First generation Ghanaian migrants in the UK; dietary intake, anthropometric indices and nutrition intervention through the Black Churches

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Title: First generation Ghanaian migrants in the UK; dietary intake, anthropometric indices and nutrition intervention through the Black Churches.

Background: Black Africans in developed countries have a higher prevalence of diet-related chronic diseases. However, dietary and anthropometry data is limited, particularly on sub-groups such as Ghanaians in the UK.

Objectives: To determine the habitual diet and body composition of first generation Ghanaian migrants, to validate a food frequency questionnaire specific for Ghanaians, find the ideal body image of Ghanaians and the body size most attractive to Ghanaian males and to conduct a nutrition intervention programme using the Black Churches as a setting.

Methodology: Cross-sectional survey. Participants were volunteers and first generation Ghanaian migrant who were congregants of Black Churches in London (n=288). Information on dietary intake was obtained from multiple repeated 24-hour recalls in a sub-sample (n=68) of the survey participants. The food frequency questionnaire was developed using the most commonly reported foods and portion sizes, field tested, shortened and then validated with multiple 24hr recalls (n=68). Information was also collected on height, weight, waist circumference, waist to hip ratio and percentage body fat which was measured using a portable bioelectric impedance analyzer (n=212). Participants from London (n=45) and Ghana (n=79) completed questionnaires to collect information on their ideal size and other body-shape related questions using the Figure Rating Scale (FRS). The nutrition intervention programme (n=76) was developed with input from participants through focus groups and the Obesity Clinic at the London Metropolitan University. Participants were assigned to either the intervention or control group and information on socio-demography, dietary intake and anthropometric measurements were taken at baseline, 6 weeks and at 3 months to evaluate the effectiveness of the intervention programme.

Results: Energy and the percentage energy from fat intake of Ghanaian migrants (1987 kcal, fat 35.3%) was similar to that of the host population (1972kcal, fat 35.4%) but carbohydrate and fibre intake was different (carbohydrate 50.1%, fibre 16.4g vs 48.1%, 13.9g) for migrant Ghanaians and host population respectively. Energy under-reporting was 31% for this survey and was associated with gender and body mass index. The food frequency questionnaire performed well relative to 7 multiple 24-hour recalls with correlations increasing after adjusting for energy (protein r= 0.71, fat r=0.69, carbohydrate r=0.54, fibre r=0.69). Participants were correctly classified in the same (34%) or adjacent quartile (54%) for most nutrients with only 3% to 9% of participants misclassified into opposite quartiles. Bland–Altman plots were within limits of agreement for all the macro-nutrients. The prevalence of overweight and obesity was higher in female migrant Ghanaians using body mass index (67%) compared to the host population (58%) but prevalence was lower when percentage body fat was used (female 40%). There was a cultural shift in acceptability of overweight and obese body sizes and shapes among Ghanaians with 60% of Ghanaian males preferring Ghanaian females with a normal body size. The nutrition intervention programme was conducted over 6 weeks and changes were observed in energy (intervention - 250kcal *vs* -135kcal (NS)) and fat intake (intervention -3.8g (p=0.04) *vs* control -2.1g (NS). Waist circumference decreased by 2.2cm (p=0.05) for the intervention group after 6 weeks. After 3 months fat intake decreased by 7.3g (p=0.000) for the intervention group and 10.4g (p=0.04) for the control group. Changes in anthropometry still persisted after 3 months for body weight (-2.3kg, p=0.001), body mass index (-1.4kg/m², p=0.001) waist circumference (-3.3cm, p=0.04) and % body fat (-2.0%, p=0.01) for the intervention group. Changes in anthropometry were also observed in the control group for weight (-0.9kg, p=0.05), waist circumference (-1.9cm, p=0.006) and waist-hip ratio (-0.1, p=0.03).

Conclusion: The dietary intake of Ghanaian migrants in the UK is similar to the host population. The food frequency questionnaire developed specifically for this population is an adequate dietary assessment tool. Ghanaian males preferred females with normal body sizes. The prevalence of overweight and obesity is higher in female migrant Ghanaians compared to the host population and the Black Churches are an effective setting for the delivery of nutrition intervention programmes.

Dedicated to my dear husband, my pillar of strength and to my parents for all their help

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CHAPTER 1

GHANAIAN MIGRANTS IN THE UK

1.1 HISTORY OF MIGRANTS IN THE UK

Populations that have migrated from one part of the world to another provide a unique opportunity to investigate the relative contributions of genetics and environmental factors to chronic diseases (Misra & Ganda, 2007). The study of the diet, health and lifestyle of migrants from a developing country who become “acculturised” to their host country, is to some extent, similar to examining the effects of nutrition transition, in microcosm. It can also help identify appropriate points of intervention and inform public health policy (Davies et al., 2006; Ingleby, 2009).

The UK has a rich and diverse number of ethnic communities. During the 1950s and 1960s, there was a peak migration from the Indian subcontinent (Harding et al., 2007). Labour shortages in Britain led to the recruitment of economically young men from India, Pakistan and Bangladesh. High unemployment, poverty and the search for a better standard of living provided the impetus to migrate to Britain from their country of origin (Peach, 1996). In the 1970s, about 28,000 East Asians refugees expelled from East Africa also arrived (Kassam-Khamis, 1996). Some South Asian men also came to the UK to take up jobs that were not attractive to white men (Kalra, 2000; Dale et al., 2004). Among this group of South Asian migrants, Pakistanis and Bangladeshis are the most recent settlers with many coming from poor rural areas with few economic or educational resources.

Around the period of World War II, small numbers of Chinese immigrants, mostly seamen, arrived primarily from Hong Kong and settled mainly in Liverpool and London. In the late 1960s, more Chinese immigrants arrived into the country (Landman & Cruickshank, 2001). During the 1990s, there were also a large group of Somalis refugees who migrated to the UK (Harris, 2004). Since 2004, some Eastern Europeans whose citizens have free movement and labour rights following the enlargement of the European Union also moved to the UK (Pollard et al., 2008; Salt, 2008). The migration from Africa was more organised with most migrants intending to pursue education,

employment and marriage in the United Kingdom. There are several reasons that explain why people particularly of African descent migrate into the United Kingdom. Some African migrants came from former British colonies and were actively recruited by Britain as a source of cheap labour for the country (Russell, 2002). Studies show that most Africans migrate to the United Kingdom or a more developed country because of the geographical differences in the supply and demand for labour in their country of origin and their country of destination (Elam et al., 2001; Chimanikire, 2002). Most African migrants make individual decisions about migrating after considering the potential benefits of migration. The government policies, lower cost of living, differences in earnings and employment rates are some of the key variables that may also influence a person to migrate (Chimanikire, 2002). The diversity created by migration means that there are now different ethnic groups in the UK. Normally people in an ethnic group share some combinations of common history, origins or customs and possibly religion (Dale et al., 2004; Herbert et al., 2006).

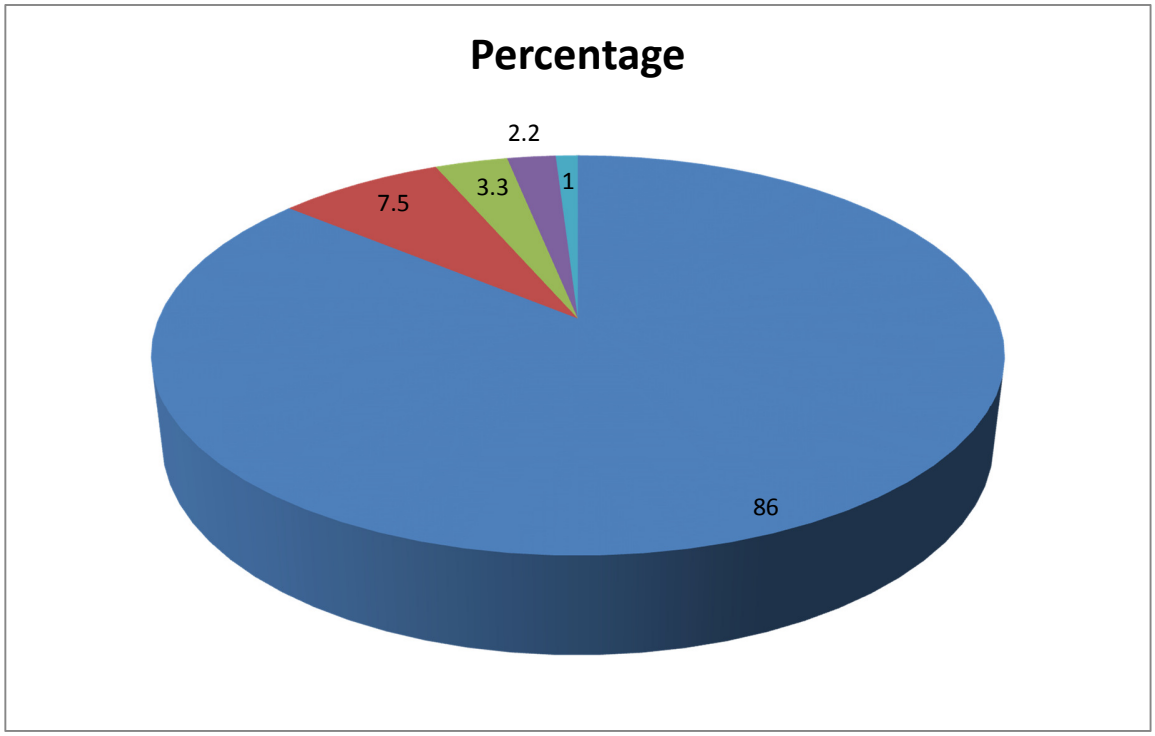
In the United Kingdom, there are several West African populations who came here as students to further their education and then stayed on after their course ended (Elam et al., 2001). Some Africans migrate into Europe or the United States because of political instability in their country of origin or lack of development. Some Africans in the United Kingdom may have also moved there as a result of their membership to a racial, religious, social or political group which may make it impossible for them to stay in their country of origin especially during civil unrest (Chimanikire, 2002).

Labour shortages after the Second World War promoted most migration from the New Commonwealth countries which includes Ghana and Nigeria. In the 1950's to 1960's peak migration from Jamaica, Barbados, St Kitts, St Lucia and Montserrat brought most of the Afro-Caribbeans to the United Kingdom. Black populations from these countries usually came as a result of the prospect of better living conditions (Landman & Cruickshank, 2001). There are some Africans who migrate because of the linguistic and historical ties they have with their country of destination. Africans and Caribbeans from ex-British colonies have also tended to migrate to England as they feel able to identify with the English culture (Elam et al., 2001; Chimanikire, 2002).

Irrespective of the reasons for moving, studies shows that some immigrants move with the intention of settling and beginning new lives whiles others move with the intention of staying long enough to earn sufficient money before returning home (Carballo & Mboup, 2005). Years of

migration into the United Kingdom by immigrants has led to the creation of a multicultural society. The 2011 census has revealed that ethnic minorities make up 14% of the total UK population (ONS, 2011).

Figure 1.1 – Ethnic groups in the UK (2011)



(Source; ONS, Census 2011)

A shift in disease patterns towards that of the host population is expected in subsequent generations of the migrant populations in the UK as they adopt the local diet and lifestyle (Harding et al., 2007). There is little nationally representative data on obesity and chronic disease prevalence for adults from minority ethnic groups in the UK apart from the Health Survey for England (HSE) data from 2004. Data is also scarce for many smaller ethnic groups (National Obesity Observatory, 2011).

1.1.1 Socio – demographic characteristic and health of ethnic minorities in the UK

Studies examining health and health status need to examine socio–demographic factors such as ethnicity, social class, level of education, occupation, housing and marital status. These factors are known to influence health behaviours and outcomes. Cultural factors concerning knowledge,

attitudes and beliefs about food, religion, norms and values, role obligations, social pressures and other health behaviours are also relevant in understanding and interpreting the relationship between nutrition and health outcomes. These sociodemographic factors may be important because they can confound the relationship between nutritional exposures and diet (Darden, 2004; Hiebert, 2006; Reitz, 2007).

In any host society, housing is a basic need that promotes positive health and socio-economic outcomes for immigrants in their new environment. Poor housing can affect the socio-demography and health of immigrants and therefore inhibit integration into a new society (Carter et al., 2009). The health and sociodemography of migrants in the UK has been found to vary by ethnicity. The seven largest ethnic groups in London are Afro-Caribbean, Black African, Indian, Pakistani, Bangladeshi, Chinese and Irish (Sproston & Mindell, 2004). Among the ethnic minorities living in London the highest economically active people are the Irish (54%), Indian (51%) and Afro-Caribbean (50%) and the least economically active ethnic minority groups are the Bangladeshi (27%) and Pakistanis (36%) (London Health Observatory, 2004). About 43% of Black Africans in London are known to be economically active. Indians living in London are the largest ethnic group to own their own housing. They are also the largest population group to own the most homes with mortgages. The largest groups living in council rented homes are the Black African and Bangladeshi ethnic groups (38% and 39%) respectively (London Health Observatory, 2004).

African migrants are among the highly educated in the UK (Office of the National Statistics, 2004). However, some sub-populations of Africans like African Muslims are also likely to be among the least educated. When it comes to employment, ethnic minorities have higher rates of unemployment compared to the white British population (Office of National Statistics, 2004). Data from the 2001 census shows that unemployment rates for black African, Afro-Caribbean and mixed ethnic populations was around 12%. This figure is around three times the rate for white British women (4%) (ONS, 2004). Employed African women have also been found to remain in full-time employment even throughout family formation compared to Indian and white women who were more likely to be in part-time employment (Dale et al., 2004). In the UK, Africans have been found to be frequently in employments that do not reflect their educational qualifications (Elam et al., 2001). Income poverty rate in the UK is around 45% for black Africans compared to a much lower rate of 20% for the white British population (Palmer & Kenway, 2007). Studies show that both males and females from Bangladeshi, Black African and Afro-Caribbeans ethnic minority groups in London have significantly greater standardized mortality ratios for all ages (Wild et al.,

2007; Scarborough et al., 2010). For those under 75 years of age, the men from these three ethnic groups have significantly higher standardized mortality ratio than for all other ethnicities in London (Walters et al., 2009). Death from cardiovascular diseases differs between ethnic groups in the UK (Whites 33%, South Asians 41%, Black Africans 31% and Afro-Caribbeans 37%) (Scarborough et al., 2010). Cardiovascular risk factors such as hypertension, obesity and diabetes also differ between ethnic groups and populations (Bos et al., 2005; Gil et al., 2007; Wild et., 2007; Harding et al., 2008; Scarborough et al., 2010). The prevalence of diabetes is high in Black African, Afro-Caribbean, Indian, Pakistani and Bangladeshi men compared to the general English population (Health Survey for England, 2004). The prevalence of diabetes is also high in Afro-Caribbean, Indian, Pakistani and Bangladeshi women. The prevalence of angina and heart attack has found to be higher in Pakistanis and Indians and lowest in Black African and Chinese ethnic groups (HSE, 2004). Bangladeshi males have the lowest prevalence of hypertension compared to Afro-Caribbeans who have the highest prevalence of hypertension (HSE, 2004).

Table 1.1 – Prevalence of diabetes in ethnic minorities in the UK

Ethnic minority groups in the UK	Prevalence of diabetes in men (%)	Prevalence of diabetes in females (%)
Bangladesh	8.2	5.2
Black African	5	2.1
Afro-Caribbeans	10	8.4
Chinese	3.8	3.3
Indian	10.1	5.9
Irish	3.6	2.3
Pakistani	7.3	8.6
General population	4.3	3.4

(Source: HSE, 2004).

The largest ethnic minority groups in the UK are South Asians (7.5%) and Afro-Caribbeans (3.3%). These two groups are also known to have a high prevalence of chronic diseases compared to the general British population (Cruickshank et al., 2001; HSE, 2004; Wild et al., 2007; Harding et al., 2008). A brief review on the prevalence of chronic diseases in these two minority ethnic groups is discussed below.

1.2 SOUTH ASIANS IN THE UK

South Asians originate from the Indian subcontinent of India, Pakistan, Bangladesh, Sri Lanka and Nepal (Gupta et al., 2006). The 2011 UK census revealed that as the second largest ethnic group, Asians represent around 7.5% of the population in England and Wales, with 2.5% Indians, 2% Pakistanis and 0.75% Bangladeshis. The rest are the Chinese and other Asians (ONS, 2011). This is an increase of 3.5% from 2001 (Hanif & Mohammed, 2009).

1.2.1 Cardiovascular diseases

The major causes of death in South Asians are coronary heart disease and stroke particularly, after migrating to affluent countries (Bhopal & Rafnsson, 2009). In the UK, Indians, Pakistanis and Bangladeshis experience about 50% greater mortality from coronary heart disease and stroke compared to the general British population (Bhopal, 2003; Wild et al., 2007). Cardiovascular disease is also a major cause of death in urban and rural areas in parts of the Indian subcontinent as a result of rapid socio-economic development (Goyal & Yusuf, 2006; Joshi et al., 2006). Similar high rates of cardiovascular disease have been found in South Asian populations in other developed countries, for example USA (Palaniappan et al., 2004; Kandula et al., 2010) and Canada (Gupta et al., 2002; Nijjar et al., 2010).

Among South Asians, myocardial infarction occurs at a much younger age. This is associated with premature mortality compared to other ethnic groups (HSE, 2004; Goyal & Yusuf, 2006; Forouhi et al., 2006; Joshi et al., 2007; Harding et al., 2008). Coronary heart disease also differs in South Asian sub groups and between men and women (HSE, 2004). It has also been reported that the prevalence of self-reported coronary heart disease in people aged 55 years and above was highest in Pakistani men (35.1%) and Indian women (14.7%) (HSE, 2004).

Although the risk factors for cardiovascular diseases are also important in South Asians (Gupta et al., 2008), the comparatively higher rates of coronary heart disease in this ethnic group has been hard to explain solely on the basis of elevated levels of serum cholesterol, smoking and hypertension (Anand et al., 2000; Forouhi et al., 2006). For example, smoking is generally less common in South Asians except Bangladeshi men than in the general UK population (HSE, 2000; HSE, 2004). Plasma cholesterol levels is either lower or similar in South Asians compared to Caucasians in the UK, however some heterogeneity exists between the South Asian subgroups (Barnett et al., 2005; Lyratzopoulos et al., 2005). However, mean lower levels of high density

lipoproteins (HDL) and high plasma triglycerides have been observed in South Asians compared to Caucasians (Ramachandran et al., 1998; Department of Health, 2001; Lip et al., 2007).

A review of some cross-sectional data has revealed that the prevalence of hypertension is similar in South Asians and Caucasians in the UK (Agyemang & Bhopal, 2003; Petersen et al., 2004). Therefore, it has emerged that much of the increased prevalence and mortality from coronary heart disease in the South Asian population is related to the higher prevalence of Type 2 diabetes mellitus and other factors related to insulin resistance (Anand et al, 2000; Bhopal, 2009). About 20-40% of South Asian patients with myocardial infarction have diabetes compared to white European patients (Gupta et al., 2002). Furthermore, evidence suggests that South Asians with diabetes have a higher mortality from coronary heart disease compared to White Europeans with diabetes (Mather et al., 1998; Forouhi et al., 2006; Joshi et al., 2007).

1.2.2 Diabetes and central obesity

The prevalence of diabetes mellitus is uniformly higher in South Asians than in other populations (Gupta et al., 2006). Diabetes has been found to be low in the rural areas and high in urban communities in India. Furthermore, this prevalence increases especially among South Asian migrants in the developed countries (Venkataraman et al., 2004; Gupta et al., 2006). The prevalence of type 2 diabetes in South Asians in the UK is between 15-20% (Petersen et al., 2004). South Asian Indians living in Atlanta, Georgia have been found to have a diabetes prevalence of 18.3% and this is higher than that observed for Caucasians, African Americans and Hispanics in the USA (Venkataraman et al., 2004). The higher prevalence of diabetes in South Asians is thought to be the main risk factor for the higher rates of coronary heart disease mortality in this population when compared to the host countries to which they migrate to (Bhala et al., 2009).

The interaction between genetic predisposition and environmental influences “thrifty gene” has been used to explain the large variation in diabetes prevalence among South Asians (Gupta et al., 2006). The “thrifty gene” hypothesis proposes that conditions of scarcity of food increases the evolutionary selection pressure for efficient metabolism. This then disadvantages those who become exposed to excess food availability at a later period. This hypothesis is based on foetal under-nutrition rather than genotype and links low birth weight to later increased coronary risk. South Asians have smaller superficial subcutaneous adipose tissue compartment than Caucasians (Yajnik, 2001; Sniderman et al., 2007). And South Asian babies are smaller and have

less peripheral fat, therefore during periods of accelerated growth (with the availability of richer diets), the primary compartment for fat storage could rapidly reach its storage capacity. This in turn leads to adverse consequences related to central obesity and dyslipidaemia (Joglekar et al., 2007; Yajnik & Deshmukh, 2008; Bhala et al., 2009).

Body fat distribution is also an important risk factor for obesity-related diseases. Excess abdominal fat or central obesity in which a high proportion of body fat is deposited in the abdomen and on the trunk, is a greater risk factor for diabetes, hypertension, dyslipidaemia and coronary heart disease than generalized obesity (Wang et al., 2005; Yusuf et al., 2005; Gupta et al., 2006; Klein et al., 2007). South Asians have a higher prevalence of central obesity and greater insulin resistance at similar levels of BMI. Insulin resistance is also common in South Asians with BMI levels that are traditionally considered normal (<25 kg/m^2) (Snehalatha et al., 2003). South Asians in London have been found to have greater visceral fat compared to Caucasians at the comparable BMI levels (Forouhi, 2005). South Asians are also considered to have a body type termed "thin-fat phenotype" (fat body but thin muscle), and this body type is associated with an increased risk of developing diabetes (Gupta et al., 2006).

