supplemented with the results from the qualitative in-depth interviews. Future studies may consider adopting a different approach to studying this topic. Data on participants' dietary and physical activity behaviours can be collected before participants emigrate out of their countries of origin. Follow-up data collection can be conducted in Australia on the same participants to provide additional evidence on the effects of acculturation on post-migration dietary and physical activity behaviours.

Moreover, data for the study relied on self-report of past behaviours and this may be associated with recalling and social desirability bias. For instance, recalling the amount and intensity of physical activity may have been overestimated by participants or participants

may have intended to provide only favourable responses. To address these potential misreporting issues, the surveys were carefully pretested and anonymously administered. Participants were informed in both the interviews and surveys to skip questions if they were not sure of the answers. Studies in the future may consider employing observational methods of measuring diet and physical activity behaviour for additional insights. For instance, devices such as accelerometers or pedometers can be used to assess physical activity behaviour which will help to reduce reporting bias.

Although the internal consistency for all scales in the questionnaire ranged from .71 to .90 (using Cronbach's alpha), which is seemingly good, it is important to note that some likely imprecisions of scales may have occurred for some items. For instance, the measurement of fat and vegetable intake using Block's (2000) approach may have missed some traditional African food items. Additionally, the questionnaire on social cognitive factors was based on current and future dietary and physical activity behaviour and did not measure past behaviour. Furthermore, the number of questions developed for the various social cognitive variables (i.e. attitude, subjective norm, behavioural control, behavioural intention) varied. For instance, the number of questions developed for measuring attitude was six whereas the number of questions developed for measuring subjective norm was three. Although this approach to measuring social cognitive factors is acceptable in Ajzen's (2013) recommended guidelines, this may have contributed to the lack of adequate significant correlations between some social cognitive variables and acculturation. Future research on this topic may consider developing a questionnaire that incorporates traditional African food items with the same number of questions for each social cognitive variable. However, in the absence of a valid questionnaire for measuring fat intake, vegetable intake, and social cognitive factors among

persons of African ancestry, Block (2000) and Ajzen (2013) approaches were deemed the best for this study. These approaches have also been used in similar studies and have yielded good results (Block, Gillespie, Rosenbaum, & Jenson, 2000; Di Noia, Schinke, & Contento, 2008).

The qualitative findings presented in Chapter Four of this thesis suggest that persons of SSA backgrounds admire moderately large body types. A major limitation associated with this finding was a lack of critical measurement of body sizes to confirm what is considered ‘moderate’ in this population. While keeping in mind that there are several controversies associated with body size measurements, as explained in Chapter One of this thesis (Hainer & Aldhoon-Hainerová, 2013; Satinsky & Ingraham, 2014), future research may need to construct precise and objective measurements of what constitutes ‘moderate’, ‘large’ or ‘small’ body size.

While a number of studies have been conducted on post-migration dietary and physical activity behaviours among African migrants in Europe and the United States, there was a lack of adequate prior research on this topic in Australia. The few available studies in Australia have been mostly descriptive in nature. Therefore, comparing this study to prior studies was a challenge. This, however, shows a need for more research on this topic.

### **Recommendations for health promotion**

Although consumption of unfamiliar Australian vegetables and gym attendance was noted by some participants, the general findings suggest that participants have mostly adopted less healthy dietary and physical activity behaviours after settling in Australia. Several of these less healthy dietary behaviours have been reported in Chapter Three and include: skipping

breakfast; eating late dinner; snacking between meals; regular consumption of high-fat fast foods; replacement of organic foods by genetically modified foods; replacement of 'chemical-free' vegetable sauces by chemicalised ready-made sauces; and increased consumption of carbohydrates and sugary drinks after immigration. These less healthy dietary behaviours were accompanied by a self-reported decline in traditional physical activities after immigration. Research has shown that these newly developed behaviours can increase the risk of weight-related problems in this population (World Health Organisation, 2010, 2018a, 2018b).

Findings from this study have further shown that these less healthy dietary and physical activity behaviours that were mostly developed after settling in Australia, are associated with several factors: acculturation, environmental, socio-cultural, socio-demographic and social-cognitive factors.

To address the acculturation-related issues associated with the less healthy dietary and physical activity behaviours, Australian institutions concerned about immigrants' health together with key individuals in the SSA community can increase awareness that immigrants from SSA backgrounds face a high risk of adopting less-healthy dietary and physical activity behaviours after immigration. With support from migration and visa issuing agencies, information about the benefits of replacing unavailable traditional African foods by healthy food options can be tailored to the Australian residents born in SSA, especially among new arrivals. To ensure that this intervention is well supported by end-users, the tailored information can be co-developed by key individuals within the SSA community and the concerned institutions.

Secondly, health promotion interventions can be developed to address the environmental factors associated with the less healthy dietary and physical activity behaviours, as presented in Chapter Three of this thesis. These interventions can be co-developed and implemented by gatekeepers in the SSA community, federal, state and local public health agencies in Australia. These agencies can encourage the importation of 'healthy' traditional African food products through subsidisation of importation duties on such foods. Given the food availability and affordability constraints noted in Chapter Three of this thesis, this will not only make healthy traditional African foods available on the Australian food market but also affordable to the community. In addition, as several participants have developed the behaviour of consuming less healthy foods, importation duties on these less healthy foods, such as sugary and fat products, can be increased and the taxes on those produced within the country can be increased as well to limit their consumption.

Based on the reported association of less healthy dietary and physical activity behaviours with work-life and time constraint factors, as shown in Chapter Three, community durbars/meetings can be co-organised by institutional stakeholders and gatekeepers within the sub-Saharan African community to discuss strategies for educating the general population on the importance of incorporating physical activity and healthy meal preparation periods into their busy work schedules. Furthermore, given that several participants have developed habits of eating-out-of-home, as can be seen in Chapter Three, peer educators within the sub-Saharan African community can be trained by concerned institutions to encourage the general population to choose healthy ready-made foods in the food market. The peer educators can support participants to self-monitor their own dietary and physical activity behaviours to

increase their awareness of energy balance or imbalance and to inform appropriate improvements in behaviour.

It has been noted in Chapter Four of this thesis that moderately large body types are admired in several SSA culture(s) and weight-gain ideals are usually promoted by family and friends. Based on these findings, health promotion agencies in Australia and the SSA community organisations have an essential duty to promote a positive change to this cultural mindset. This could be done by empowering significant others, such as peers, families and health promoters, to encourage healthy-weight ideals in the community. For instance, regular community durbars can be organised to remind persons within the SSA community about the need to eat healthy diets to maintain a healthy weight. Nevertheless, sufficient care should be taken to ensure that the delivery of such messages will not promote discrimination against people with large body types.

In the implementation of health promotion interventions geared toward reducing less healthy dietary and physical activity behaviours after immigration, special attention can be focused on specific population characteristics. This is important as Chapter Five of this thesis has shown that some socio-demographic characteristics of participants significantly moderate the effects of acculturation on post-migration dietary and physical activity behaviours. For instance, young and unemployed persons face a higher risk of consuming a low amount of fruits/vegetables/fibre than older and employed persons. Older persons also face a higher risk of low engagement in physical activities than younger persons. When implementing health promotion interventions in this population, attention can be focused on these different-need categories to make optimal use of available public health resources.



Based on findings in Chapter Six that social-cognitive factors significantly explain variations in post-migration dietary and physical activity behaviours, state and local health agencies can strengthen the ability of individuals to develop positive attitudes toward reducing high fat intake and increasing engagement in regular physical activity. This would, however, require support from some behavioural experts, such as health psychologists and social workers, who can recognise and support persons with special needs through outreach programmes.

## **Conclusions**

Recognising factors that are associated with post-migration weight-related behaviours, especially the less healthy behaviours that occur among African migrants in Western countries, is an important but under-studied health issue. Employing an integrated framework, this thesis has examined factors associated with post-migration dietary and physical activity behaviours, with an interest in less healthy dietary and physical activity behaviours that emerge after migration from sub-Saharan Africa (SSA) to Australia. Based on analyses of combined data from qualitative in-depth interviews and quantitative surveys, findings indicate that several factors shape post-migration dietary and physical activity behaviours among Australian residents born in SSA. Consistent with previous studies, acculturation plays a vital role in the development of new dietary and physical activity behaviours after immigration. More specifically, findings from this present study show that numerous less healthy dietary and physical activity behaviours that emerge after immigration, are associated with the adoption of less healthy aspect of Australian mainstream culture.

Secondly, evidence suggests that the physical, economic and social environment also affect the extent to which the effects of acculturation shape post-migration dietary and physical activity behaviours. In line with the conceptual framework, changes in environmental factors, such as unavailability of traditional food and physical activity resources, affordability of preferred foods and physical activity resources, exposure to different work-life in Australia, and constraints associated with time management, affect post-migration dietary and physical activity behaviours.

Thirdly, this study confirms assumptions in some prior research that socio-cultural beliefs about body size shape post-migration dietary and physical activity behaviours among persons of SSA backgrounds. Specifically, findings from this study suggest that most participants have maintained their pre-migration cultural preference for moderately large body types, regardless of their exposure to different body size expectations in Australia. In turn, this cultural admiration for moderately large body types are associated with a number of weight-related behaviours, such as increased food portion size.