1.2.3 Diet of South Asians

It has been observed that diets of migrants do change from their traditional pattern to that of the host country. Some migrants are known to include processed foods, such as burgers, pizzas, French fries, cakes and sweetened breakfast cereals to their traditional diets (Kumar et al., 2004; Gilbert and Khokhar, 2008). The main staple in Pakistan and some parts of India is chapatti or roti made from whole grain wheat flour; and in Bangladesh and Sri Lanka, it is rice (Abeywardena, 2003; Gilbert & Khokhar, 2008). Simmons & William (1997), observed that 29% of Pakistanis and 93% Gujaratis (India) living in Coventry, England exchanged the traditional whole wheat chapatti flour with white flour.

The traditional diet of South Asians include pulses as a major source of protein (Popkin, 2009; Monteiro, 2010), however, this has been observed to decrease in some subgroups of migrant South Asians. In Norway, 45% of Pakistanis and 63% of Sri Lankan migrants have been found to have increased their meat intake, while 30% and 45% respectively have reduced their intake of beans and lentils (Wandel et al., 2008). Vyas et al., (2003), has observed that chicken and lamb contribute substantially to the energy intake of Pakistani migrants in the UK. Interestingly, beans

and lentils were not among the substantial (top 10) foods that contribute to total energy intake (Vyas et al., 2003).

The energy content of the traditional diet of South Asians is usually low in fat and high in carbohydrate (60-70%) due to the high intake of grains, legumes and tuber (Shobana et al., 1998; Misra et al., 2001; Abeywardena, 2003; Misra et al., 2009). The energy intake of British Gujaratis from Sandwell, UK, has been found to be higher than that of Gujaratis in India from similar cultural and genetic background (Patel et al, 2006). The energy intake was 2,330 kcal vs 1,440 kcal per day and 1,690 kcal vs 1,210 kcal for males and females from Britain and India respectively. For Gujarati men and women in the UK, energy from fat was higher (48% and 43%) and lower from carbohydrate (48% and 43%) compared to those living in India (fat: 31% and 32%, carbohydrate: 56% and 55%) (Patel et al., 2006). Anderson et al., 2005, also observed that both first and second generation South Asian women living in Glasgow, Scotland had a higher energy intake compared to the general population. The contribution of fat to energy intake was 42.4% for the South Asian women compared to 39% for the general population. The high fat intake among South Asians in the UK has also been observed in other studies with dietary intake being dependent on the degree of acculturation (Landman & Cruickshank, 2001; Donin et al., 2010). Some studies (Vyas et al., 2003) have however, reported lower energy intake among migrant South Asians compared to the general British population.

The studies on South Asians in the UK have provided important information about how the diet, lifestyle and genetics contribute to the health of this migrant population and to our understanding of the aetiology of chronic diseases.

1.3 AFRO-CARIBBEANS IN THE UK

Afro-Caribbeans are the second largest minority ethnic group (3.3%) in the UK (ONS, 2011). According to the 2011 census, Black Africans (n=787,500) now surpass Afro-Caribbeans (n=609,400) in the UK. The term African Caribbean or Afro-Caribbean is used inconsistently in the UK. Afro-Caribbeans is sometimes used by researchers to refer to people of either West African or Caribbean migrants (Cappuccio et al., 1998) or just Caribbean migrants (Karlsen et al., 2001; Jackson et al., 2007). Black Africans and Caribbeans are two different groups that can be distinct in terms of beliefs, behaviours, risk factors, height and weight and disease experience (Williams, 1997; Oppenheimer, 2001).

Studies in the US (Singh & Siahpush, 2002) and the UK (Low et al., 2001; Gil et al., 2007) shows considerable diversity in health status and behaviour between different African descent populations. The diet, religion, migration experience, language, education and health behaviour has been found to be different even among Black African people in the UK (Elam et al., 2001; Office for National Statistics, 2001). These differences in behaviour and health are lost when people of African ancestry are grouped together as one homogenous group (Agyemang et al., 2005).

1.3.1 Chronic diseases in Afro-Caribbeans

People of African descent have a low prevalence of coronary heart disease and a high incidence of stroke and diabetes compared to Caucasians (Chaturvedi, 2003; HSE, 2004; Bruijnzeels et al., 2005; Gil et al., 2007; Wild et al., 2007). The lower rate of coronary heart disease in populations of African descent does not imply that this is uncommon among this population. Coronary heart disease may be increasing in some populations of African descent (Agyemang et al., 2009). Harding et al., (2008), observed that between 1979-1983, the age-standardised rate of coronary heart disease was lower in Jamaican born women than those born in England and Wales (Rate ratio = 0.63, 95% CI: 0.52, 0.77). However between 1999-2003, Jamaican born women were more likely to have coronary heart disease compared to those born in England and Wales (Rate ratio = 1.23, 95% CI: 1.06, 1.42) (Harding et al., 2008). This is similar to what happened in the USA where African Americans now have a higher coronary heart disease rate than White Americans, reversing the previous pattern (American Heart Association, 2002). In the United States, although overall mortality from coronary heart disease is decreasing; Black Americans still have higher coronary heart disease mortality than Whites (Hajjar & Kotchen, 2003; Lillie-Blanton et al., 2004; Lancaster et al., 2006). Dietary patterns often differ within racial groups by ethnicity and measures of acculturation including place of birth (Lancaster et al., 2006). Though very few studies have examined the dietary and health practices of immigrant blacks who live in the United States, it has been found that among this ethnic group, the prevalence of the risk factors and health conditions related to cardiovascular disease including obesity and diabetes varies by level of acculturation (Kaplan et al., 2004; Mooteri et al., 2004; Lancaster et al., 2006). Studies have shown that people born outside the United States often have more healthy diets than their US–born counterparts (Bermudez et al., 2000; Dixon et al., 2000; Durham et al., 2004).

Hypertension causes at least 51% of deaths due to stroke and 45% deaths due to heart disease (WHO, 2008). The prevalence is lower in high-income countries and higher in low–income

countries. Hypertension is highest in people living in Africa (46%) and lowest in people living in the Americas (35%) (WHO, 2008; WHO, 2010). The number of people with hypertension has risen from 600 million in 1980 to 1 billion in 2008 (WHO, 2010). The prevalence of hypertension is high among populations of Afro-Caribbeans in Europe (Cruickshank et al., 2001; Agyemang & Bhopal, 2003; Agyemang et al., 2005) and North America (Cooper et al., 1997; Hajjar & Kotchen, 2003). High blood pressure among people of African descent in Europe is a major contributor to the high incidence of stroke in this population (Gil et al., 2007; Lip et al., 2007). In the United Kingdom, the prevalence of hypertension differs between ethnic groups. Hypertension is higher in Afro-Caribbeans compared to Caucasians in the UK (Khan & Beevers, 2005). The prevalence is 32% and 26.9% in Afro-Caribbean males and females respectively (HSE, 2009). The high prevalence of hypertension among Afro-Caribbeans has also been found in other populations of African descent (Edwards et al., 2000; Agyemang et al., 2005; Agyemang, 2006; Addo et al., 2007; Mensah, 2008).

The prevalence of diabetes is also high in people of African descent compared to Caucasians (Diabetes UK, 2004; Bindraban et al., 2008). Recent estimates for the prevalence of diabetes indicate that 17% of the Afro-Caribbean population in the UK has type 2 diabetes compared with 3% of the general UK population (Diabetes UK, 2004). The increased prevalence of type 2 diabetes among populations of African descent has been linked to increasing obesity levels, insulin resistance, physical inactivity and unhealthy diet (Zoratti et al., 2000; Oldroyd et al., 2005). The high diabetes rates among people of African descent in the United Kingdom, U.S. and the Caribbean has been explained by the fact that these people share a common genetic ancestry (Cooper et al., 1997). The prevalence of overweight and obesity is relatively high among Afro-Caribbean women in the UK compared to the host population (HSE, 2004; Goff et al., 2006). The prevalence of overweight and obesity is 32.4% and 32.1% in Afro-Caribbean women compared to 33.9% and 23.2% in the general British population. There are also higher rates of central obesity among Afro-Caribbeans in the UK (HSE, 2004). Goff et al., 2013, has also reported that Afro-Caribbean women have a higher BMI and proportion of body fat compared to Afro-Caribbean men, South Asians and Caucasians in the UK.

1.3.2 Diet of Afro-Caribbeans

Many minority ethnic groups change their diet after migration, combining parts of their traditional diet with some of the less healthy elements of the UK diet. Age and generation are the two main factors that determine the extent to which ethnic minority groups change their diet (Gilbert &

Khokar et al., 2008). Availability of food, religion, income spent on food and food beliefs can also influence migrant diet. There is limited published data on the frequency and the type of foods consumed by Afro-Caribbeans in the UK (Sharma et al., 1998; Mennen et al., 2001; Vyas et al., 2003; Jackson et al., 2007; Goff et al., 2013). The Afro-Caribbeans in the UK consume a mixed diet of West Indian and British foods (Sharma et al., 2002). Afro-Caribbeans in the UK have been found to have favourable dietary habits despite their high rates of dietary related conditions such as obesity (HSE, 2004). The consumption of fruit and vegetables has been found to be high in Afro-Caribbeans compared to the general British population, however this was observed only in those who were older. Fat intake has also been found to be lower in Africans than in the general British population (HSE, 2004). Salt intake is higher than average in Afro-Caribbeans in the UK (HSE, 2004). Afro-Caribbeans have been found to have a lower intake of saturated fat and a higher intake of carbohydrates (Vyas et al., 2003; Goff et al., 2013).

1.4 GHANAIANS – A UNIQUE POPULATION

Ghanaian migrants in the UK migrate from Ghana. The country Ghana can be found in West Africa on the African continent. Ghana is bounded on the East by Togo, on the North by Burkina Faso, on the West by Cote D'Ivoire and on the South by the Atlantic sea. On the attainment of independence in 1957, it changed its colonial name from Gold Coast to Ghana (Gyimah-Boadi & Asante, 2003). The population of Ghana is currently estimated to be about 25 million (Ghana Statistical Service, 2010). There are about 60 different ethnicities in Ghana which is made up of a vast mosaic of large and small ethnic groups (Langer & Ukiwo, 2007). According to the 2000 census, the major ones are the Akan (49.1%), Mole-Dagbani (16.5%), Ewe (12.7%), Ga-Dangme (8.0%), Guan (4.4%) and the Gurme (3.9%). The rest of the population makes up the minor ethnic groups (Ghana Statistical Service, 2000).

Figure 1.2 – Map of Ghana

1.4.1 Religious practices of Ghanaians

The 2010 census in Ghana revealed that the three major religions in Ghana are Christianity, Islam and Traditional. Christianity is nationally the dominant religion with more than half (68.8%) of the population claiming affiliation with the Christian faith. About 15.9% of the population are Moslems and 8.5% are known to have Traditional religious beliefs. The proportion of females (70.5%) with Christian beliefs is higher than for males (67.1%) (Ghana Statistical Service, 2010).

Religion has for a long time provided the context for the formation of a cultural society for Ghanaians (Gyimah-Boadi & Asante, 2003).

Like all immigrants, a crucial question that confronts most African migrants is how they should live in the country they have migrated to and how to adjust to the sociocultural life of their new country in order to attain their goals without losing who they are (Langer & Ukiwo, 2007). In the African community, most people are of the belief that survival is largely dependent on the maintenance of a good relationship between humans on the one hand and God and other supernatural forces on the other hand. Africans are known to be notoriously religious people who take their religion wherever they go. Religion is something that cannot be separated from the social lives of Africans. This is evident from the many African churches that have been formed in many cities and towns even in their migrant countries (Laitin, 1986; Langer & Ukiwo, 2007).

In the developed countries, religion also played a role in the formation and maintenance of identity among immigrants. Religion provides the context for the formation of a cultural community through which an immigrant's identity can be preserved. In fact religion, in the past has been found to be the most pronounced and persistent form of identification among immigrants, their children and grandchildren (Langer & Ukiwo 2007). A majority of Ghanaian migrants are Christians. Evidence shows that 70% to 90% of first generation Ghanaians go to church (Elam et al., 2001; Owusu et al., 2010). During this research, it was observed that there are over 3000 black majority churches in the United Kingdom with most of them located in London *(http://www.blackmajoritychurches.co.uk assessed on 10th December 2007).*

1.4.2 Ghana – nutrition transition

Although there has been a rapid change from traditional diets and lifestyles in developing countries, food insecurity and undernutrition still persists in these countries. In addition to all this are the issues of food security and global access to adequate levels of food intake. This has created a nutrition transition linked with obesity as well as hunger (Popkin et al., 2012). The population of Ghanaians living in urban communities increased from 29% to 44% from 1984 to 2000 (Tagoe, 2012). This has contributed to the increase of chronic diseases in Ghanaians within this period (Badasu, 2001; Badasu, 2007; Agyei-Mensah & de Graft Aikins, 2010). Over the last few decades, there has been a shift in the major causes of death from predominantly infectious diseases to a combination of infectious and chronic diseases among Ghanaians. The top 10 causes of death in Ghana now includes stroke, hypertension, diabetes and cancers (Agyei-

Mensah & de Graft Aikins, 2010). While under-nutrition is still widespread in the country, there is now the other issue of increased overweight and obesity especially in the urban areas in Ghana (Amoah et al., 2002; de-Graft Aikins, 2007).

Ghana, like other sub-Saharan African countries have to contend with communicable diseases like malaria and tuberculosis as well as non-communicable ones such as diabetes and cardiovascular diseases (Agyei-Mensah & de Graft Aikins, 2010). Most countries like Ghana are going through a nutrition transition associated with demographic and epidemiological changes. These nutrition transitions have been found to be related to the increased access to technology which has reduced energy expenditure at work and changes in transportation, home production and leisure (Bell et al., 2001; Bell et al., 2002; Monda et al., 2008). The complex interplay of energy imbalances and biological factors during foetal and infant development in energy also exacerbates many health problems (Gluckman et al., 2011). Food and diet has changed drastically across the low and medium income countries from traditional to 'Western diet'. This trend has been observed in not only urban areas but also increasingly in rural areas in most developing countries (Popkin et al., 2012). Increased fat and sugar intake, animal products and reduced intake of legumes, whole grains and vegetables has been observed in these populations. Technology in food production has contributed to the easy and increased access to cheaper processed, high fat, added-sugar and high-salt foods in these developing countries (Asfaw, 2011; Popkin et al., 2012).

1.4.3 Diet of Ghanaians

The diet of Ghanaians and to a large extent most West Africans consists of tubers, maize, millet and sorghum. These foods are the main contributors to the diet of this ethnic group (Banea-Mayambu et al., 2000). A typical African diet has been described as monotonous. About 20%-25% of kilocalories in both rural and urban African diets are supplied by fat most of which is found in the form of palm, peanut and corn oil (Cole et al., 1997; Kigutha, 1997). The most frequently consumed diet of Ghanaians is cereals, roots and tuber. For protein, fish and legumes are commonly consumed (Nti, 2008; Kobati, 2012).

1.4.4 Migration of Ghanaians

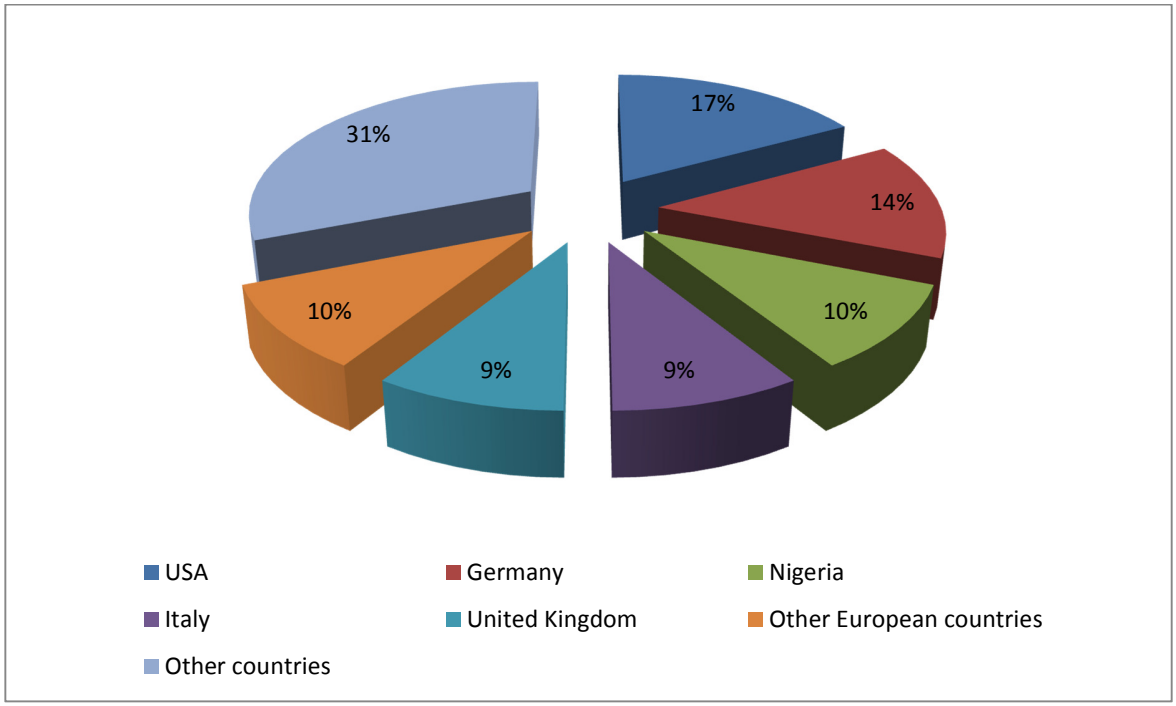
Modern migration from Ghana began when the country slipped into economic crisis in the mid-1960s. This started as a result of unemployment, balance of payment deficits, raw material and

spare parts shortages, and increasing levels of crime and smuggling (Anarfi et al., 2003). It has since then become a country with high internal and external migration for the first time since slavery ended (Nugent, 2004; Taylor, 2009). In the 1970s, the outflow of Ghanaians from the country increased as a result of employment of Ghanaian professionals by newly independent African countries. The outflow of Ghanaian emigration intensified as jobs in agriculture across West Africa and Nigeria's booming oil industry attracted the less educated. By the year 1980, about 15% of Ghanaians were living outside the country (Anarfi et al., 2003). Ghana has been judged to be the second country after Haiti to be hardest hit by the "brain drain" (Douquier et al., 2005). Ghana's net migration rate has been found to be negative with the population emigrating faster than it is attracting returnees (Bump 2006; Taylor, 2009).

Historically, international migration from Ghana involved a relatively small number of people, most of whom were students and professionals. Most of these immigrations went to the United Kingdom and other English speaking developed countries with colonial links. The initial emigration of Ghanaians started after 1965. During this period, Ghana experienced an economic crisis of an unprecedented magnitude as a result of growing unemployment, balance of payment deficit and social malaise (Anarfi & Awusabo-Asare, 2000). However, the most recent phase of Ghanaian migration began in the 1980s characterised by their diasporisation. From the 1990s, a large number of Ghanaians immigrated to major cities like London, Amsterdam, Hamburg and New York (Anarfi, 1982; Black et al., 2003). In 1996, documents from the UK Home Office showed that Ghanaians were among the top ten populations migrating to the UK (Anarfi et al., 2003).

It is estimated that the net migration of Ghanaians at any particular point in time within and from Ghana is 4.5% (United Nations Development Programme, 2009). It is estimated that over 900,000 Ghanaians live outside Ghana mainly in other African countries, Europe and North America. However, data from Ghanaian embassies shows that a higher estimate of 1.5 million Ghanaians live outside Ghana. Ghana currently has the highest rate of skilled emigration in Western Africa, with 47% of highly-skilled Ghanaians living outside the country (Bump 2006; United Nations Development Programme, 2009; Docquier & Marfouk, 2010).

Figure 1.3 – The proportion of Ghanaians living outside Ghana



(Source: Commission of the European Communities, (2001). Eurostat, Netherlands).

1.4.5 Health of Ghanaians

Data gathered between the 1920s and 1960s from the Korle-Bu teaching hospital in Ghana showed a steady increase of stroke and cardiovascular diseases (Pobee, 2006). In Accra (the most urbanised area of Ghana), cardiovascular disease has risen from being the seventh and tenth cause of death in 1953 and 1966 respectively to become the number one cause of death in adults in 1991 and 2001 (Agyei-Mensah, 2004; de-graft Aikins, 2007). By the year 2003, hypertension, stroke, diabetes and cancer had become one of the top ten causes of death among adults in Ghana (Cappuccio et al., 2004; Hill et al., 2005; Pobee, 2006; de-Graft Aikins, 2007). The risk for chronic disease in Ghana has been found to not only be limited to the urban rich but also to the urban poor.

1.4.5.1 Diabetes

Based on studies in southern Ghana, there has been a steady increase in the prevalence of diabetes from 0.2% in 1964 to 6.4% in 2002 (Dodu & de Heer, 1964; Amoah et al, 2002). The percentage of medical admissions due to diabetes increased from 3.5% in the mid-1970s to 6.4 in

the mid-1980s (Adubofour et al., 1993; Adubofour et al., 1997). In the early 1990s, diabetes prevalence was 2-3% in urban areas in southern Ghana. And in the late 1990s, this has increased to about 6.4% for diabetes and 10.7% for impaired glucose tolerance (Amoah et al., 2002).

The prevalence of type 2 diabetes between the 1960s and 1980s was lower than 1% in African countries except in South Africa and Côte d'Ivoire (McLarty et al., 1990). Currently, this has changed with the prevalence of type 2 diabetes rising in many parts of Africa (Mbanya et al., 2010). According to the Burden of Metabolic Risk Factors of Chronic Disease Study, the prevalence of type 2 diabetes was higher in North Africa and lower in Sub-Saharan Africa in 2008 (Unwin et al., 2011). The prevalence of diabetes ranges from 2.5% to 8% in rural and urban areas in West Africa (Baldé et al., 2007; Oladapo et al., 2010); 1% to 12% in rural and urban areas in East Africa (Asprey et al., 2000; Christensen et al., 2009; Matenge et al., 2010; Hall et al., 2011; Maher et al., 2011); 2.9% to 6.2% in rural and urban Central Africa (Sobngwi et al., 2000; Ministry of Health, Cameroon, 2004); and 3% to 10% in South Africa (Levitt et al., 1993; Motala et al., 2008).

Unfortunately, there is currently no data on the prevalence of diabetes in Ghanaian migrants in the UK. The few studies that have attempted to quantify diabetes in African migrants in the UK, have grouped all West African migrants or African migrants together, or with Caribbeans as Afro-Caribbeans. Based on these studies, there is some evidence to suggest that the prevalence of type 2 diabetes is higher in West African migrants than in Caucasians in the United Kingdom and the United States (Cappuccio, 1997; Harris et al., 1998; Erens et al., 2001; Diabetes UK, 2004; Bindraban et al., 2008). The prevalence of diabetes mellitus is not only prevalent among people relative to West Africa but also more prevalent among blacks than whites in the United States (Luke et al., 2001; Chow et al., 2012). The risk of diabetes is 77% higher among African Americans than Caucasians (Centres for Disease Control and Prevention, 2011). About 18.7% of African Americans older than 20 years are diabetic compared to 7.1% of Caucasians (Centres for Disease Control and Prevention, 2011*).*

1.4.5.2 Hypertension

A study by the WHO in a semi-urban area in Ghana during the 1970s observed that about 13% of the population had high blood pressure (Pobee, 2006). In 1998, the national prevalence of hypertension in Ghana was 27.8% (Bosu, 2007). Hypertension has increased by 67% from

58,677 in 1989 to 97,980 in 1998 in Ghana (Amoah et al., 2002). Hypertension is the second leading cause of morbidity in Ghanaian adults older than 45 years (Ministry of Health Ghana, 2005). In Ghana, hypertension has been found to be positively associated with body mass index, waist circumference, salt intake, excessive alcohol consumption and family history (Addo et al., 2012).

While hypertension is uncommon in the rural areas in Africa, among the urban areas the prevalence has been gradually increasing (Seedat, 2000; Sobngwi et al., 2002; Cooper et al., 2003; Tesfaye et al., 2009). According to WHO, the prevalence of hypertension is the highest in Africa at 46% compared to other WHO regions of the world (Global Health Observatory, 2012; Mohan et al., 2013). Hypertension is increasing rapidly in Sub-Saharan Africa even in young and active adults (Opie & Seedat, 2005). In Nigeria, hypertension increased from 8.6% during the period of 1970-1979 to 22.5% in 2011 (Ogah et al., 2012). A recent study in South Africa observed that hypertension in a sample of 3,840 adults aged 50 years or older was 77.3% (Peltzer & Phaswana-Mafuya, 2013).

1.4.5.3 Obesity

The prevalence of overweight and obesity among adult Ghanaian women has increased 2.5 fold in ten years from 10% in 1993 to 25.3% in 2003 (Ghana Statistical Service, 2004). Currently there are more obese women (25.3%) than malnourished women (9%) in Ghana (de-Graft Aikins, 2007). Obesity among Ghanaians is higher in women than men, married individuals rather than single, older than young and urban areas than rural areas (Biritwum et al., 2005). Similar to the nutrition transition going on in most developing countries, obesity in Ghanaians has been linked to modernization, urbanization, affluence and changing lifestyles (de-Graft Aikins, 2003; de-Graft Aikins, 2005; Badasu, 2007; Clegg-Lamptey, 2007; Ekem, 2007).

In Africa, a positive association has been found between overweight/obesity and socio-economic status (Kuga et al., 2002; Fezeu et al., 2006; Christensen et al., 2008). The prevalence of obesity has been found to be 23% in Malawi, 28% to 29% in both Burkina Faso and Senegal, 32% in Tanzania, 35% in Niger and 38% in Kenya (Ziraba et al., 2009). Overweight and obesity in Africa has been observed to be higher in the educated and employed (Villamor et al., 2006; Abubakari et al., 2008; Durazo-Arvizu et al., 2008).

1.4.6 Ghanaian migrants in the UK

In the United Kingdom, Ghanaians are the largest and most established African diaspora group (Higazi, 2005). Modern Ghanaian migration to the UK started in the early 1980s. They came as political asylum seekers or economic migrants because of the situation in Ghana at that time. In the 1990s, a second wave of Ghanaian migrants arrived in the UK as the Ghanaian government moved from military rule to a multi-party democracy (International Organisation for Migration, 2009). Data from the UK shows that, between 1990 -2001, about 21,485 Ghanaians had migrated to the UK (Office for National Statistics (ONS), 2003; International Organisation for Migration, 2009). Evidence from the 2001 census showed that there were about 56,112 Ghanaian born people living in the UK (ONS, 2003). However, recent evidence from the 2011 census puts this figure at about 93,846 (ONS, 2011). Ghanaians in England can be found predominantly in the London boroughs of Waltham Forest, Barnet, Haringey, Brent, Havering, Hounslow and Croydon. Other Ghanaian populations can also be found in Liverpool, Milton Keynes, and Southampton, Manchester, Birmingham and Bracknell (International Organisation for Migration, 2009).

1.4.6.1 Health of migrants of African descent

In England, little is known about the health of Ghanaians and to a large extent the health of the people of African descent and also the environmental and lifestyle factors that may influence their health. This is mainly because this population is known to have come from about fifty three different regions with distinct ethnic identities. Researchers note that while the bulk of this group originated traditionally from West Africa, increased political instability since the 1970s and 1980s has seen an increase in the number of asylum seekers coming from Ethiopia, Somalia, Eritrea and Uganda into the United Kingdom. From the 1991 census held in the United Kingdom, it was observed that people from black African communities were least likely to record long-standing illness (Elam et al., 2001). The cited reasons for this were because of the young age structure of the African population. From the census, they found that people of African ancestry had higher long-standing illness compared to whites but lower than those among other ethnic minority groups (Elam et al., 2001; Erens et al., 2001).

1.5 IMPETUS OF STUDY

South Asian and Afro-Caribbeans minority ethnic groups in the UK are more likely to suffer from coronary heart disease, diabetes, hypertension and stroke compared to the host population (Gil et al., 2007; Bhala et al., 2009; Goff et al., 2013). Ghanaians in the UK are less studied than other

groups in the UK. Whilst there is some research on Ghanaians in the UK, this has tended to focus on issues of development and return migration (Tiemoko, 2003; Black et al., 2003; Henry & Mohan, 2003) and working conditions (Herbert et al., 2006). The impetus for this study was therefore to bridge this gap in knowledge and gather information on the dietary intake and body composition of Ghanaians in the UK and identify an appropriate point of intervention.

CHAPTER 2

AIMS AND OBJECTIVES

2.1 AIM OF THE STUDY

The aim of this study is to assess the dietary intake and body composition and deliver a nutrition intervention programme to first generation Ghanaians in London, UK.

2.2 STUDY OBJECTIVES

Five main objectives will be considered in this study.

- Examine the food groups and nutrient intakes between migrant Ghanaian males and females. This will help to provide current data on the usual diet of first generation Ghanaian migrants in the UK.
- Validate a food frequency questionnaire for the assessment of the habitual dietary intake of the migrant Ghanaian population.
- Examine the prevalence of overweight and obesity in migrant Ghanaians in the UK.
- Determine the ideal body size and image of native and migrant Ghanaians and the female body size most attractive to Ghanaian males.
- Develop a nutrition intervention programme using Black churches as a setting. This will be administered to a sub-sample of the study population and its efficacy assessed.

2.2.1 Assessing the dietary intake of first generation Ghanaian migrants in the UK

Dietary surveys on Ghanaian migrants are very limited, partly due to difficulty in access (Elam et al., 2001). Ghanaian foods consists mainly of well-seasoned stews and soups accompanied by starchy roots, tubers and rice, however, there is no evidence to suggest that this is still the practice especially for those who have migrated to a host country (Webster, 1998). There is currently no evidence to show whether Ghanaian migrants have adopted the diet of their host country. This study therefore hopes to address these issues by aiming to assess the habitual diet

of the Ghanaian migrant population in the UK. The method of dietary assessment to be used here will be the repeated 24 hour dietary recall method. Data on socio-economic variables will be collected and the extent of reporting bias will also be examined.

2.2.2 Validating a food frequency questionnaire (FFQ) for use in Ghanaian migrants in the UK

Validating a dietary assessment tool is similar to calibrating a piece of equipment in the laboratory (Nelson & Margetts, 1997). To our knowledge, there is currently no validated FFQ for use in the Ghanaian population in the UK. This study will therefore develop an FFQ and validate it in a sub-sample of the study population. The validated FFQ will be used to assess change in dietary behaviour in the nutrition intervention programme. Once validated, this can also be implemented for use in other epidemiological studies. The reference method for use in this validation study will be the repeated 24-hour recall. A correlation of at least 0.5 - 0.7 between the food frequency questionnaire and the reference method for energy and macronutrients will suggest a satisfactory performance for the FFQ.

2.2.3 Assessing the prevalence of overweight and obesity in migrant Ghanaians

There have been several studies on the prevalence of overweight and obesity in native Ghanaians (de-Graft Aikins, 2003; Biritwum et al., 2007; de-Graft Aikins, 2007; Agyemang et al., 2009). However, there is currently no data on the prevalence of overweight and obesity in Ghanaian migrants in the UK. There is also evidence to suggest that Ghanaians living in other developed countries have a higher prevalence of obesity compared to those living in Ghana (Saleh et al, 2002; Amoah, 2003; Agyemang et al., 2005; Osei, 2005). Unfortunately almost all these studies used only BMI to assess body composition. This current study will therefore be the first study in the UK to characterize levels of overweight and obesity in Ghanaian migrants using BMI as well as waist circumference, waist to hip ratio and percentage body fat. Data collected will be compared with socio-demography characteristics as well as the native British population.

2.2.4 Body image and perceptions of native and migrant Ghanaians

Different cultures prefer different body sizes and images as their ideal. Being overweight or obese can be associated with fertility, sexuality, attractiveness, wealth and well-being in some cultures (Brown, 1991; Teti, 1995; Popenoe, 2003; Becker, 2004). This study will therefore assess the body size and image Ghanaians find healthy, attractive and ideal using focus group meetings.

These meetings will also be used to determine the nutrition and health issues that Ghanaians migrants want to be discussed under the nutrition intervention programme.

2.2.5 Nutrition intervention programme

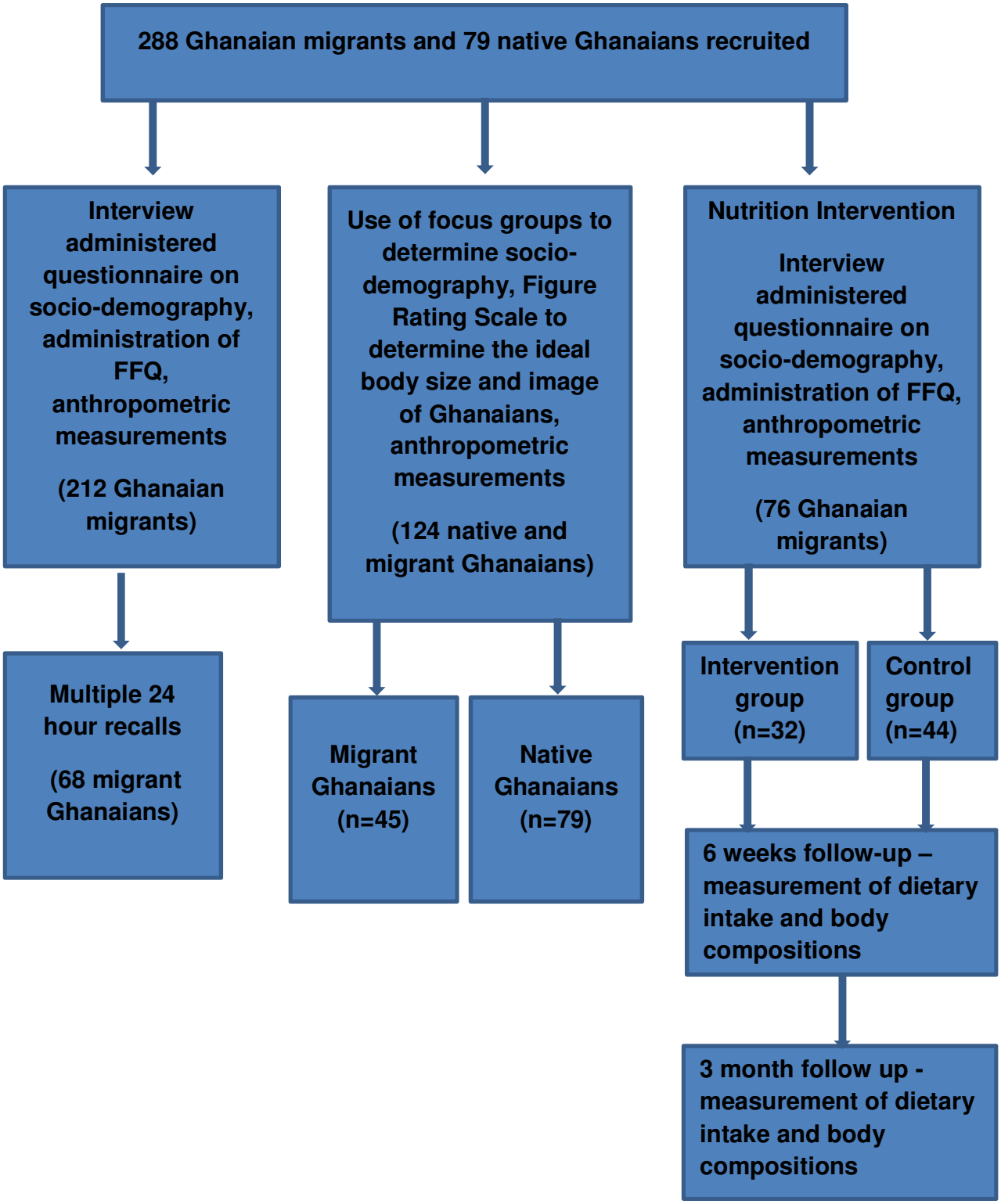
Nutrition intervention programmes are developed to address specific goals and targets by directly or indirectly influencing factors that affects individual or population behaviours (Margetts, 2004). For interventions to be successful, they should be culturally and ethnically appropriate (Holm et al., 1998; Sahay et al., 2006). Successful interventions should also include diet and physical activity, as well as behaviour and lifestyle modification that can be more effective (Pleas, 1998). Focus group meetings will be held with a sub-sample of the migrant Ghanaian population to determine the content of the intervention programme. The intervention programme will be delivered at selected UK Ghanaian Churches to a sub-sample of the population. Input and advice from the Obesity Clinic at The London Metropolitan University will be sought, and its current programme will be used as a template for the intervention programme. The intervention programme will promote the idea of Church-based weight management programmes and also aid in establishing links with the local West African community. To our knowledge, this will be the first nutrition intervention programme in the UK, using Black Churches.

2.3 POTENTIAL CONTRIBUTION OF THE STUDY

This study will be the first, to my knowledge;

- To report on the habitual intake of Ghanaian migrants in the UK.
- To develop and validate an FFQ to characterize the habitual diet of Ghanaians in the UK.
- To report on the prevalence of overweight and obesity amongst the Ghanaian migrant population in the UK.
- To report on the ideal body image of Ghanaians and the female body size most attractive to Ghanaian males.
- To deliver a weight-loss intervention programme using the congregations from Black Churches in the UK.

Figure 2.1 – An overview of the study design



CHAPTER 3

DIETARY INTAKE OF GHANAIANS IN THE UK

3.1 INTRODUCTION

To the best of our knowledge, there is no available information on the dietary intake of Ghanaian migrants in the UK. Thus, the aim of this chapter is to characterize the dietary intake of first generation Ghanaian migrants in the UK using multiple 24-hour recalls.

3.1.1 Dietary assessment

Dietary assessment methods have been used over the years by researchers to determine the habitual diet and energy intake in individuals and populations (Patterson & Pietinen, 2004; Thompson & Subar, 2013). The assessment methods have been classified depending on whether they are used for individual nutrient assessment or for the assessment of the dietary intakes of households or groups (Patterson & Pietinen, 2004; Gibson, 2005). At the individual level, the objectives of the dietary assessments may range from assessing how adequate the diet is in meeting the energy and nutrient requirements, finding the relationship between a dietary risk factor and a given health outcome. It can also be used to observe how an individual responds to dietary manipulations (Willett, 1998; Thompson & Subar, 2008; Fialkowski et al., 2010). The methods used here can be either retrospective reporting of intake from the past or the prospective recording of current intake. These methods can be used to estimate the amount of food consumed over the last day, week, and month or even for several years (Willett, 1998; Rutishauser & Black, 2002; Patterson & Pietinen, 2004). The different methods make it easier to assess nutritional status even under very diverse conditions.

The 24 hour dietary recall and the 7 day food record methods have proven to be very useful in population studies particularly for the purposes of nutrition interventions and monitoring. These methods are often used for comparing the mean intakes of the intervention and control group in nutrition intervention studies. The open-endedness of these methods makes them appropriate to

be used in assessing the dietary intake of populations with different eating patterns (Cade et al., 2004; Patterson & Pietinen, 2004; Thompson & Subur, 2008).

In all dietary and nutrition assessment methods portion sizes must be estimated especially when food is not weighed directly. People who are untrained have difficulty in estimating portion sizes when examining displayed food and when reporting foods previously consumed. Estimating portion sizes inaccurately can be a principle source of error in dietary assessment (Gibson, 2005; Rumpler et al., 2008; Souverein et al., 2011). Studies shows that portion sizes may be easily reported for foods that are commonly bought or consumed in defined units such as a slice of bread, pieces of fruit or beverages in bottles or cans. On the other hand, portion sizes of foods that are not in defined units such as steak, lettuce or poured liquids may not be easily determined by people (Thompson & Subar, 2013). Portion sizes that are small may be overestimated whereas large portion sizes underestimated (Nelson et al., 1996; Harnack et al., 2004). Photographs and food models can also be used to help participants to describe and estimate their portion sizes (Nelson M & Haraldsdottir, 1998; Thompson & Subar, 2013).

3.1.2 7 day weighed records

The 7 day weighed record method is known to provide quantitative and accurate information on food consumed as it is usually conducted over a period of time (Mahabir et al., 2006; Thompson & Subur, 2013). The length of time required for data collection for the weighed food record depends on the purpose of the investigation, the sample size and the desired precision of the estimate (Willett, 1998; Berdanier et al., 2008; Chun & Davies, 2012). For this method, participants are normally required to carry a diary or record with them and record all the foods eaten over this period. Researchers using this method may also adopt the use of models and other aids to instruct participants on estimating portion and/or serving sizes (Patterson & Pietinen, 2004). The weighed food record can be used to give a very detailed description of types and amounts of foods and beverages consumed, meal by meal, over a required period. In order to help in providing accurate results, it is important to ensure that sufficient detail is captured on foods and the type of preparation method used. Additionally, an instruction on keeping records should be provided before the period of recording and the records reviewed for completeness after the recording period (Willett, 1998; Patterson & Pietinen, 2004).

The 7 day weighed food records involve the weighing and recording of foods eaten usually over a period of one week. In the past, the weighed records were considered as the “gold standard” to

assess nutritional intake (Willett, 1990; Bingham et al., 1994) and considered an imperfect "gold standard" in the present (Hill & Davies, 2001; Holmes et al., 2008; Murtaugh et al., 2010). This is because several studies have reported that for small selected adult samples, energy and protein intakes on food records can be underestimated in the range of 4% to 37% when compared to energy expenditure measured by doubly-labelled water or protein intake as measured by urinary nitrogen (Hill & Davis, 2001; Trabulsi & Schoeller, 2001; Seale et al., 2002; Mahabir et al., 2006). Although the 7 day weighed food record can be used to assess the habitual intake of a population, it does not take into account seasonality. In addition, because of the large respondent burden of recording food intake associated with this method, participants may alter their normal food choices merely to make recording easier. This limits the weighed food record method to people who are literate and highly motivated (Willett, 1998; Thompson & Subur, 2008; Posluna et al., 2009). Participants using this method can also become sensitized to food choices. Because diet may be altered during the days used for the records, the weighed food record method can present results that are unrepresentative of the true habitual dietary intake (Ziegler & Filler, 1996).

3.1.3 Rationale for the use of 24 hour dietary recall

The 24-hour recall dietary assessment method is inexpensive, requires low levels of literacy and easy to administer to a large number of participants. The immediacy of the recall period for this method makes it easier for respondents to generally remember most of their dietary intake over the past 24 hour period. This relatively low respondent burden on respondents also means that those who agree to give their previous day's intake are likely to be representative of the population than those who agree to keep food records (Patterson & Pietinen, 2004; Thompson & Subar, 2008). This method is also culturally sensitive because it can allow for any food combination (Cassidy, 1994; Patterson & Pietinen, 2004). This makes it suitable for use in this study population. Data can be collected in a highly consistent manner from all respondents because 24-hour recalls are usually interviewer administered (Patterson & Pietinen, 2004).