The fourth conclusion that can be drawn from this study is that the effects of acculturation on post-migration dietary and physical activity behaviours are also shaped by some socio-demographic factors, such as age, employment status, place of residence before immigration and duration of residence in Australia.

Lastly, the data from this study indicate that social-cognitive factors do not qualify as significant mediators in the relationship between post-migration dietary and physical activity behaviours and acculturation, though they significantly explain variations in the behaviours. As this particular finding was unexpected, it is believed that possible confounding factors, such as acculturation stress and emotions that affect behaviour, might have affected the

interplay of post-migration dietary and physical activity behaviours with acculturation and the social-cognitive factors.

The overall findings suggest that several interrelated factors affect post-migration dietary and physical activity behaviours. For example, some participants cited physical environmental factors, such as unavailability of traditional African foods, as contributing factors in their adoption of unfamiliar foods in Australia. Therefore, in the future, examination of factors associated with post-migration dietary and physical activity behaviours, especially among Australian residents born in SSA, could be approached from an integrative perspective that considers the interaction of multiple factors rather than an approach that only examines direct relationships between two factors.

While a small amount of evidence for the adoption of healthy dietary and physical activity behaviours after migration to Australia emerged from this study, most of the post-migration changes in behaviours reported by participants translate into high risk for weight-related diseases. Interventions, as proposed above, are therefore needed to address the various issues that are associated with less healthy dietary and physical activity behaviours among Australian residents born in SSA.

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## APPENDIX I: ETHICS APPROVAL LETTER



14-Mar-2017

Dear Professor John de Wit,

<b>Project Title</b>	Determinants of Adiposity-Related Behaviour Patterns Associated with Risks of Non-Communicable Diseases (NCDs): A Study of sub-Saharan African Immigra
<b>HC No</b>	HC17018
<b>Re</b>	HC17018 Notification of Ethics Approval
<b>Approval Period</b>	14-Mar-2017 - 13-Mar-2022

Thank you for submitting the above research project to the HREC Executive for ethical review. This project was considered by the HREC Executive at its meeting on 14-Mar-2017.

I am pleased to advise you that the HREC Executive has granted ethical approval of this research project. The following condition(s) must be met before data collection commences:

**Conditions of Approval:**

N/A

**Conditions of Approval - All Projects:**

- The Chief Investigator will immediately report anything that might warrant review of ethical approval of the project.
- The Chief Investigator will seek approval from the HREC Executive for any modifications to the protocol or other project documents.
- The Chief Investigator will notify the HREC Executive immediately of any protocol deviation or adverse events or safety events related to the project.
- The Chief Investigator will report to the HREC Executive annually in the specified format and notify the HREC Executive when the project is completed at all sites.
- The Chief Investigator will notify the HREC Executive if the project is discontinued before the expected completion date, with reasons provided.
- The Chief Investigator will notify the HREC Executive of his or her inability to continue as Coordinating Chief Investigator including the name of and contact information for a replacement.

The HREC Executive Terms of Reference, Standard Operating Procedures, membership and standard forms are available from <https://research.unsw.edu.au/research-ethics-and-compliance-support-recs>.

If you would like any assistance, or further information, please contact the ethics office on:

P: +61 2 9385 6222, + 61 2 9385 7257 or + 61 2 9385 7007

E: [humanethics@unsw.edu.au](mailto:humanethics@unsw.edu.au)

## APPENDIX II: FIRST PAGE OF PUBLISHED PAPER IN CHAPTER 3

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LONG RESEARCH ARTICLE

WILEY

Health Promotion  
in Australia



# Determinants of post-migration changes in dietary and physical activity behaviours and implications for health promotion: Evidence from Australian residents of sub-Saharan African ancestry

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### Funding information

Faculty of Arts and Social Sciences in the University of New South Wales

### Abstract

**Issue addressed:** Several studies have attributed excess weight gain after immigration to changes in dietary and physical activity behaviours. However, recognising the main factors that influence post-migration changes in dietary and physical activity behaviours is less clear, particularly among Australian residents of sub-Saharan African (SSA) ancestry. Drawing on acculturation theory, this study examines main factors driving changes in dietary and physical activity behaviours among Australian residents who were born in SSA and provides insight into the extent to which the factors are related to immigration.

**Methods:** A qualitative design based on a phenomenological approach was employed and a quota sampling technique was used to recruit 24 study participants for in-depth interviews.

**Results:** The study found significant self-reported changes in dietary and physical activity behaviours after immigration that increase the risk of excess weight gain. The changes in dietary and physical activity behaviours were mainly driven by issues related to availability, accessibility and affordability of dietary and physical activity products. Time management and factors related to convenience also emerged as key determinants of change in dietary and physical activity behaviours. Apparently, some factors noted by participants shape dietary and physical activity behaviours irrespective of immigration, and these factors include: tastes and cravings for foods; friends and family influence on behaviour; and misconceptions about food and exercise.