Data collection for the 24-hour recalls occurs after the food has already been consumed and therefore there is less potential for the assessment method to interfere with dietary behaviour (Thompson & Subar, 2013). For the 24-hour recall method, the participant is usually asked to remember and report all the foods and beverages consumed in the preceding 24 hours or day. This method can be conducted by telephone or in person (Casey et al., 1999; Bogle et al., 2001; Sallis & Owen, 2002; Arab et al., 2011). The 24-hour recall is also suitable for capturing seasonality if the recalls are recorded throughout the year making it possible to measure habitual

intake (Thompson & Subar, 2008). The open-endedness of the 24-hour recall also makes it appropriate for assessing intake among population groups with different eating patterns (Patterson & Pietinen, 2004).

The 24 hour dietary recall was selected because it has a low respondent burden and can be administered by telephone. This is especially the case if the study sample is scattered in a wide and different geographical areas. The telephone interviews also make it easier to reach people who otherwise might have refused to participate. A disadvantage with the telephone interviews is that people who do not have telephones will be unable to participate (Bogle et al., 2001; Brustad et al., 2003). For this study, all participants who agreed to participate in the dietary assessment using the 24-hour recall method had a telephone and could be contacted at any time.

The 24-hour recall method cannot be used to study the distributions of dietary intake because an individual's diet can be unusually high (example a celebratory meal) or unusually low (example during periods of ill health) on any given day. These days cannot be representative of an individual's usual intake even when they are perfectly recorded (Patterson & Pietinen, 2004; Thompson & Subar, 2008). The 24-hour recall method relies on memory and the respondent's ability to estimate portion sizes which can lead to under-reporting or over-reporting of dietary intake (Patterson & Pietinen, 2004). However, under-reporting and over-reporting can also be observed among respondents using other dietary assessment methods to assess intake (Jonnalagadda et al., 2000; Neuhouser et al., 2008; Preis et al., 2011).

There are only a few studies on dietary intake that have been conducted on West African immigrants (Delisle et al., 2009; Kumar et al., 2009; Patil et al., 2009; Alonge et al., 2011) and even fewer studies on Ghanaian migrants in developed countries (Saleh et al., 2002; Owusu et al., 2010). A study from the UK, suggests that the frequency of consumption of foods and food portion sizes of the Afro-Caribbean population in Britain differs from those consumed by the majority White population (Sharma et al., 2002).

3.2 METHODOLOGY

3.2.1 Recruitment

First generation Ghanaian migrants were recruited from a selection of black majority churches with a predominantly large West African congregation in London which is known to have a high population of Ghanaian migrants (Chapter 1). Churches were used for this study because of the difficulty in obtaining assess to this population. In most African communities, the church community is the primary source of social support and community leadership (Levin, 1984; Eng et al., 1985). Four Churches namely Praise Chapel, Faith Baptist Church, Harvest Chapel International and Trinity Presbyterian Church of Ghana were initially approached and permission to use congregation for the study sought from the Pastors and leaders. After discussions about the aims and importance of the study, all Pastors agreed to allow their churches to participate. Arrangements were then made to meet the congregations to discuss the study with them further. Special dates were then arranged with each church to begin data collection from those interested in taking part in the study. Eligible subjects were required to have been born in Ghana and should have lived in the UK for a minimum of 5 years.

3.2.1.1 Ethical approval

Ethical approval was obtained from London Metropolitan University before study commenced. Letters written to Pastors to allow access to their congregation and consent forms completed by participants can be found in Appendix A1 and Appendix A2.

3.2.1.2 Sample size

Based on other studies, the sample size was set to detect 80% power, at a 5% significance level with a target sample size of 100 participants. We allowed for a 30% dropout rate. Most of the study participants originated from the Greater Accra and Ashanti region of Ghana. Initially, all study participants recruited from the selected churches were invited to participate in the dietary assessment using the 24 hour dietary recall method. In total, eighty five agreed to participate, but by the end of the research period, seventeen participants had dropped out due to illness (n=4), lack of time (n=11) and outright refusal to continue (n=2). Therefore the total number of participants who completed a total of seven 24-hour recall interviews was sixty eight.

3.2.2 Interview administered questionnaire

A questionnaire was also developed to collect information on age, gender, country of birth, marital status, occupation, and level of education, and other relevant lifestyle factors (Appendix A3). The questionnaire has been piloted on a sub-sample of the study population to ensure that wording was culturally sensitive and also logically set out. The first section of the questionnaire had 5 major questions with sub-questions and was concerned with the collection of information on age, gender, country of birth, marital status, occupation, and level of education. The second section of the questionnaire was concerned with levels of physical activity, the presence or absence of any disease, potential confounders and other relevant lifestyle factors.

3.2.2.1 Rationale for using an interview-based questionnaire

Questionnaires can either by administered by an interviewer or self-administered. A questionnaire that is self-administered requires the participant to be literate in English or the language used to write the questionnaire. This can possibly increase the respondent bias. An advantage of the self-administered questionnaires is that they are less costly. They are also more anonymous and therefore more honest (Margetts & Nelson, 1997; Tsakos et al., 2008). However, in relation to this study, using a self-administered questionnaire could possibly be a problem for the first generation Ghanaian migrants whose first language is not English. Therefore, the interview-administered questionnaire was considered to be the most ideal for this study. Although this method can be time consuming and more expensive, it also allows the measurement of physical characteristics. The interview-administered questionnaires can also increase the response rate because of the personal contact made between the interviewer and the respondent. The interaction between the interviewer and the participant can also introduce bias in the estimates because the presence of an interviewer can be distracting to respondents. Respondents may also be reluctant to reveal behaviours that are unlikely to be endorsed by the interviewer (Bowling, 2001; Bowling 2005; Nichols & Childs, 2009).

3.2.2.2 The interview

During the interview, several strategies were employed to keep participation rates very high. All appointments to conduct the interviews were arranged to the convenience of the participating churches. The interviews were conducted on the church premises. Conducting an interview in an unhurried, relaxed, neutral and non-judgemental manner can put the participant at ease and therefore increase the recall accuracy (Thomas, 1980). The interviewer (myself) was of Ghanaian

origin and fluent in three major Ghanaian languages. If there was any ambiguity in the answers given, participants were probed further. During the interview all efforts were made to ensure that the questions were not asked in any biased way that encouraged the participants to respond to the questions in a certain way. Further care was taken to ensure that the questions were not confusing or misleading which can lead to unreliable answers. After, the interview, the questionnaire was checked for omissions by the interviewer and the respondent thanked for their participation.

3.2.3 Data management and analysis

All questionnaires were double-checked by an independent person and not the interviewer for completeness and accuracy. Questionnaires with missing and inconsistent data were shown to the interviewer who contacted the participant again if necessary. To verify data, participants were sometimes asked about the same information twice but asked at different points of the survey and in a number of different ways. Data quality was checked for each individual observation and for the entire data set during the whole period of the study.

3.2.4 The random repeated multiple 24-hour recall interviews

There are different approaches to the 24-hour recall interview. The study participant can be asked to give a description of all foods eaten in the previous 24 hours beginning from either the first thing eaten today or what was eaten exactly 24 hours ago. For this study, participants were initially interviewed face-to-face and then contacted via the telephone on random days and asked to recall all foods eaten within the last 24 hours. Participants were also asked how food was prepared. Some studies have found out that there are no significant differences in mean energy intake between the face-to-face and telephone interviews (Lyu et al., 1998; Tran et al., 2000; Brustad et al., 2003).

During the interviews all possible variations was offered to participants to help memory recall. To do this, participants were asked questions on activities, time references and meal sequences of the day. After the participant had completed the 24-hour recall interview, areas requiring further information were identified and specific strategic questions were asked, if the respondent was unclear about the type of food eaten, all possible variations were offered to help memory recall. All the interviews were conducted in a similar manner using a standard protocol. The 7 repeated 24 hour dietary recall interviews were conducted over a six month period. The mean number of

days between recalls was 15 days. All the interviews were personally conducted by the same nutritionist to avoid inter-observer bias. The 24-hour recall interview began by asking the participants what they had for breakfast, lunch and then supper from the previous day. A table with the questions on the day of the week for the interview, meal time, food type, food preparation method, description of food including brand name and portion of the food eaten can be found in Appendix A5. Additionally, participants were probed to find out their activities for the day to help them recall any foods or drinks consumed during these periods.

3.2.5 Estimation of portion sizes

The usual methods for assessing portion sizes in dietary assessment is to weigh food directly or weigh food visually using household measures, food models or photographs. For this study, household measures were used to determine portion sizes. Some foods like eggs and apples were recorded as units and others described as ladles, tablespoons, teaspoons, bowls or cups. Household measures have been used successfully in studies such as NFCS (National Food Consumption Survey and CSFII (Continuing Survey of Food Intakes of Individuals). Household measures are familiar, easy to use and generates a higher level of co-operation from study participants (Young & Nestle, 1995).

Because most Ghanaian foods are served from a common pot, portion sizes are usually determined by the number of serving spoons used thus household measures may be the most appropriate method for estimating portion sizes for this population. For the face-to-face 24-hour recall interviews food photographs of a standard cereal bowl, plate, cup, ladle, tablespoon and teaspoon were shown to participants to help them determine their portion size. The weight of the food was estimated by directly weighing the food using the household measures used by the participants to determine portion size. Example of the table used to collect information on the dietary intake of participants using the 24-hour recalls and the photographs used to estimate portion sizes can be found in Appendix A5 and Appendix A6 respectively.

3.2.6 Food composition tables

Although there is a food composition table for Ghanaians in Ghana (Tayie & Lartey, 2000), this has been found to be incomplete. The current Ghana food composition table does not include all the major Ghanaian foods. Also, only the macro-nutrients and a few micro-nutrients have been analyzed for these foods. This makes it difficult to conduct nutritional epidemiological studies on

Ghanaians. Some nutrient values were also available only for raw ingredients rather than composite dishes. For the purpose of this study, it was decided that the McCance and Widdowson's food composition table and the Ghana food composition table would be used together to compute the average dietary intake of Ghanaian migrants over the past year (Food Standards Agency, 2002; Tayie & Lartey, 2000).

3.2.7 Energy under-reporting

In dietary surveys, the Goldberg cut-off can be used to evaluate the mean population bias in reported energy intake. The suggested cut-off point by Goldberg is used to represent the limits of energy needs of a free-living person (Goldberg et al., 1991; Black, 2000). This cut-off point takes into consideration the activity or lifestyle of the population in question. It is desirable especially in smaller studies to calculate individual energy requirements or measure energy expenditure and to compare energy intake directly with energy expenditure. In the context of this study, the measured height and weight of participants were used to estimate their basal metabolic rate (BMR) through the Schofield predictive equations (Schofield, 1985). The calculated BMR values were then used to calculate energy intake, (EI): BMR ratio.

Schofield equation (adapted from Payne-James & Wicks, 2003)

Equations for predicting BMR in males and females from body weight (w) in kg

Age range(year)	BMR kcal/d (males)	BMR kcal/d (females)
15-18	17.6w+656	13.3w+690
18-30	15.0w+690	14.7w+496
30-60	11.4w+870	8.7w+829
>60	11.7w+585	10.5w+596

The physiologically plausible energy intakes of weight stable individuals were calculated from the Goldberg equations based on an expected mean total expenditure value (TEE). Taking into

account inter-individual variation in TEE/BMR values, the lower cut-off limit for determining mis-reporting is then defined as the lower 95% confidence limit of the expected TEE/BMR. EI/BMR lower or equal to the cut-off TEE/BMR shows under-reporting (Goldberg et al., 1991; Black, 2000).

Goldberg equation

$$\mathbf{EI/BMR \geq 1.55 \times \exp[-2 \times S/(100\sqrt{n})]}$$

$$\mathbf{Where\ S = \sqrt{[(CV/w^2/k)] + CVB^2 + CVp^2}}$$

CV/w^2= within-individual coefficient of variation of energy intake;

CVB^2= co-efficient of variation for measured or predicted BMR as estimated from Schofield equations;

CVp^2= co-efficient of variation for TEE/BMR as determined according to FAO/WHO/UNU;

N= number of individuals for which intake is examined (n=if on an individual level);

K= number of days for which the intake is recorded;

Goldberg et al., (1991) assumed CV/w^2 to be 20%, CVB^2 to be 8% and CVp^2 to be 12.5%

In this study, the cut-off limit determined was EI/BMR ≥ 1.15. This was based on an individual level (n=1) for an average of 7 days reported intake at the 95% confidence limit. Those whose energy intakes were below this cut-off point were classified as energy under-reporters. The calculated cut-off limit of EI/BMR ≥ 1.15 was chosen because the majority of the population is mainly sedentary. This cut-off point has also been used in other studies (Mennen et al., 2000; Yannakoulia et al., 2007).

3.2.8 Number of days required to estimate habitual intake

It is important to determine the number of days needed to assess dietary intake because of the day-to-day variability in individuals or population intake. If there is an element of consistency in long-term diet the habitual (true) intake of a person can be expressed as the mean and standard deviation of a large number of days. The greater the number of days measured, the greater the precision of the estimates and hence, the smaller the standard deviation observed. Long term diet may be misrepresented if too few days are measured (Tooze et al., 2010; Chun & Davis, 2012). On the other hand, if the number of days required to record dietary intake is too high, it can increase respondent burden and hence affect response rates (Willet, 1998; Carriquiry, 2003; Jahns et al., 2005).

When assessing the diets of individuals, day-to-day variations in dietary intake is an important factor that needs to be taken into consideration (Gibson, 2005). For the purposes of this study, it was important to determine the minimum number of days required for participants to record their diets within the confines of financial and practical limitations. It has been observed that the minimum number of days required for gross characterizations of habitual energy and macronutrient intake ranges from 3 to 10 days (Hartman et al., 1990). For this study, it was decided that 7 days will be used to estimate habitual intake to include both weekends and weekdays.

Beaton et al., (1979) devised a formula which can be used to determine the number of days needed to assess intake. The within-person coefficient of variation of intake of a particular nutrient can be obtained as a proportion of the person's mean intake, by dividing the within-person standard deviance (s) by the mean (¥) and expressing the result as a percentage (s/¥ × 100). The within-person and between-person variance for each nutrient examined were obtained from analysis of variance on the repeated 24-hour recalls. The number of repeated measures was estimated for within a specified limit of accuracy of 20% and 30% of the habitual intake. The normal deviate for the percentage of times the measured values should be within a specified limit did not change and remains constant (Z=1.96).

Number of days required to calculate habitual intake is $n = (Z\acute{\alpha}CV\omega/Do)^2$

Where

n = the number of days needed per person

Zά = the normal deviate for the percentage of times the measured values should be within a specified limit

CVω = the within-person coefficient of variation

Do = the specified limit of accuracy (as a percentage of long term habitual intake

3.2.9 Statistical analysis

All statistical analysis was performed using STATA 12 (Stata Corporation, Texas). Data was checked for deviation from normality. Background characteristics and all measurements taken were presented as mean and standard deviation for continuous variables (e.g. energy intake) and proportion (%) for categorical variables (e.g. gender). Chi-square test of significance was used to analyze all categorical data. The t test was used to compare means between groups. To identify confounders affecting under-reporting, multiple linear regressions were computed. The main food groups consumed by the Ghanaian population was also identified and compared with the food groups mainly consumed by the general British population. To assess the day-to-day variation in nutrient intakes, nutrients from each individual were grouped by weekday or weekend. The t-test was used to detect any differences in dietary intake between weekdays and weekends. P-value was set at 0.05.

3.3 RESULTS

3.3.1 Representativeness

Table 3.1 shows the socio-demographic characteristics of Ghanaian migrants compared with that of the native British population. Data was obtained from 68 study participants (25 men and 43 women). This was compared to data from the British population. Ghanaian migrants were on average younger, single and more educated compared to the general British population. Only 3% of the Ghanaian population was unemployed. Ghanaian migrants were more likely to be living in council or privately rented houses compared to the host population.

3.3.2 Dietary intake of Ghanaians

Results from Table 3.2 shows that on average the energy intake of Ghanaian migrants was similar to that of the general UK population and lower than that of Afro-Caribbeans in the UK. Proportion of macro-nutrient contribution was however, different. Percentage contribution of energy from protein was lower (14.3%) and that from carbohydrate higher (50.1%) compared to the percentage contributions from the general British population (16.6% versus 48.1%) for protein and carbohydrate respectively. Percentage energy contribution from fat intake was similar to that of the host population. Fibre intake, sodium and vitamin E intake were higher for the Ghanaian migrants compared to the native population.

3.3.3 Low-energy reporters (LER) versus non low-energy reporters (non-LERs)

In this present study, the cut-off limit determined to identify low-energy reporters was EI/BMR ≥ 1.15. Those whose energy intakes were below this cut-off point were classified as energy under-reporters. The regression analysis was stratified by gender because of several differences observed in univariate analysis between genders. As illustrated in Table 3.3, 31% (n=21) of the study population was classified as low-energy reporters of which 38% (n=8) were males and 62% (n=13) females. Significant differences were observed in intake of protein, carbohydrate, fibre, Vitamin E and sodium between LERs and non-LERS. There were no significant differences between energy under-reporters and non-energy under-reporters for fat, iron, vitamin C and vitamin B_{12}. The multiple regression results presented in Table 3.4 shows that age, education, employment, marriage and BMI influenced energy under-reporting in this population. For Ghanaian males, under-reporting was found to be influenced by age, education, employment,

marriage and BMI. For females, age, education and BMI were found to be related to energy under-reporting.

3.3.4 Minimum number of days needed to record habitual dietary intake

From Table 3.5, it can be observed that on average the within-person and between-person variations observed for the macronutrients were lower compared to the variances recorded for the micronutrients. This was particularly high for vitamin C, iron and vitamin B_{12}. It was particularly low for dietary fat (11 and 8 for within-person and between-person variances respectively). The minimum number of days needed to obtain values that lie within 30% of the true habitual intake was 5 days for energy, fat and sodium. The number of days needed to obtain values that lie within 30% of the true habitual intakes ranged from 3 days (for protein) to 22 days (for vitamin C). The number of days needed to obtain nutrient accuracy of 20% of true mean intake was higher than 7 for almost all the nutrients. It was observed that for the micronutrients, a higher number of days were needed to obtain values that lie within both 20% and 30% of the true habitual intake compared to macronutrients.

3.3.5 Differences in intakes between weekends and weekdays

Table 3.6 shows average nutrient intakes for study participants on weekdays and weekends. On average, energy, protein, fat and carbohydrate intakes were higher on weekends than on weekdays. Fibre, sodium and vitamin C intakes were higher on weekdays than on weekends. There were significant differences between weekdays and weekends for energy ($p=0.04$), protein ($p=0.05$), fat ($p=0.047$), carbohydrate ($p=0.05$) and vitamin C ($p=0.05$).

3.3.6 Contributions of food groups to total energy intake

Results from the nutrient analysis showed that carbohydrate was the highest contributor to total energy. This is observed in Figure 3.1, which shows that rice and pasta dishes and cereal and cereal products contributed the most to total energy (30.7%). Meat and meat products were also high contributors to total energy (20.2%). Results from the 2008/2009 – 2009/2010 NDNS (Whitton et al., 2011) showed that meat and meat products (21%), cereals and cereal products (14%) and sweet and snacks (19%) were the food groups that contributed the most to total energy for the British population. Alcoholic and non-alcoholic beverages contributed only 3% to the total energy intake of Ghanaian migrants compared to 12% for the general British population. From Figure 3.2, the food groups that contributed the most to total fat intake were meat and meat

products (27.5%) and sweets and snacks (22%). This was similar to that observed for the general British population (Whitton et al., 2011). Pulses and lentils and cereal and cereal products were the food groups that contributed the most to total fibre intake for both the Ghanaian population and the general British population (Figure 3.3) (Whitton et al., 2011).

The main staple food in the Ghanaian diet in the UK, using the 24-hour recall was rice and the most common dishes consumed being jollof rice, fried rice and white rice. Chicken and corned beef/sausage/luncheon was the most commonly consumed meat and meat products. The most commonly used oil in cooking was sunflower oil (50%). Yam, plantain and cocoyam which are commonly eaten by most native Ghanaians were eaten by 52% of the population. Potatoes were also commonly eaten by the migrant population (90% of respondents). Pizza and burger were consumed by more than half of the population. The most commonly eaten nuts were groundnuts (peanuts) and cashew nuts. Among the Ghanaian snacks featured in the food frequency questionnaire only kelewele was highly consumed. Snacks like crisps, cakes, scones, doughnuts and ice cream were consumed almost weekly by the study population. Some of the fruits and vegetables commonly eaten by this population were banana, apple, orange, plantain, tomatoes, onions and carrots.

Table 3.1 – Sociodemography of study participants (n=68)

Characteristics		Ghanaian migrants (n=68)	*British population
Age (Years)			
	18 – 29	48 %	13 %
	30 – 49	44 %	38 %
	50 -79	8 %	48 %
Education Level			
	No qualification	0 %	23 %
	Primary, secondary and other	59 %	50 %
	Level 4 and over	41 %	27 %
Employment			
	Employed	94 %	71 %
	Un-employed	3 %	7.5 %
Marriage			
	Single	66 %	35 %
	Married	28 %	47 %
	Widowed	3 %	8 %
	Separated/divorced	3 %	10 %
Housing			
	Owned	17 %	64 %
	Rented	83%	15 %

*NDNS 2008/2009-2009/2010 (Whitton et al., 2011).

Table 3.2 – Comparison of mean daily nutrient intakes between the study population, the National Diet and Nutrition Survey (2008/9-2009/10).

Nutrients	Ghanaians (n=68) (SD)	* African Americans	** Afro-Caribbeans	*** NDNS	**** NDNS
Energy (kcal/d)	1987 (364)	2147.3	2166	1918	1972
Protein (% energy)	14.3 (20)	15.5	14.7	17.5	16.6
Fat (% energy)	35.3 (11)	34.7	31.2	36.0	35.4
Carbohydrate (% energy)	50.1 (69)	47.8	54.1	47.0	48.1
Fibre (g/d)	16 (4)	13.9	23.7	13.7	13.9
Vitamin C (mg/d)	72 (8)	105.1	-	-	82.2
Vitamin E (mg/d)	11 (2)	8.6	-	-	9.4
Sodium (mg/d)	3024 (432)	3486	-	-	2808
Iron (mg/d)	11 (2)	-	-	-	11.9
Vitamin B12 (µg/d)	5 (1)	5.1	-	-	5.7
Vitamin D (µg)	2.3	-	-	-	-

* Lancaster et al., (2006)

** Mennen et al., (2000)

*** National Diet and Nutrition Survey 2008/9 – 2009/2010 (Whitton et al., 2011)

**** National Diet and Nutrition Survey (2004)

Table 3.3 – Differences in nutrient intake between low-energy reporters and non low-energy reporters by gender under-reporting for both men and women

% contribution to energy	LER (n=21)	Non-LER (n=47)	p value
Protein (g)	14.0	14.5	0.042
Fat (g)	34.8	35.7	0.142
Carbohydrate (g)	51.1	49.8	0.009
Fibre (g)	17.4 (4.8)	15.3 (7.9)	0.041
Vitamin C (mg)	74.2 (18.7)	69.7 (25.1)	0.241
Vitamin E (mg)	11.6 (4.3)	10.7 (7.4)	0.052
Sodium (mg)	3111.7 (542.2)	2937.1 (289.1)	0.034
Iron (mg)	10.9 (6.7)	11.6 (8.2)	0.061
Vitamin B12 (µg)	5.3 (3.2)	5.1 (1.2)	0.113

LER – Low-energy Reporters

Table 3.4 – Results showing factors associated with low-energy reporting (EI/BMR < 1.15) among Ghanaians

Dependent variable is LER (EI/BMR < 1.15)				
	Males		Females	
	Standardized β – coefficient	*P* value	Standardized β – coefficient	*P* value
Age	0.712	0.021	0.856	0.001
Education	-0.525	0.034	0.499	0.051
Employment	-0.301	0.048	-0.082	0.560
Marriage	0.497	0.001	-0.484	0.072
BMI	0.533	0.001	0.572	0.004

The above table represents the results from the final model. The initial model included type of housing, physical activity status and intention to lose weight but these were excluded in the final model because they were not significantly associated with low-energy reporting

Table 3.5 – Means, within-person and between-person coefficients of variation of dietary intake with the number of repeated days needed for 95% of the observed values to lie within 20 and 30 percent of the true mean of usual intake of Ghanaian migrants in the UK

Nutrient	Mean	% coefficient of variation		Number of days required to lie within specified % of the true means		Other studies of adults	
		within	between	20%	30%	* Study 3	**Study 2
Energy (kcal)	1987 (291)	16	12	9	5	6	10
Protein (g)	71 (23)	20	14	7	3	8	23
Fat (g)	78 (21)	11	8	10	5	7	188
Carbohydrate (g)	250 (59)	19	16	13	10	6	8
Fibre (g)	16 (3)	26	21	14	8	8	21
Vitamin C (mg)	72 (8)	21	17	19	22	13	152
Vitamin E (mg)	11 (3)	33	24	11	9	-	-
Sodium (mg)	3024 (471)	26	22	22	5	-	-
Iron (mg)	11 (2)	32	19	17	12	9	65
Vitamin B12 (µg)	5 (1)	40	43#	32	15	34●	121

* from Nelson et al., (1989), values given refer the number of days of diet record equivalent to lie within 20-25% of the true mean intake

** from Nyambose et al., (2002), values refer to the number of replicates per individual for 95% of observed values to within 20% percent of true mean in an African population

log transformed to improve normality

● log transformed to improve normality

Table 3.6 – Comparison of nutrient intake between weekdays and weekends using food records for Ghanaian migrants in the UK (n = 68)

Nutrient	Weekday	(SD)	Weekend	(SD)	P value
Energy (kcal)	1955	(289.7)	2018	(552.1)	0.040
Protein (g)	70.9	(20.1)	71.6	(53.2)	0.050
Fat (g)	76.3	(35.2)	80	(28.1)	0.047
Carbohydrate (g)	246.2	(61.2)	252.9	(267.3)	0.050
Fibre (g)	16.4	(4.9)	15.8	(6.2)	0.783
Vitamin C (mg)	74	(8.4)	70.3	(19.2)	0.050
Vitamin E (mg)	11.1	(2.9)	13.2	(3.5)	0.082
Sodium (mg)	3102	(432)	2945.9	(772.9)	0.071
Iron (mg)	10.2	10 (2)	11.9	(4.1)	0.052
Vitamin B12 (µg)	5	(1.2)	5	(0.8)	0.265

Figure 3.1 - Percentage contributions of food groups to average daily energy intake

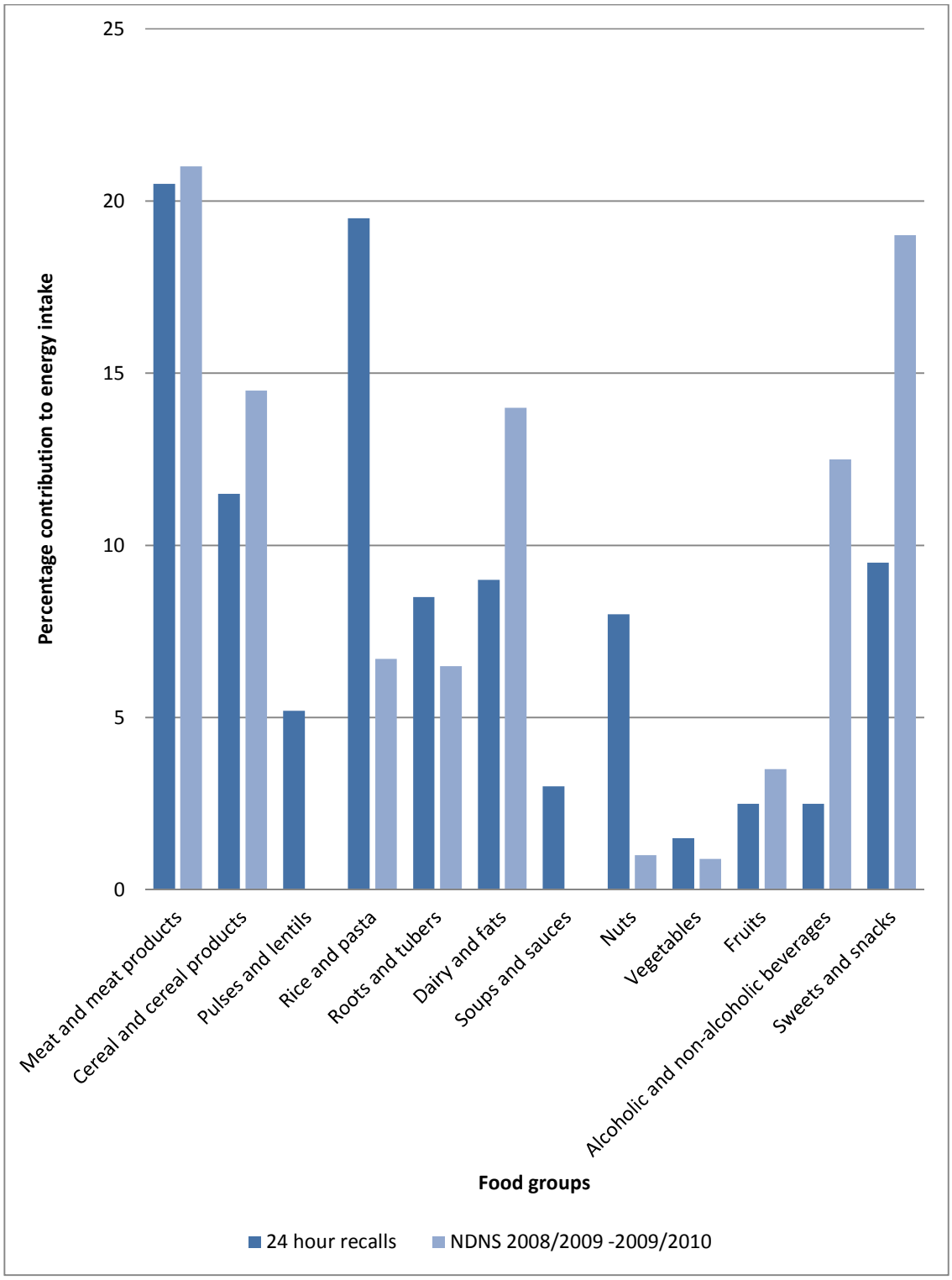


Figure 3.2 - Percentage contributions of food groups to total daily fat intake

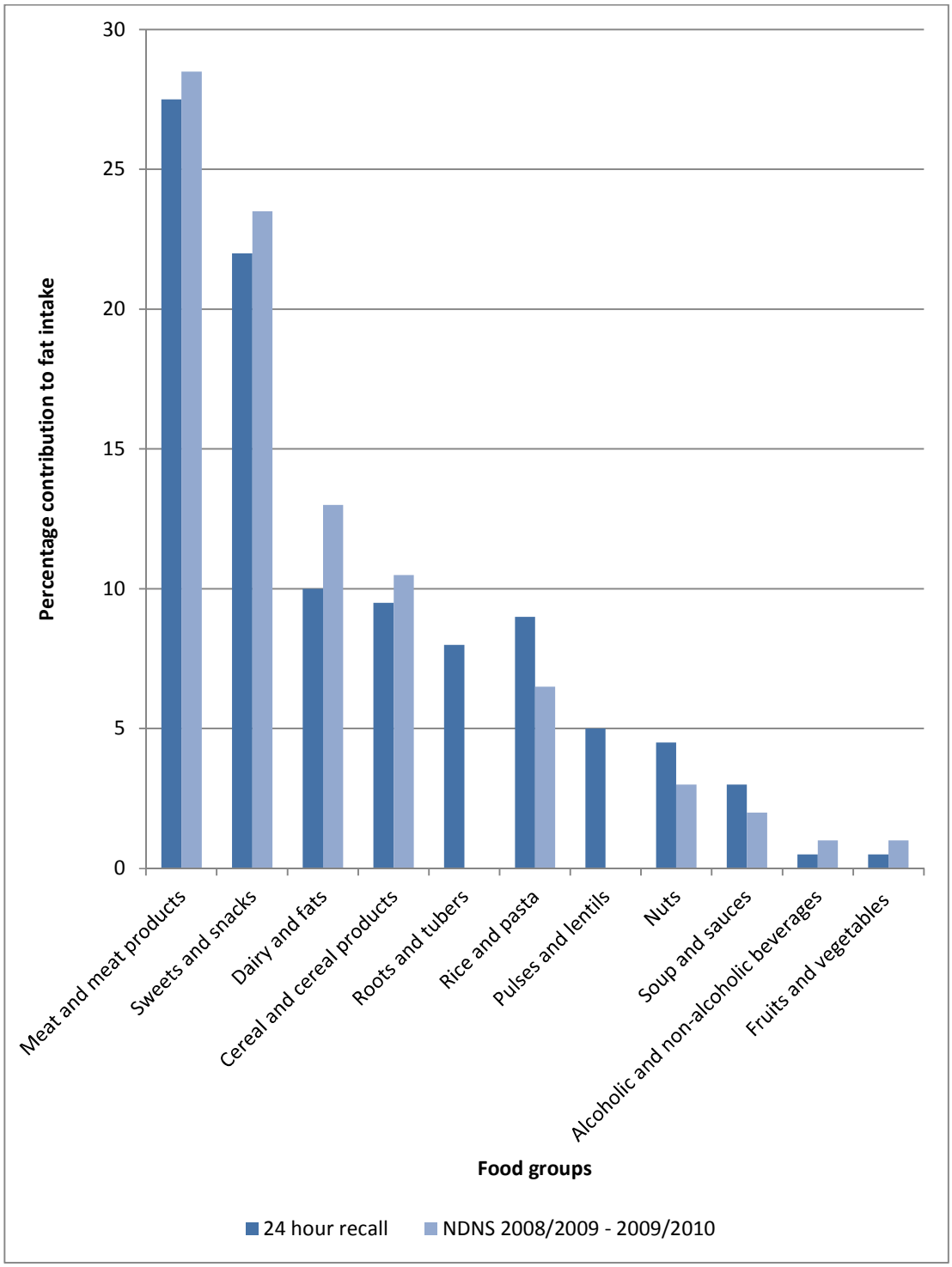
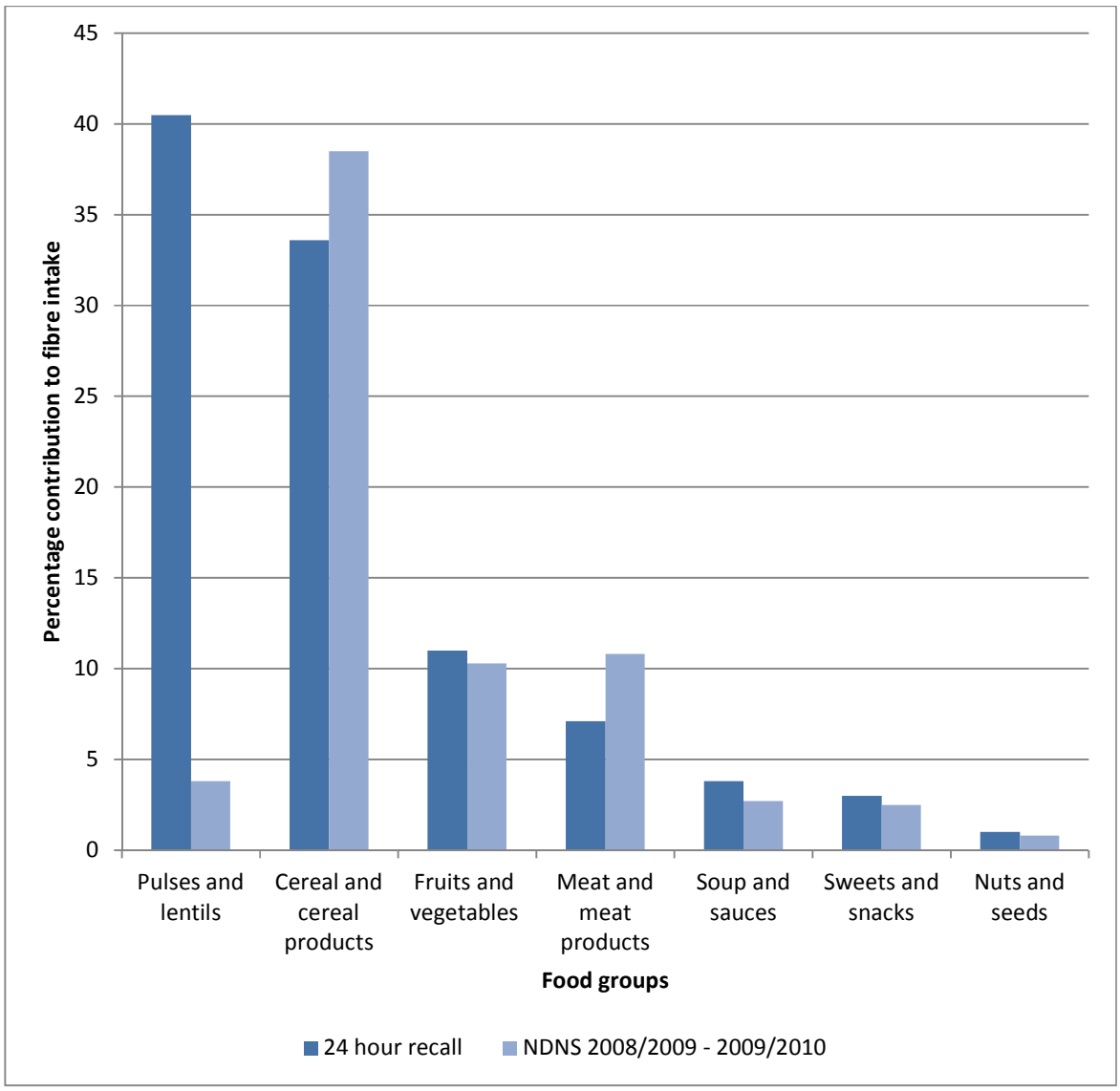


Figure 3.3 - Percentage contributions of food groups to total daily fibre intake



3.4 DISCUSSION

3.4.1 Representativeness of the population

The sample size for this dietary assessment study was n=68 which is relatively small but similar to the sample sizes of other studies in migrant ethnic populations (Goulet et al., 2004; Sharma et al., 2009; Earland et al., 2010; Owusu et al., 2010). It is well documented that between 70% - 90% of migrant Black Africans attend Church (HSE, 2004, Owusu et al., 2010). Ninety seven of the study population were employed and more likely to be living in council or privately rented homes. There is supportive evidence to suggest that the Ghanaian community in the UK is mostly Christians and only a few Ghanaians from other religions are thought to have settled in the UK (Elam et al., 2001). Despite having similar qualifications, many Blacks and Asians are in worse jobs than white people (Coyle & Fitzpatrick, 2009), however, this may be changing. The percentage of Black Africans with some form of qualification is 67% (ONS, 2001). From the 2001 census, 12% of Black Africans have no qualification (ONS, 2002). However, all the first generation Ghanaian migrants in this study were educated. The Ghanaian population used in this dietary assessment was volunteers and were not selected randomly. It is highly possible that they are not representative of the whole Ghanaian population in the UK. There is also no new census data exclusively on Ghanaians in the UK to which this study population can be compared with.

3.4.2 Dietary pattern of Ghanaian migrants

The staple food of most Ghanaians and West Africans are starchy rice, maize, starchy roots and tubers. Ghanaians reportedly derive more than 50% of their energy intake from these foods (Banea-Mayambu et al., 2000, Lartey, 2008; Kobati et al., 2012). However, from this study, roots and tubers were not the major sources of energy intake for this migrant Ghanaian population instead it was rice and potatoes. Other studies have also observed that the diet of migrants changes upon migration. A study on Afro-Caribbeans in the UK has observed that about 92% of this population still consumes traditional Caribbean foods (Earland et al., 2010). The researchers from this study observed that the Afro-Caribbeans were willing to travel to other places outside their local areas to purchase traditional Caribbean foods. This is quite high compared to results from this study which observed that only 61% of this population was consuming traditional Ghanaian foods. A similarity between this study group and the Afro-Caribbean group was that carbohydrate contributed the most to total energy intake (53%). The percentage contribution of fat to total energy intake for this group was however low at 30% compared to this study population.

The diet of some ethnic groups has been found to change from traditional to that of the host population upon migration especially in developed countries (Church et al., 2005; Gilbert & Khokhar, 2008). Some changes in the dietary habits of migrants are as a result of unavailability or the high price of imported traditional foods to the host population. It is also related to age, education and length of stay in host country (Gordon-Larsen et al., 2003; Renzaho & Burns, 2006; Gilbert & Khokhar, 2008). Research in Sydney observed that Ghanaians living in Australia consume less fish, fruits and vegetables compared to when resident in Ghana (Saleh et al., 2002). Just as it was observed in this study, the researchers in Australia also observed that the consumption of tropical root crops like cassava, cocoyam and yam by Ghanaians was frequently replaced with potatoes by those living in Sydney. A study conducted in the United Kingdom shows that the diet of Afro-Caribbeans living in Manchester, England had a fat content of between 32% and 35% (Sharma et al., 1998). A recent study on Afro-Caribbeans in the UK also found out that the percentage of energy provided by fats and carbohydrates was 30% and 53% respectively (Earland et al., 2010). The percentage contribution of fat to total energy was lower than that reported for Ghanaians in this study and that of the general British population (Whitton et al., 2011).

Gil et al., 2005, used the food frequency questionnaire to assess the habitual diet of migrants from Equatorial Guinea and Cameroon living in Spain. In the study, the researchers randomly selected a sample of these migrants aged 18-84 years who were born in the West African country but now living in Madrid, Spain. The participants were interviewed about their usual diet with the use of an FFQ. Using this, the researchers observed that the habitual diet of this population resembles the urban diet consumed by the native Spanish people. The percentage contribution of fat, protein and carbohydrate to total calorie intake was 33.9%, 18.3% and 47.7% respectively. They observed that these West African migrants however had a higher protein intake and lower fat intake compared to the usual diet in Cameroon. The diet of this group also reported a higher protein and lower fat and alcohol consumption compared to the host population living in Madrid. Obesity rates were also observed to be higher among migrant women than the men and even higher than the obesity rates among the local Spanish women.

3.4.3 Fibre intake

Mean fibre intake at 16g was higher in Ghanaian migrants than in the general British adult population. However, this intake is still lower than that of the Recommended Nutrient Intake (RNI) of 18g (COMA, 1991; Whitton et al., 2011). The high fibre intake in the diet of Ghanaian migrants

can be attributed to their reported intake of cereal and cereal products, pulses, fruits and vegetables. Fibre intake has been found to be high in Afro-Caribbean adults living in the UK in a previous study (Sharma et al., 1999). The authors from that study observed that fibre intake was 24.9g and 22.4g for males and females respectively. This intake is considerably higher than that observed for this study group as well as that for the general British population (Sharma et al., 1999). Goff et al., (2013) also observed that fibre intake for South Asians, Afro-Caribbeans and White European population in the UK was 18.1g, 13.5g and 15.8g respectively.