**Conclusion:** Migration from SSA to Australia contributed to changes (mainly less healthy) in dietary and physical activity behaviours. To a large extent, post-migration changes in dietary and physical activity behaviours were driven by socio-economic and environmental factors.

**So what?** Health promotion programs that address the risky behaviours associated with excess weight gain among Australian residents of SSA ancestry should pay more attention to socio-economic and environmental factors.

## APPENDIX III: FIRST PAGE OF SECOND PUBLISHED PAPER IN CHAPTER 4



**Ethnicity & Health**



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### **Socio-cultural beliefs about an ideal body size and implications for risk of excess weight gain after immigration: a study of Australian residents of sub-Saharan African ancestry**

**Isaac Yeboah Addo, Loren Brener, Augustine Danso Asante & John de Wit**

To cite this article: Isaac Yeboah Addo, Loren Brener, Augustine Danso Asante & John de Wit (2019): Socio-cultural beliefs about an ideal body size and implications for risk of excess weight gain after immigration: a study of Australian residents of sub-Saharan African ancestry, *Ethnicity & Health*, DOI: [10.1080/13557858.2019.1607261](https://doi.org/10.1080/13557858.2019.1607261)

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## APPENDIX IV: FIRST PAGE OF FIRST SUBMITTED PAPER IN CHAPTER 5

Manuscripts submitted to Health Promotion International

OXFORD  
UNIVERSITY PRESS

Health Promotion International

### **Interaction effects of acculturation and socio-demographic characteristics on dietary and physical activity behaviours in Australia**

Journal:	<i>Health Promotion International</i>
Manuscript ID	Draft
Manuscript Type:	Article
Keywords:	determinants of health, community health promotion, ethnic, health behaviour, global health
Keywords:	

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## APPENDIX V: FIRST PAGE OF SECOND SUBMITTED PAPER IN CHAPTER 6

Addo et al. *Journal of Ethnic Foods* (2019) 6:29  
<https://doi.org/10.1186/s42779-019-0039-x>

Journal of Ethnic Foods

### ORIGINAL ARTICLE

### Open Access



# Associations of post-migration dietary and physical activity behaviours with acculturation and social cognitive factors: a cross-sectional study of Australian residents born in sub-Saharan Africa

Isaac Yeboah Addo<sup>1\*</sup>, Loren Brener<sup>1</sup>, Augustine Danso Asante<sup>2</sup> and John de Wit<sup>1,3</sup>

## Abstract

A considerable amount of research suggests that several 'immigrants' from low-and-middle income countries often adopt less healthy dietary and physical activity behaviours after settling in high income countries, which may lead to increased risk of weight-related diseases. Several studies have also reported that post-migration changes in dietary and physical activity behaviours are associated with acculturation. Given that social cognitive factors are proximal determinants of behaviour, understanding their interplay with acculturation in the process leading to less healthy weight-related behaviours can assist in developing more useful interventions for populations at risk. A cross-sectional survey was undertaken among Australian residents born in sub-Saharan Africa (SSA) to assess the interplay of post-migration dietary and physical activity behaviours with acculturation and social cognitive factors. A total of 253 participants were self-selected from two Australian states: New South Wales and Victoria. Theory of planned behaviour variables were employed as social cognitive factors. Fat intake and fruits/vegetables/fibre intake were used as indicators of dietary behaviour. Acculturation was measured using two sub-scales: cultural maintenance and cultural participation. The findings show that acculturation and social cognitive factors were significantly associated with variances in fat intake and physical activity. More specifically, the variance in post-migration fat intake was significantly explained by cultural participation and attitude while the variance in physical activity was significantly associated with cultural maintenance and behavioural intention. It is therefore important to consider both acculturation and social cognitive factors when developing weight-related interventions for Australian residents born in SSA.

**Keywords:** Social cognitive factors, Acculturation, Dietary and physical activity behaviours, Australian residents of sub-Saharan African ancestry, Migration

## Introduction

### Migration and less healthy changes in dietary and physical activity behaviours

Several studies have reported that migration from a low to a higher income country often leads to less healthy changes in dietary and physical activity behaviours [1, 2]. For example, a significant increase in fat intake was

found in a systematic review of studies of European residents who emigrated from low-income countries [2]. In the USA, a study of residents who emigrated from Gulf countries noted a significant decrease in physical activity and a low intake of fruits/vegetables after immigration [3]. There is evidence to also suggest that these less healthy dietary and physical activity behaviours which often occur after immigration may put immigrants at risk of weight-related diseases, such as diabetes, some cancers, cardiovascular diseases, and chronic respiratory diseases [4].

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