3.4.4 Micronutrient intake of Ghanaians in the UK

Sodium intake was also higher than the recommended daily intake for the Ghanaian population. From the National Diet and Nutrition Survey, sodium intake in the British population has also been found to be higher than the recommended intake of 1.6g (Bates et al., 2010). Most of the participants interviewed also reported that they added food seasonings which contain monosodium glutamate like Maggi cubes to their foods to enhance the flavour (Plange-Rhule et al., 1999; Cappuccio et al., 2000). Most participants also reported that they frequently added salt to food at the table. Other studies on Ghanaians have also found that most native Ghanaians add salt at the table (Amoah et al. 2002; Kerry, 2005; Pobee, 2006; Bosu, 2007).

Vitamin D intake intake was low in the Ghanaian population. The action of sunlight on the skin can generate adequate levels of vitamin D without any dietary intake. However, some studies show that some populations particularly with dark skin may be vitamin D deficient (Thomas et al., 1998; Hochwald et al., 2004; Muscarella et al., 2006; Harvey & Cooper, 2004; Bodnar et al., 2007; Holick & Chen, 2008). Low serum vitamin D (25 hydroxy-cholecalciferol) has been observed to be more prevalent among African Americans compared to other ethnic groups in the US (Nesby et al., 2002; Harris, 2006). This is mainly due to the fact that production of vitamin D is reduced by the skin pigmentation of black people (Holick, 2004; Nesby et al., 2002; Harris, 2006; Kiebzak et al., 2007). A study in the UK has found that 33.3% South Asians, 25% Afro-Caribbeans and 12.5% Caucasians have low levels of serum vitamin D (Ford et al., 2006).

Iron intake for this migrant Ghanaian population is lower than the recommended RNI of 15mg for adults (COMA, 1991; Food Standard Agency, 2006). Results from the NDNS also show that iron intake is low in the British population (Bates et al., 2010). Reported low intakes of iron do not necessarily preclude low serum levels. And the iron content of the diet is not as important as its bioavailability. Iron absorption from the diet can be enhanced with increasing intake of meat and

meat products and vitamin C. The absorption of iron can be inhibited by the presence of phytates present in legumes and cereal based diets (Vijayaraghavan, 2004).

3.4.5 Under-reporting

Evidence from several studies suggests that under-reporting in dietary surveys is much more common than over-reporting (Black et al., 1991). This is particularly so for the multiple 24-hour recall methods. It is important to consider under-reporting when examining relationships between energy intake, macronutrients, micronutrients or toxic substances in foods and excess weight gain and/ or obesity related diseases (Rennie et al., 2007). This current study observed that there were cases of under-reporting among both males and females with 37% of females under-reporting whereas only 25% of males were classified as energy under-reporters. A study of energy under-reporting among four populations of African origin found out that under-reporting was 6% for both men and women in rural Cameroon (Mennen et al., 2000). It was 4% and 5% in urban Cameroon, 24% and 19% in Jamaica and 28% and 39% in the UK for males and females respectively when cut-off levels of 1.15 for EI/BMR_{est} was used and this trend was still observed when higher cut-off levels for EI/BMR_{est} were used (Mennen et al., 2000). The study observed that underreporting of energy intake was highest in people of African descent living in the most developed country, UK and least in the country of least development, Cameroon. Energy under-reporting has also been found to be an issue in all the NDNS dietary surveys with some members of the general British population under-reporting their average energy intake (Bates et al., 2012).

Studies show that under-reporting of energy intake in dietary studies is a fairly common problem (Rasmussen et al., 2006). Like previous studies, this study observed that under-reporting was higher among individuals who were overweight or obese compared to those with healthy weights (Lichtman et al., 1992; Rennie et al., 2007; Garriguet, 2008). A number of studies have used various methods to investigate the characteristics of under-reporters but the results have not been consistent (Rasmussen et al., 2006). The most common finding has been the relationship between increased under-reporting and increased BMI. This relationship has also been observed in most studies (Johansson et al., 1998; Johansson et al., 2001; Goris et al., 2000; Olafsdottir et al., 2006; Rasmussen et al., 2006) but not all (Samaras et al., 1999; Samuel-Hodge et al., 2004). From this study, it was observed that there was a significant and positive relationship between under-reporting and increasing BMI for both men and women. Cook et al., (2000), has suggested that the association between high BMI and energy under-reporting may be related to an assumption in the Schofield equation of a linear relationship between body weight and basal

metabolic rate. This is because fat tissue is less metabolically active than lean body mass and therefore the predicted basal metabolic rate for individuals with a high BMI may be higher than the actual BMI. For this study, the probable cause of under-reporting could be because of the incomplete recall of food intake which could have been either conscious or unconscious.

Some studies have observed that energy under-reporting could also be related to percentage body fat (Samaras et al., 1999; Novotny et al., 2003). Under-reporting has also been found to increase with age (Johansson et al., 2001). This trend has been found to be more frequent among females than men as observed among the Ghanaian migrant population in London (Asbeck et al., 2000). Studies has also shown that there is a tendency for individuals who want to lose weight to restrict food intake and hence under-report their dietary intake (MacDiarmid & Blundell, 1998; Gibney et al., 2004). From the present study most of the women interviewed reported that they wanted to lose weight. Results from the National Diet and Nutrition Survey showed that 27% and 29% men and women under-report their energy intake in the UK. Under-reporting of energy needs was observed to be 25% after excluding those subjects who reported their eating being affected by dieting or illness during the reporting period (Rennie et al., 2007).

Assessing the habitual diet of a population to evaluate the relationship between nutritional factors and health outcomes can be difficult. This is because all the available methods used to assess dietary intake are subject to bias and no gold standard exists (Mennen et al., 2000). In most large epidemiological studies, self-reported methods with several limitations are usually used (Schoeller, 1995). For example energy intake has been found to be frequently underestimated. Energy underreporting has been found to be unrelated to the type of self-reported method used (Black et al., 1997). It is known that the underreporting of energy intake affects the observed associations of nutritional factors especially in studies on obesity (Lissner et al., 1998; Lau et al., 2006; Rennie et al., 2007). Factors which influence the correct reporting of dietary intake include inaccuracy in reporting food portions, memory disturbances, psychological, behavioural and cultural factors (Heymsfield et al., 1995; Novotny et al., 2003; Tooze et al., 2004; Broyles et al., 2008). For this study, (excluding BMI) age, education, marriage and employment were all found to be related to low-energy reporting for Ghanaian males whereas for females it was only age and education.

To minimize bias from under-reporting, results from low-energy under-reporters can be excluded from the analysis. However, excluding low-energy reporters from this can be undesirable and can lead to a substantial loss of valuable data. Because low-energy reporters can also be found in

some selection of the population, (i.e. the overweight), this can introduce selection bias. Additionally, the analysis can be stratified by low-energy reporter status (Slattery et al., 2002; Rennie et al., 2007; Broyles et al., 2008).

3.4.6 Number of days required for this study

Although the dietary recall method has proven to be useful in population studies, an important limitation of this method is that a single day's intake cannot be used to study the distribution of dietary intake. This is because on any given day, an individual's diet can be unusually high especially in cases where there is a celebration or on special occasions. These days cannot therefore be representative of an individual's intake even when they are perfectly recorded. Although this day-to-day variation in dietary intake does not bias the estimation of a group's mean intake, this variability can result in an increased distribution of observed intake (Sempos et al., 1991; Patterson & Pietinen, 2004).

The within-person and between-person variances observed in this study were in general comparable to ranges reported in some other studies (Hartman et al., 1990; Willet, 1998; Nyambose et al., 2002). The within-person variances observed for this study group were higher compared to the between-person variances. This could mean that the diet within this population is more homogenous. The within-person and between-person variances were generally lower for the macronutrients compared to the micronutrients. This higher variability observed makes it difficult to obtain reliable estimate of nutrient intakes from just a few repeated observations. To correct this, several confounding factors need to be adjusted when estimating variances (Palaniappan et al., 2002). This will then lead to a reduction in the within and between-person variances (Palaniappan et al., 2002; Patterson & Pietinen, 2004).

From the results, it was observed that considerably more days were required to obtain estimates of usual nutrient intake within 20% of usual intake than it was for 30% of the true intake. The number of days estimated to obtain a nutrient intake with an accuracy of 20% of the true intake was higher than 7 days for majority of the nutrients. There are other studies that have also reported similar findings (Nelson et al., 1989; Willet, 1998; Jahns et al., 2004; Tooze et al., 2012). Most nutrients have high within-person variability which can result in a greater number of days required to estimate reliable intakes for individuals (Willet, 1998; Jahns et al., 2005; Chun & Davis, 2012). Also, the sample size can be increased especially when comparing group means as

this can reduce the number of days needed to obtain habitual intake (Palaniappan et al., 2002; Nyambose et al., 2002; Tooze et al., 2010).

3.4.7 Weekdays and weekend variations in nutrient intake

From the results obtained, it can be observed that there were differences in nutrient intakes between weekends and weekdays. Energy and alcohol intake was on average higher on weekends than on weekdays for this migrant Ghanaian population. Other researchers have also found differences although not always significant between nutrient intakes on weekdays and weekends (Haines et al., 2003; Rhodes et al., 2006). Rhodes et al., (2006) observed that the mean daily energy intake was 9% lower on weekdays than on weekends. This study also reported that the mean intakes for carbohydrate, protein and fat were also higher on weekend days. Another study by Haines et al., (2003) also indicated that there were statistically significant differences in dietary intake between weekdays and weekends with the average American consuming 82 kcal more per day on each weekend day. The study also reported that alcohol and fat intake was higher on weekends than on weekdays.

3.4.8 Sources of error in dietary surveys

Problems encountered in dietary assessment methods include the length of time required, the cost involved, accuracy of the method used, the ability of the results to be representative of the usual intake and how the results is interpreted (FAO/WHO/UNU, 1985). Individual bias and deliberate underestimation and overestimation may introduce errors which makes it difficult to provide a fully accurate measure of intake (Black et al., 1997; Lafay et al., 2000; Schoeller, 2002; Bazelman et al., 2007; Rennie et al., 2007; Biltoft-Jensen, 2009). This was evident with 31% energy under-reporters in this present study.

In most dietary survey methods, the calculation of energy and nutrient content of foods is usually performed by consulting food composition tables. This step can also introduce new sets of errors. Changes in the composition of food brought about by genetic modification of food, formulation of new foods and agricultural practices may have affected the nutrients calculated using the food composition tables (Willett, 1998; Ferro-Luzzi, 2001). The Ghanaian food composition table used in this study was also incomplete with the values for some micro-nutrients missing. Another problem is that in societies where domestic preparation of food prevails, ingredients such as the fat or sugar content can only be back-calculated from standard recipes (Ferro-Luzzi et al., 2002;

Nelson et al., 2004; Thompson & Subar, 2008). The population used in this study reported that they regularly consumed home cooked meals. Errors in dietary surveys can reduce the statistical power to detect the association between intake and disease. These errors and biases can increase the likelihood of spurious false positive diet-disease associations, or accepting the null hypothesis even though an association may exist (Westersterp & Goris, 2002; Patterson & Pietinen, 2004; Rennie et al., 2007).

3.4.9 Summary

To our knowledge, this is the first dietary survey to report on the nutrient intake of first generation Ghanaians migrants in the UK. Energy and fat intake was similar to that of the native British population but carbohydrate and fibre intake were higher. Energy under-reporting was comparable to other studies, as were the number of days estimated to capture macro-nutrient intake. Energy, fat and alcohol consumption were higher on weekend than weekdays. A major limitation of the survey was the incompleteness of the Ghanaian food composition table.

CHAPTER 4

VALIDATION OF A FOOD FREQUENCY QUESTIONNAIRE FOR USE IN GHANAIAN MIGRANTS

4.1 INTRODUCTION

The food frequency questionnaire has emerged to be one of the key research tools in nutrition epidemiology because of its convenience, low-cost and ease of administration (Willett, 1998; Cade et al., 2004). Currently, there is no food frequency questionnaire to assess the habitual diet of Ghanaians in the UK.

The aim of this chapter therefore is to develop a food frequency questionnaire to characterize the habitual diet of Ghanaian migrants and validate with multiple 24-hour recalls. This FFQ can then be used in the nutrition intervention study (Chapter 7) to measure change in dietary intake.

4.1.1 Rationale for using the food frequency questionnaire

Food frequency questionnaires (FFQs) are used to capture standardized quantitative data on usual, long term and past diets to assess nutritional status of individuals and populations (Willett, 1998; Subar et al., 2001; Lassale et al., 2009). Average long term diet, for example over weeks, months or even years is the conceptually important and underlying principle of FFQs. In dietary assessment although all measurements are imperfect, it is still important to use the best method that suits the needs of the population of interest (Willett, 1998; Block et al., 2004; Thompson & Subar, 2008). The FFQ can be used to rank subjects into broad categories of low, medium and high intake. This will therefore allow for the examination of nutritional hypothesis, diet-disease relationships and dose-response relationships (Rohrmann & Klein, 2003; Donaldson, 2004).

The FFQ also makes it easier to describe one's usual frequency of food consumption than to describe what foods were eaten at any specific meal in the past (Willett, 1998; Vioque et al., 2013). Nutritional epidemiological studies are often interested in groups and disease outcome. In

most cases, large-scale studies of hundreds and sometimes thousands of participants are often surveyed to investigate the association between diet and disease outcome. This means that the dietary assessment method used should be easy, quick, cheap and reasonably accurate. Hence for this study, with a sample of over 200 participants, the FFQ was the only feasible dietary assessment method to be used. Also, the FFQ allows for the retrospective assessment of dietary intake over a relevant period (Willett, 1998; Patterson & Pietinen, 2004).

4.1.2 Validation of the food frequency questionnaire

Although the FFQ has considerable advantages, through poor design and inappropriate use, it may not yield the required information leading to a reduction in its usefulness (Cade et al., 2004; Prentice et al., 2004). The problems of measurement errors in dietary assessments can be partially addressed using validation studies. Validation studies are therefore used to identify errors in collected dietary data and to assess their potential impact on the reported findings. Validation of the FFQ is important to assess the degree to which the questionnaire measures the foods or nutrients for which it has been designed. Using incorrect information when using the FFQ can lead onto bias which can lead to false positive associations, bias in interview administration and over-reporting of the nutrient intakes being measured. Given that no dietary assessment method is perfect, it is important that the errors associated with the FFQ and the reference method be as independent as possible to avoid high estimates of validity (Willett, 1998; Cade et al., 2004; Watson et al., 2009).

Weighed food records are likely to have the least correlated errors among the available and feasible comparison methods for validating an FFQ (Willett, 2013). The major sources of error associated with FFQs are usually due to the restrictions imposed by memory recall, the fixed list of foods and interpretation of results. Validating the FFQ with the weighed food records reduces the auto-correlation of errors. This is because weighed food records are often open-ended and do not depend on memory. In addition, weighed foods records allow for direct assessment of portion sizes by dimension or weight measurements. Therefore, errors associated with the food frequency questionnaires and weighed food records are usually independent (Willett, 1998; Neuhouserand & Patterson, 2007; Thompson & Subar, 2008). Food records in principle are kept for a sufficient number of days to represent average intake and cover the interval of time corresponding to the questionnaire before used as a standard to assess the validity of the FFQ (Thompson & Subar, 2008). Weighed food record can alter usual food habits and can possibly reduce the correlation between the FFQ and the record. Nutrient intakes calculated from both

methods use food composition tables which are usually based on similar sources of published data. The food composition table therefore becomes an error that is likely to remain correlated when validating the FFQ with a weighed food record (Willett, 1998; Thompson & Subar, 2008). The other alternative for evaluating an FFQ is the collection of multiple 24-hour recalls. Although errors are more likely to be correlated with the use of this method, in many situations, such as when study participants are illiterate or less than highly motivated, multiple 24-hour recalls may be the only reasonable option. Twenty-four hour recalls are less likely to influence the diet of participants. They are also, usually less demanding for participants compared to the weighed food records (Willett, 1998; Cade et al., 2002; Block et al., 2006; Haftenberger et al., 2010; Jackson et al., 2011).

4.1.3 Review of validation studies

FFQs can be used in dietary studies to assess dietary intake in a group or population (Torheim et al., 2001; Ngo et al., 2009) or rank individuals (Thompson & Subar, 2008). Some studies have also used the FFQ to measure patterns of dietary intake (Brewer et al., 1987; Kant et al., 1991; Barrett et al., 1998; Hu et al., 1999; Ngo et al., 2009; Haftenberger et al., 2010). Some FFQs used in epidemiological researches were designed to include foods that are important to some cultural or ethnic groups (Thompson & Subar, 2008). A review of most studies show that the most common time frame used for the assessment of diet was the previous 1 year (Parr et al., 2002; Goulet et al., 2004; Crozier et al., 2008; Haftenberger et al., 2010; Jackson et al., 2011). The different frequency categories used in most food frequency questionnaires have been found to range from 1 to 12 divisions of time. The choice of frequency category used is a reflection of the time frame of interest (Kassam-Khamis et al., 1999; Subar et al., 2001; Torheim et al., 2001; Parr et al., 2002; Cade et al., 2004; Thompson & Subar, 2008; Carithers et al., 2009; Jackson et al., 2011).

Validated FFQs are either self-administered or interview administered. In some instances especially when assessing the diet of a child, a parent can complete the FFQ on behalf of the child (Bellu et al, 1996; Resnicow et al., 2000; Magkos et al., 2006). The sample sizes used in validating the FFQ has been found to vary from very small to very large sample sizes depending on location, population, funding, time, availability of participants and study design. Studies show that the number of food items included in the food list for the FFQ ranges from 5 to 350 with a mean of 85 (Cade et al., 2004; Ngo et al., 2009). To help in determining portion sizes, some food

frequency questionnaires included the use of food photographs (Porrini et al., 1995; Cade et al., 2002; Cade et al., 2004; Ngo et al., 2009).

The FFQ has been mostly validated with the 24-hour recalls and the weighed food record (Cade et al., 2004; Block et al., 2006; Haftenberger et al., 2010; Dehghan et al., 2012), but many have also been validated with biomarkers (Hodson et al., 2008; Øverby et al., 2009; Patterson et al., 2012). Biomarkers provide information on the levels of exposure of body tissues to substances in the body that include nutrients and biochemical derivatives of nutrients or related compounds (Nelson et al., 2004). This can measure both short-term and long-term exposure to nutrient intake and may provide an objective measure of dietary exposure than the food frequency questionnaire, as it is independent of memory and knowledge of the participants (Lucas et al., 2008). The use of biomarkers to validate the FFQ was not possible for this study because of the cost involved.

A correlation coefficient is the statistical tool most used to assess measurement differences in most validation studies. This method only measures the degree to which the methods are related and does not measure the agreement between the two methods. Correlation coefficients in most validation studies have been found to be highest when study participants are able to describe their own portion size compared to when no portion sizes were specified or when the portion sizes were specified on the food frequency questionnaires (Cade et al., 2004). Other statistical tools used in most validation studies are the Student's t-test, the Bland-Altman method and the Kappa statistic (Lambe et al., 1999; McIntyre et al., 2001; Parr et al., 2001; Cade et al., 2004). For this study, the 24-hour recall was selected as the reference method because of its ease of administration in this population.

4.2 METHODOLOGY

4.2.1 Recruitment of participants

Recruitment of Ghanaians for this study has already been described in the previous chapter (Chapter 3). Participants for this part of the study were all recruited from the four churches listed in Chapter 3.

The validation study lasted approximately for two years. Dietary intake data was collected over a period of six months for the 24-hour recalls and two years for the food frequency questionnaire. Collecting dietary data using the FFQ took longer than the estimated one year because of scheduling conflicts with two churches. A total of 212 participants were interviewed to assess dietary intake using the food frequency questionnaire.

4.2.2 Development of the semi-quantitative food frequency questionnaire

4.2.2.1 Food list section

Dietary assessment method developed for one population may be inappropriate for use in another population because of the complex and cultural behaviour of individuals, groups and societies (Thompson & Subar, 2008). Hence there is the need to develop a dietary assessment method sensitive to the food habits and culture of the population of interest (Coates & Monteilh, 1997; Romieu et al., 1997; Wham et al., 2011). In designing an FFQ, it is important to consider and understand the purpose for which it is to be used for. This is to ensure that the questionnaire is sensitive enough to detect differences in the foods or nutrients of interest (Margetts et al., 1995; Cade et al., 2004; Thompson & Subar, 2008).

The basic FFQ is made up of two component; a food list with the questions on usual frequency of intake with portion sizes and a frequency response section for subjects to report how often each food is eaten. The food list usually makes up the main part of the food frequency questionnaire. Food lists are usually selected to collect data on major sources of energy and nutrients for most people, between person variation in food intake and lastly specific objective of the investigation. In this study, the food list was obtained by initially interviewing a sub-sample (n=10) of the study population using repeated 24-hour recall to identify commonly consumed foods that contribute most importantly to the absolute intake of the nutrient by the population group as a whole (Block

et al., 1986). The list obtained was then used to create a food list. Foods and dishes were included if they were consumed once a week by at least 20% of the participants in the 24 hour dietary recall method. The food list was then supplemented with foods obtained from peer-reviewed studies which used FFQ to assess usual dietary intake (Torheim et al., 2001; Parr et al., 2002; Bhakta et al., 2006; Krem et al., 2009). Using the commonly reported foods and portion sizes, the semi-quantitative FFQ was constructed and organised into 13 food categories.

The FFQ was pilot tested on a sub-sample (n=20) of healthy first generation Ghanaian adult migrant population, shortened and developed into the final FFQ. The food list also included foods that are popular in the native British diet. The main food groups used in the food frequency questionnaire were cereals, bread and other staples, rice and pasta dishes, roots and tubers, pulses and lentils, meat, fish and poultry, dairy products and fats, soups, stews and sauces, nuts, vegetables, fruits, alcoholic and non-alcoholic beverages and sweets and snacks. The FFQ was designed to record additional information on if and any supplements taken, method of cooking, the type and amount of fat used and the consumption of fat on meat. The FFQ was designed to assess habitual diet over the past year.

4.2.2.2 Portion size and frequency response section

Participants in any epidemiological study should be able to conceptualize the unit of portion size and relate this to their own dietary habits. This will aid in providing useful information on serving sizes (Willett, 1998). Food items with a similar nutrient content and of similar portion size were grouped together; for example custard and milk puddings were grouped together as milk puddings. Standard portion sizes were derived from commonly used household units specific to this population for each food listed. Ladleful, spoonful, handfuls and cups were the household measures commonly used to determine portion size. For some foods like roots and tubers and meats/fishes, a semi-quantitative approach was necessary and portion sizes were described as small, medium or large. The frequency of consumption of each food item was recorded as never/rarely, frequency per day, per week or per month.

In most epidemiological studies the exposure of interest is dietary intake over a number of years. Diets usually tend to be correlated year to year and hence study participants are often asked to describe their frequencies of food intake in reference to the previous year. Dietary intake responses should be independent of the year and should include seasonal variations producing a full cycle of seasons. There can be loss of information and decrease in sensitivity of the FFQ if

the format of the frequency response is unclear or too few (Nelson, 1997; Willett, 1998; Thompson & Subar, 2008). For the purpose of this study, the open-ended method was adopted. This provided subjects with the option of answering in terms of frequency per day, week, month or never (Willett, 1998; Jayawardena et al., 2012). An example of the FFQ used in this study can be found in Appendix A4.

4.2.3 Reference method

The 24-hour recall method has proven to be very useful particularly for monitoring the nutrient intake of individuals and populations. This method is most appropriate for comparing mean intakes between the intervention group and control group in nutrition/dietary intervention studies. These methods are also appropriate for assessing intake among population groups with different eating patterns because they are open-ended (Willett, 1998; Patterson & Pietinen, 2004).

Dietary data was collected using a semi-quantitative food frequency questionnaire (FFQ) which was validated using repeated 24-hour recalls in a sub-sample of the population. This method of validation has been used successfully in other studies (Bhakta et al., 2006; Haftenberger et al., 2010; Braakhuis et al., 2011). The 24-hour recalls were conducted initially by face-face on a sub-sample (n=68) of the population and then randomly repeated six times using telephone interview over a period of six months. Food amounts were estimated using household measures like ladles, spoons, cups and handfuls. In order to estimate food intake, three ladlefuls, spoonfuls or handfuls were weighed using digital scales. Intake was then determined by calculating the number of ladle/spoon/handfuls multiplied by the average weight of the three measured ladle/spoon/handfuls (see Chapter 3).

4.2.4 Nutrient and data analysis

The total intake of a nutrient can be calculated as the nutrient content for each food multiplied by the sum of the products of the frequency of weight. All collected dietary data was converted to nutrient intakes using McCance & Widdowson food composition tables and the Ghana food composition table to find the average dietary intake of Ghanaian migrants over the past year (Tayie & Lartey, 2000; Food Standard Agency, 2002).

Data from the FFQ and the 24-hour recall method were analyzed using STATA 12 (STATA, CORP). Background characteristics and all measurements taken were presented as mean and

standard deviation for continuous variables (e.g. energy intake) and proportion (%) for categorical variables (e.g. gender). All nutrient data was assessed for deviation from normality. Since all of the nutrient intakes were normally distributed, parametric statistical methods were used. Pearson's product moment correlation coefficients were computed to compare the degree of associations between the FFQ and the repeated 24-hour recall. The nutrient intakes were adjusted for total energy by computing residuals from regressions analysis. For the regression analysis, nutrient intakes were computed as the dependent variable and energy intake as the independent variable. The residuals were added to the expected nutrient value for the mean energy intake to obtain the adjusted energy intake (Willett, 1998). Pearson's product moment correlations were computed for all nutrient intakes before and after adjustment for total energy.

The distribution of the energy-adjusted nutrient intakes were categorized into quartiles and the percentage of participants classified into the same, adjacent and extreme quartiles estimated. Socio-demographic and other correlates of low-energy reporting were explored using multiple regression analysis to identify potential confounders. The regression analysis was stratified by gender because of several differences observed in univariate analysis between genders. The Bland-Altman method (Bland & Altman, 1999) was also used to assess the agreement between the mean energy and nutrient intake values obtained using the FFQ and the 24-hour recall. The difference in intake between the two methods was plotted against the mean of the two measures. All statistical tests were two-tailed and p values ≤ 0.05 were considered as statistical significance.

4.3 RESULTS

4.3.1 Characteristics of study population

From Table 4.1, there were no significant differences in age, employment and marital status observed between the validation group and the total study population. The validation group was more likely to be educated to tertiary level and live in rented accommodation ($p<0.05$).

4.3.2 Validation of the FFQ

Table 4.2 shows the average dietary intake from the FFQ and the 24-hour recall. Energy intake was higher for the FFQ (but was not significant, $p>0.05$) compared to the 24-hour recall. Protein, carbohydrate, fat, fibre, vitamin B_{12}, vitamin E and iron intake were higher for the FFQ compared to intakes from the 24-hour recall. Differences in nutrient intakes were significantly higher for protein ($p=0.04$) and fibre ($p=0.03$) for the FFQ compared to the 24-hour recalls. Sodium ($p=0.05$) and vitamin D ($p=0.04$) intakes were significantly higher for the 24-hour recalls compared to intakes from the FFQ.

Table 4.3 shows the unadjusted and adjusted correlations for nutrient intakes between the dietary assessments methods used. It was observed that correlations increased for all the nutrients after adjusting for total energy. The adjusted correlations ranged from 0.54 to 0.71. The quartiles of nutrient intakes are also presented in Table 4.3. The majority of participants correctly classified in the same or adjacent quartile of nutrients and only 3-9% of participants were misclassified into opposite quartiles ranged after adjusting for energy.

Bland-Altman plots showing the difference in nutrient intake between the FFQ and the 24-hour recall plotted against the mean intake of the two methods were plotted for energy, protein, fat and carbohydrate. Results from this can be observed from Figures 4.1 to 4.4. For energy and all macronutrients, data was within acceptable limits of agreement.

4.3.3 Energy under-reporting in Ghanaian migrants using the FFQ

Thirty nine percent (39%) of participants were identified as low-energy reporters in this validation study. Table 4.4 shows the difference in nutrient intakes between low-energy reporters and non low-energy reporters. Protein intake was lower for non low-energy reporters but this was not

significant. Fat (p=0.05) and carbohydrate (p=0.05) intakes were significantly higher for non low-energy reporters compared to low-energy reporters. There were no significant differences in sodium, vitamin C, vitamin E and vitamin B_{12}. Iron intake was significantly higher at p=0.01 for low-energy reporters compared to the non low-energy reporters. Results from Table 4.5 shows that energy under-reporting was influenced by education and BMI for males. For Ghanaian females, energy under-reporting was associated with increasing age, education and BMI.

4.3.4 Contributions of food groups to total energy and fat intake

Figure 4.5 and 4.6 shows the percentage contribution of food groups to total energy and fat intake. The figures shows 12 food groups identified as the major sources of energy and fat in the diet for both the dietary recalls and the food frequency questionnaire. These food groups do not represent single foods and were compiled from responses to the food frequency questionnaire and the 24-hour recall. The food groups are not necessarily ranked in order of contribution. Carbohydrate food groups such as cereal and cereal and cereal products and rice and pasta dishes were the main sources of energy for both the FFQ and the 24-hour recall. Meat and meat products were also high contributors to total energy for both groups. The energy contribution of alcoholic and non-alcoholic beverages, soups and sauces, and dairy and dairy products were all higher for the FFQ compared to the 24-hour recall method. Vegetable intake was higher in the migrant Ghanaian population using the FFQ compared to the 24-hour recall method. Contribution to energy intakes from nuts (7% vs 6%), and pulses and lentils (3.5% vs 2.5%) was higher for the recall method compared to the FFQ. Energy contribution from roots and tubers were the same for both groups. The main sources of fat in the Ghanaian diet were meat and meat products and rice and pasta dishes for both the FFQ and the 24-hour recall.

Table 4.1 - Differences in socio-demography variables between validation group and total study population

Characteristics		Total study group (n = 212)	Validation group (n = 68)	P Value
Age (Years)				
	20 -39	102 (48 %)	34 (50 %)	0.06
	40 -59	95 (45 %)	32 (47 %)	
	60 -79	15 (7 %)	2 (3 %)	
Education Level				
	Primary and secondary	131 (62%)	40 (59%)	0.03
	Tertiary	81 (38 %)	28 (41 %)	
Employment				
	Manual	119 (56 %)	37 (54 %)	0.55
	Non – manual	87 (41 %)	28 (41 %)	
	Un-employed	6 (3 %)	3 (5 %)	
Marriage				
	Single	144 (68 %)	45 (66 %)	0.76
	Married	55 (26 %)	19 (28 %)	
	Widowed	6 (3 %)	2 (3 %)	
	Separated/divorced	7 (3 %)	2 (3 %)	
Housing				
	Owned	51 (24 %)	12 (17 %)	
	Rented	145 (76 %)	56 (83 %)	0.04

Table 4.2 - Differences in mean nutrient intake between the FFQ and the repeated 24-hour recalls

Nutrients	FFQ (n=212)		24-hour recall (n=68)		P value
	Mean (SD)	% contribution to energy	Mean (SD)	% contribution to energy	
Energy (kcal)	2071 (360)		1987 (291)		0.09
Protein (g)	77(34)	*14.9*	71 (23)	*14.3*	0.04**
Fat (g)	81 (11)	*35.2*	78 (21)	*35.3*	0.23
Carbohydrate (g)	259 (66)	*49.9*	250 (59)	*50.4*	0.17
Fibre (g)	18 (4)		16 (3)		0.03**
Vitamin C (mg)	68 (11)		72 (8)		0.06
Vitamin E (mg)	10 (2)		11 (3)		0.33
Sodium (mg)	2969(542)		3024 (471)		0.05**
Iron (mg)	12 (1)		11 (2)		0.06
Vitamin B_{12}	6 (1)		5 (1)		0.41
Vitamin D (µg)	1.5		2.3		0.04**

**Significant differences in dietary intake between the FFQ and the 24-hour recall (p-value < 0.05).

Table 4.3 – Correlation and rank classification of study participants in quartiles of dietary intake using the FFQ and the 24-hour recalls (n=68).

Nutrients	Correlation		Ranking		
	Unadjusted	*Adjusted	(¥) same quartile	(§) Adjacent quartile	(#) Opposite quartiles
Energy (kcal)	0.64		46	48	6
Protein (g)	0.60	0.71	50	45	5
Fat (g)	0.57	0.69	50	47	3
Carbohydrate (g)	0.48	0.54	54	42	4
Fibre (g)	0.55	0.69	48	47	5
Vitamin C (mg)	0.54	0.62	46	49	5
Vitamin E (mg)	0.46	0.56	51	46	3
Sodium (mg)	0.49	0.66	49	44	7
Iron (mg)	0.51	0.60	47	48	5
Vitamin B_{12} (µg)	0.44	0.67	51	39	9
Vitamin D (µg)	0.39	0.59	49	44	7

* Nutrient intakes adjusted using the residuals from regression models with energy intakes as the independent variable and nutrient intakes as the dependent variables

¥ - Percentage of Ghanaians classified in the same quartile of dietary intake with the FFQ and the 24-hour recall.

§ - Percentage of Ghanaians classified in adjacent quartile of dietary intake with the FFQ and the 24-hour recall.

- Percentage of Ghanaians classified in the opposite quartile of dietary intake with the FFQ and the 24-hour recall.

Table 4.4 – Differences in nutrient intake between low-energy reporters and non low-energy reporters for the FFQ

Nutrients	LER (n=47)	Non-LER (n=170)	p value
Energy	1980	2162	0.04**
Protein (g)	79.2	75.3	0.07
Fat (g)	77.6	83.6	0.05**
Carbohydrate (g)	241.0	277.1	0.05**
Fibre (g)	19.4 (3.7)	17.3 (5.0)	0.05**
Vitamin C (mg)	68.1 (19.5)	68.4 (25.8)	0.34
Vitamin E (mg)	9.8 (3.1)	10.4 (2.9)	0.08
Sodium (mg)	2977.5 (613.8)	2959.7 (326.3)	0.62
Iron (mg)	14.1 (4.1)	9.8 (5.0)	0.01**
Vitamin B12 (µg)	5.9 (2.2)	6.1 (0.9)	0.22
Vitamin D	1.0 (0.1)	2.0 (0.4)	0.05**

**Significant difference in dietary intake between low-energy reporters and non low-energy reporters (p-value < 0.05).

Table 4.5 – Results showing factors associated with low-energy reporting (EI/BMR < 1.15) among Ghanaians

Dependent variable is LER (EI/BMR < 1.15)				
	Males		Females	
	Standardized β – coefficient	*P* value	Standardized β – coefficient	*P* value
Age	0.512	0.062	0.383	0.042
Education	-0.722	0.012	0.529	0.033
Employment	0.417	0.074	-0.287	0.150
Marriage	0.654	0.057	0.721	0.062
BMI	0.694	0.001	0.511	0.002

Figure 4.1 – Bland-Altman plot showing the difference in energy intake between the FFQ and the 7 day record plotted against the mean intake of the two methods

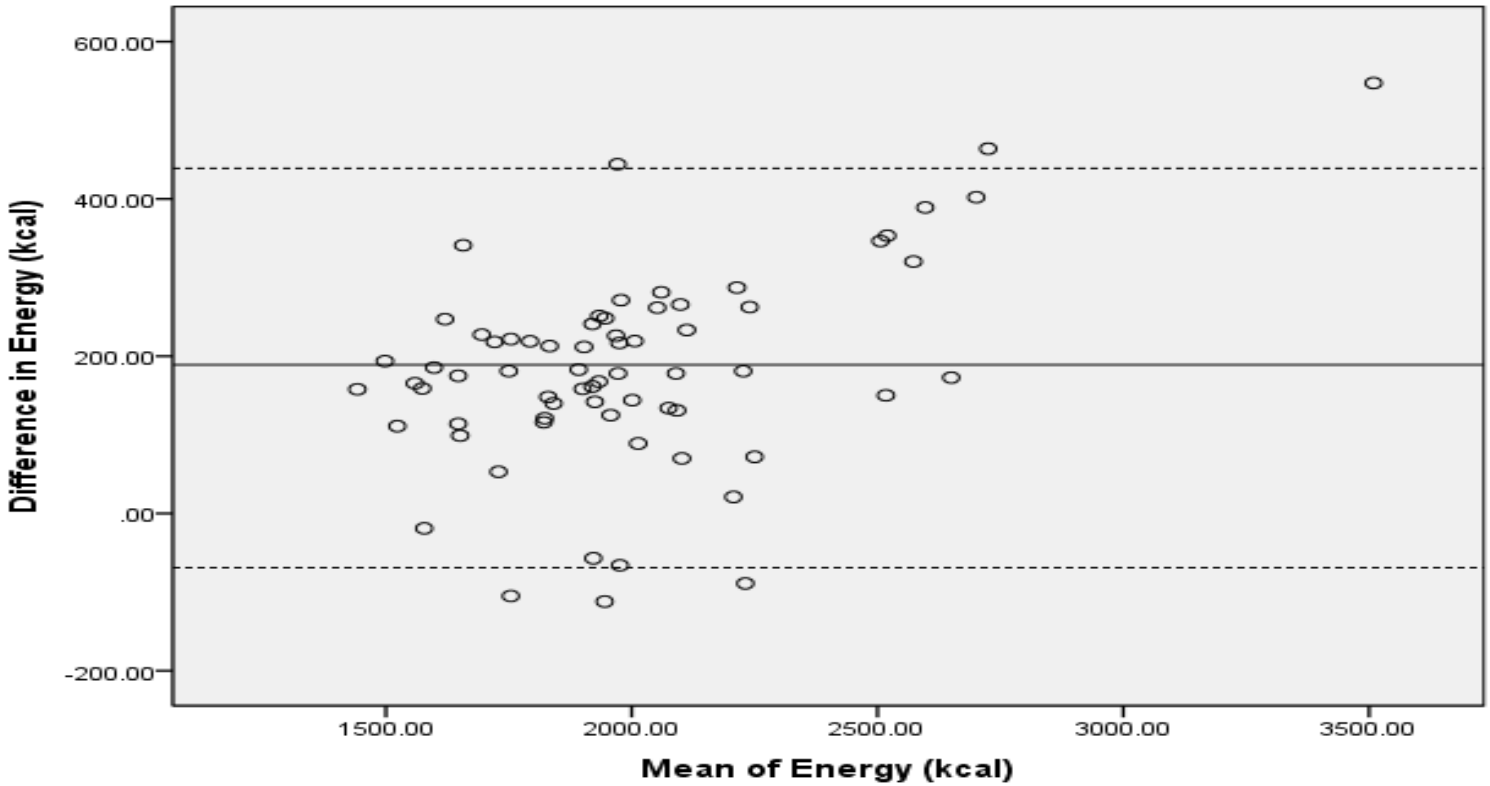


Figure 4.2 – Bland-Altman plots showing the difference in fat intake between the FFQ and the 7 day record plotted against the mean intake of the two methods

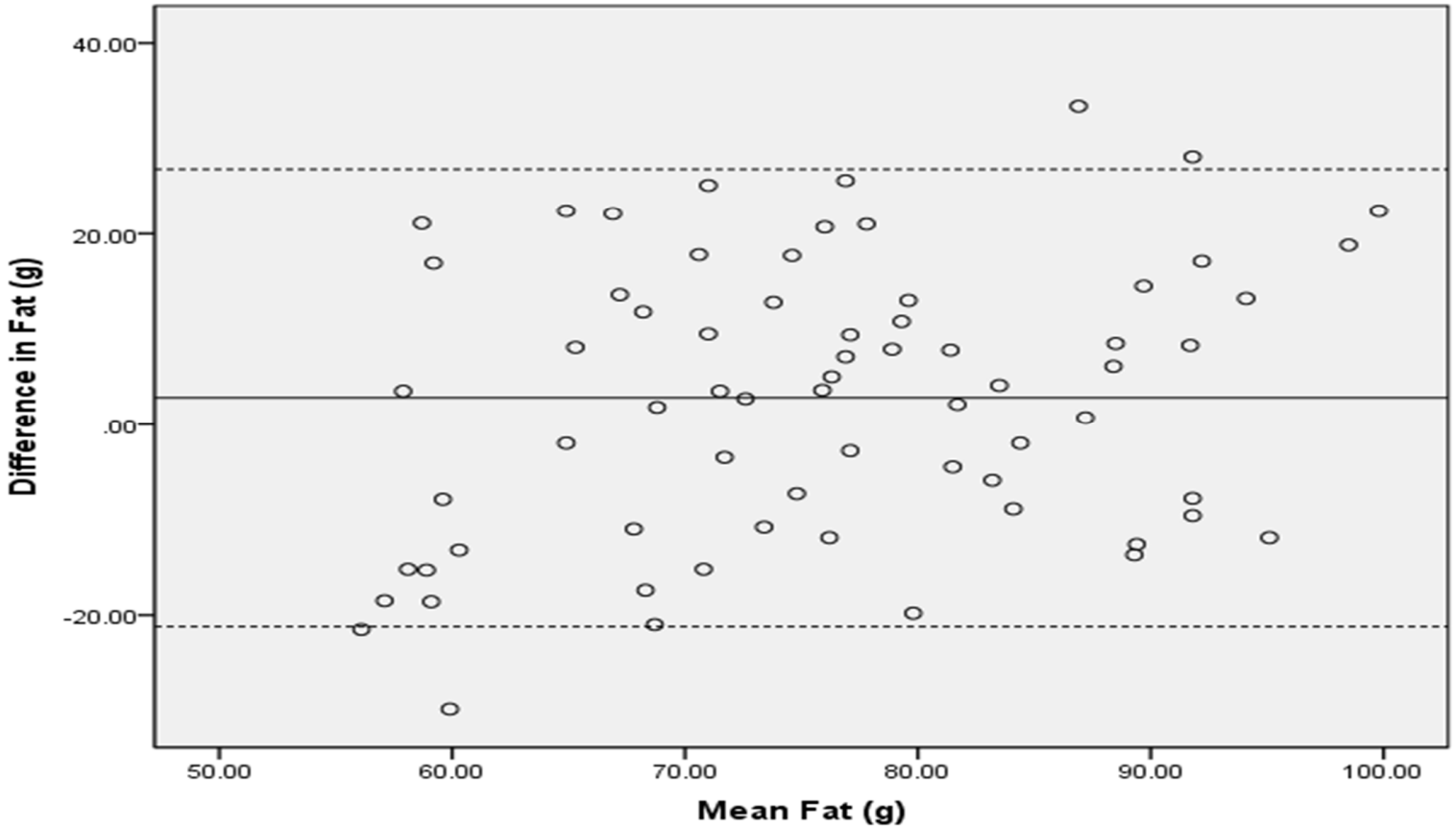


Figure 4.3 – Bland-Altman plots showing the difference in Protein intake between the FFQ and the 7 day record plotted against the mean intake of the two methods

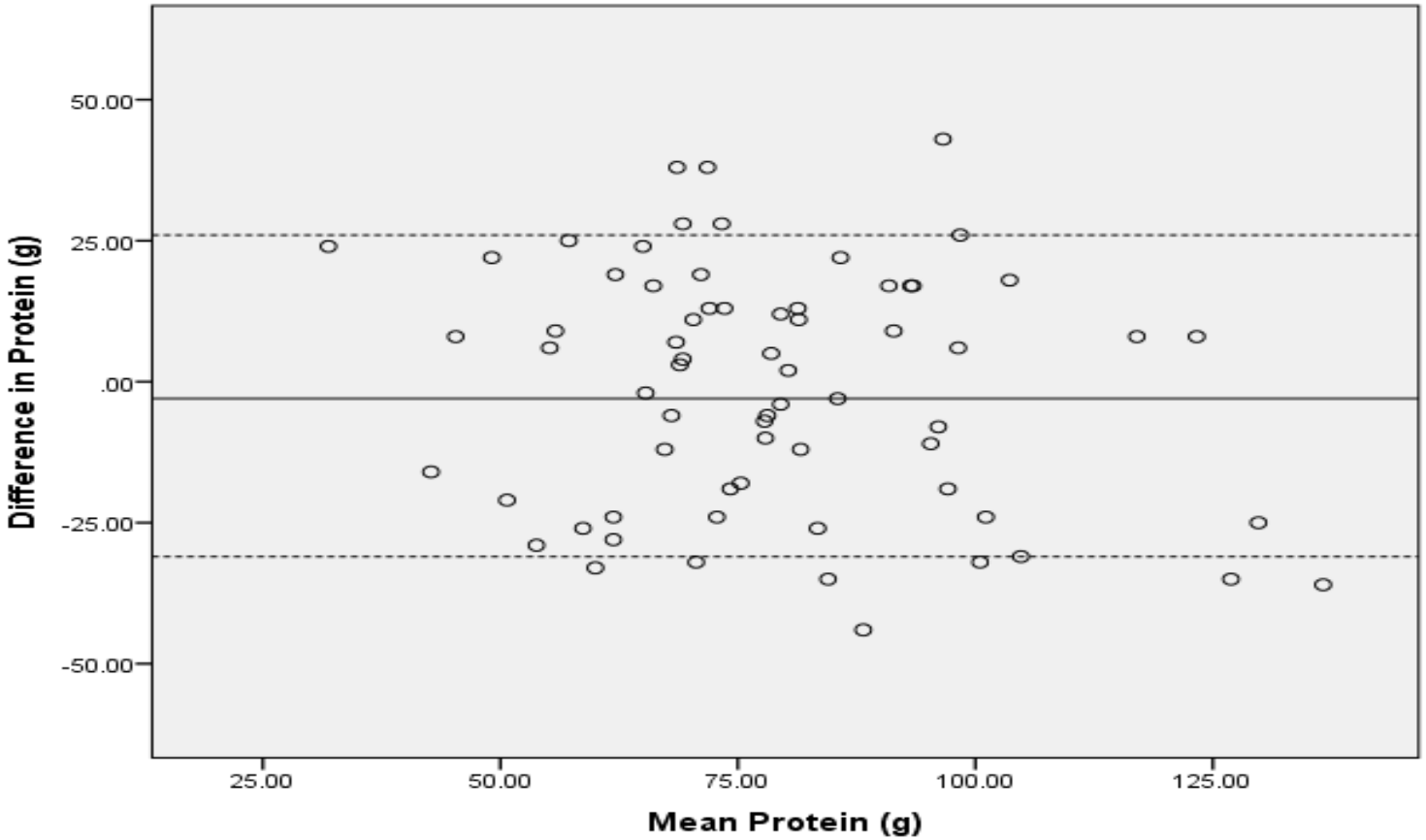


Figure 4.4 – Bland-Altman plots showing the difference in Carbohydrate intake between the FFQ and the 7 day record plotted against the mean intake of the two methods

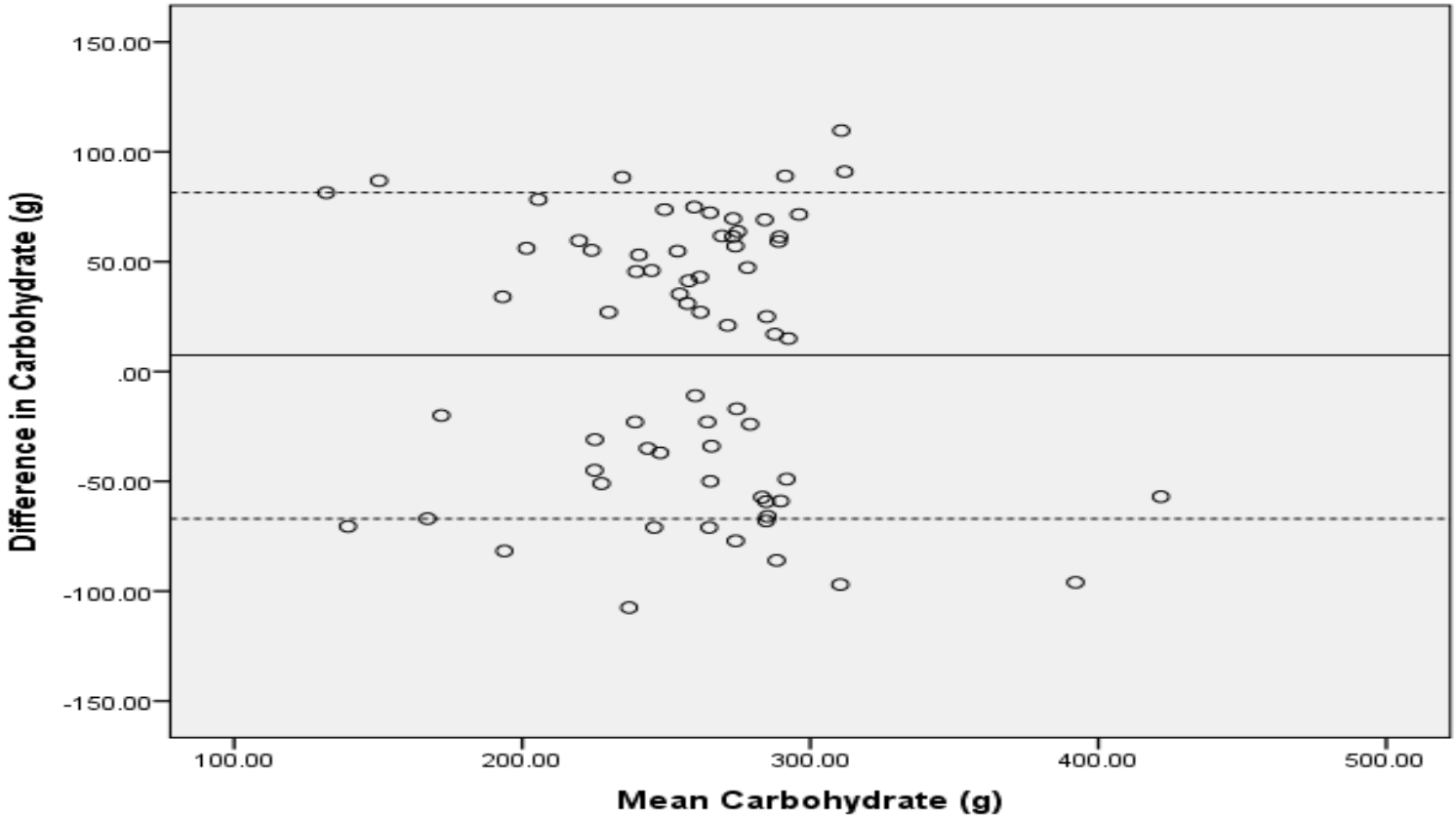


Figure 4.5 – Main food groups' contributions to energy

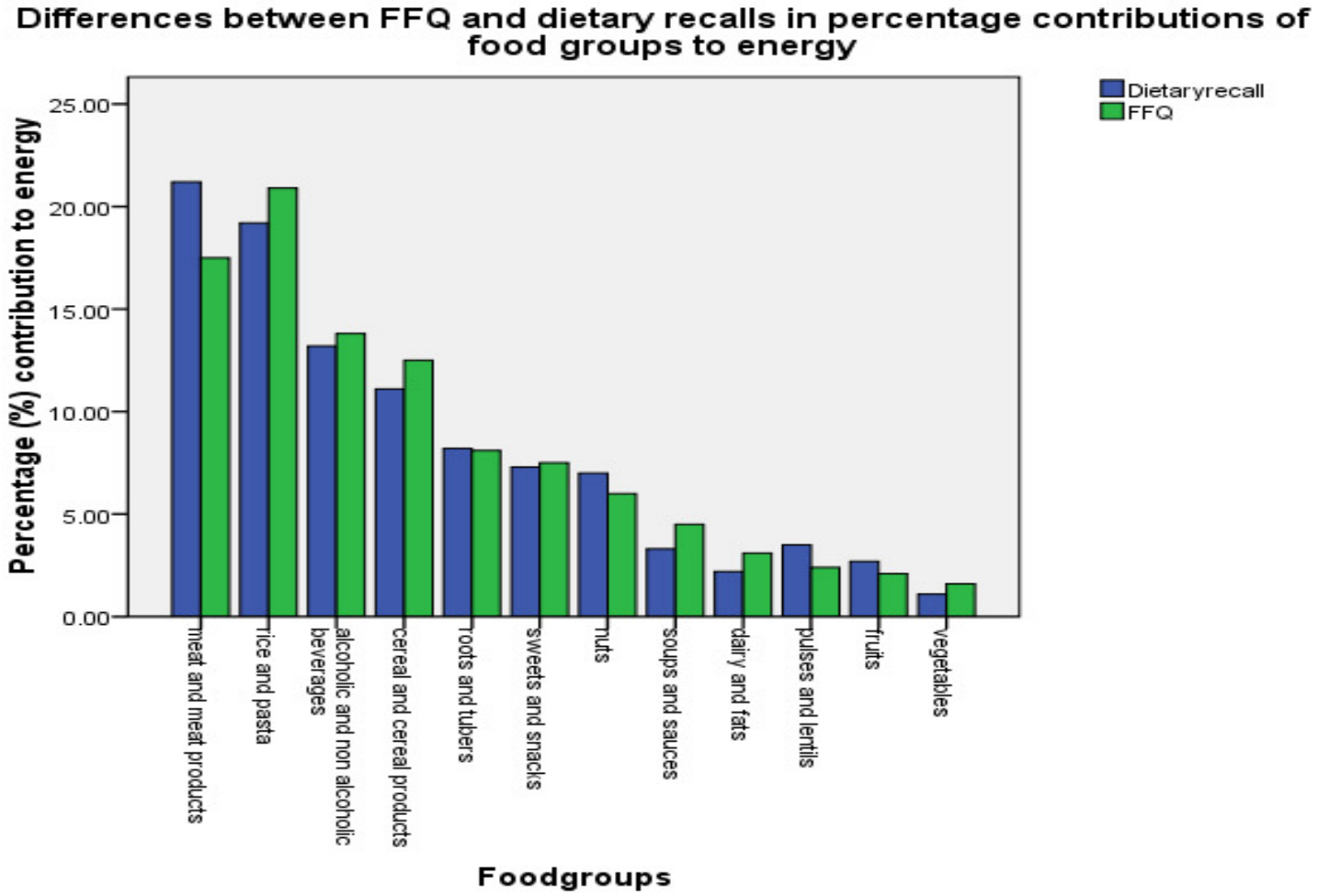
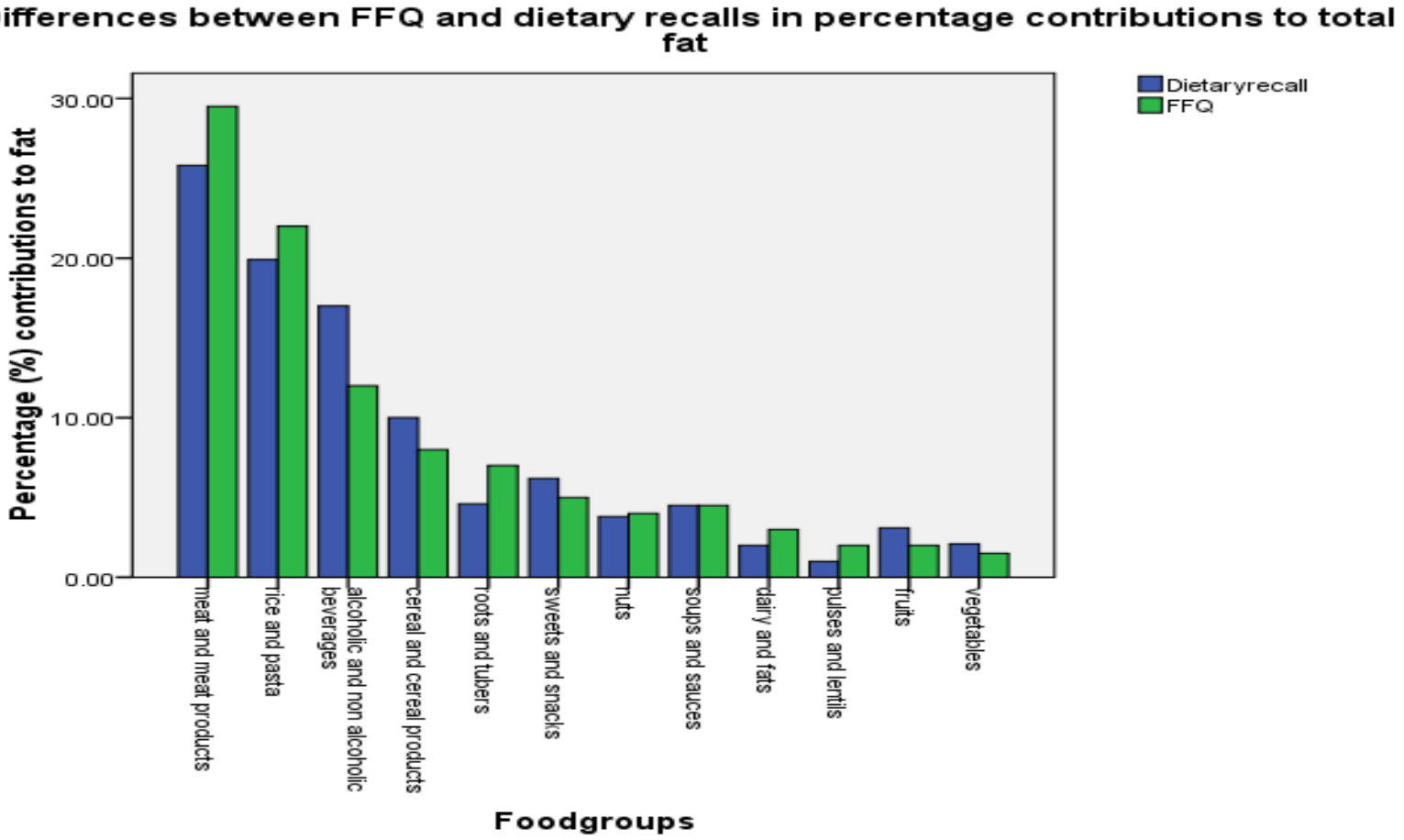


Figure 4.6 – Main food groups' contributions to fat



4.4 DISCUSSION

4.4.1 Representativeness of study population

A total of two hundred and twelve Ghanaians who attended church regularly participated in this validation study. The sub-sample used as the validation group represented 32% of the total Ghanaian study population. The participants in this survey were volunteers who attended Church regularly and were motivated enough to complete the FFQ, health and anthropometric survey. It is also possible that the validation group in this study were more educated. It was impossible to determine whether the population used in this study were representative of the Ghanaian population in the UK, because there is no census data specific for this population.

4.4.2 Validity of the FFQ

This study evaluated the performance of a food frequency questionnaire (FFQ) for use in Ghanaian migrants in the UK by comparing nutrient intakes from this instrument with those obtained from the repeated 24-hour recall method. To our knowledge a number of studies have reported the development and validation of FFQs in some African populations but not for use in Ghanaians (Sharma et al., 1996; Sloan et al., 1997; McIntyre et al., 2001; Torheim et al., 2001; Parr et al., 2002). This is of importance since this population has been found to be disproportionately prone to diet-related diseases such as obesity, diabetes and high blood pressure compared to the host population in the UK (Harris et al., 1998; Mennen et al., 2001).

The nutrient intakes assessed by both methods were observed to be correlated after adjusting for total caloric intake. Correlation coefficients of a nutrient should range from 0.5 to 0.7 in order to produce a good agreement between assessment methods (Thompson & Byers, 1994; Willett, 1994). From this study, most of the significant positive correlations found between the nutrients from the FFQ and the 24 hour dietary recall method were observed to lie within this expected range before and after adjusting for total energy. The strength of correlations observed in this validation study is comparable to other validation studies in populations in the US, Mali, Japan, Jamaica and Guatemala (Salvini et al., 1989; Torheim et al., 2001; Rodriguez et al., 2002; Ogawa wet al., 2003; Marks et al., 2006; Jackson et al., 2011). The FFQ on average overestimated the nutrient intake of some foods. There are several validation studies that have shown that when compared to 24-hour recalls and food records; the FFQ overestimates nutrient intakes (Schaefer

et al., 2000; Torheim et al., 2001; Rodriguez et al., 2002; Marks et al., 2006; Segovia-Siapco et al., 2007; Carithers et al., 2009; Jackson et al., 2011; Liu et al., 2013; Streppel et al., 2013).

However, other studies have also reported that the FFQ did not overestimate nutrient intakes when compared with other dietary assessment methods (Parr et al., 2002; Goulet et al., 2004; Quandt et al., 2007). Correlations are normally affected by several factors other than the population of interest and the questionnaire used. The validity of a food frequency questionnaire can be affected by the number of days of food records or 24-hour recalls used as the reference method (Willett, 1998; Jackson et al., 2001; Parr et al., 2002; Sebring et al., 2007; Dehghan et al., 2012). In this study, a total of 7 days was used to collect dietary data for the reference method to evaluate usual intake. The 7 days used was estimated to capture energy and macronutrients intakes adequately (see Chapter 3).

Energy adjustment in epidemiological studies assumes that each study participant reports nutrient intakes in similar proportions on both the FFQ and the reference method although the absolute amounts may differ (Flegal & Larkin, 1990; Subar et al., 2001; Thompson & Subar, 2008). Energy adjustment should at least remove the correlation error between the nutrient and energy intake and thus improve the correlation between the FFQ and the reference method used. On the other hand, energy adjustment can also reduce the between-subject variation which can then lead to a reduction in the correlation coefficients. In validation studies, adjusting energy improved the overall magnitude of correlation in some studies but not in all (Jackson et al., 2001; Willett, 2001; Thompson & Subar, 2008). In this study, correlations improved after adjusting for energy.

One important use of a validation study is to correct the observed risks for measurement error, therefore choosing an appropriate sample size is of utmost importance. Generally, fewer subjects are required for a validation study with higher degrees of validity. However, no sharp cut-off exists to define an optimal sample size. For correlations between the FFQ and “truth”, it has been observed that validation studies with a sample size larger than 150 to 200 subjects provide little apparent precision in corrected confidence intervals. Also, validation studies with small sample sizes leads to a major increase in the width of corrected confidence intervals. Although only 68 participants were available for the validation study the correlations and Bland-Altman plots obtained were within acceptable limits, thus confirming data quality. The use of portion sizes in data collection is known to contribute to differences in observations made between males and females. Gender has been found to have an effect on the measures of agreement in FFQ

validation studies. Correlations in single-sex studies tend to be higher (Marks et al., 2006). Assigning the same portion size to men and women can underestimates nutrient intakes for men and overestimates nutrient intakes for females (Subar et al., 2001). In validation studies where participants define their own portion sizes, correlations can be high (Cade et al., 2004). Because of the day-to-day variation in food intake, several days of records are necessary to adequately estimate an individual's usual intake. The accuracy and completeness of recording actual changes in dietary intake reduces with time. This therefore limits the usefulness of short-term dietary recording methods like dietary recalls and food records especially when the objective is to characterize usual intake in individuals (Patterson et al., 1998; Willett, 1998; Thompson & Subar, 2008).

Table 4.6 – Review of studies with validated FFQ in different populations

Study	Study design	Sample	Exposure Assessment	Findings	Comments
Parr et al., 2002	Cross-sectional study	70 Heterogeneous Malian adults (n=34 women) (n=36 men) between the ages of 15 to 45 years from 29 households	Interview administered FFQ consisting of 164 food items FFQ validated with a 2-day weighed food record	FFQ underestimated lunch and overestimated dinner and snacks Correlations ranged from 0.16 for protein to 0.62 for retinol equivalents 29% of participants classified in the same quartile for food groups and 36% for energy and nutrients	No adjustment for energy and confounders Difficulty in estimating portion size
Goulet et al., 2004	Quasi-experimental	71 Canadian women between the ages of 30 to 65 years	Participants part of a nutrition intervention programme FFQ was interview administered and contained 91 food items with 33 sub-questions FFQ validated against 3-day food record (2 week-days and 1 weekend-day) at week 0, 6 and 12 of the nutritional intervention study	Mean values of intakes not statistically different Energy adjusted correlation coefficients ranged from 0.36 for proteins to 0.60 for carbohydrates p=0.01 35.1% correctly classified and 5.1% grossly misclassified in extreme quartiles	Mean energy and nutrient intakes were estimated accurately by our FFQ compared to the 3-day food record Both methods appeared to underestimate energy intake in a large proportion of subjects

Table 4.7 – Review of studies with validated FFQ in different populations

Study	Study design	Sample	Exposure Assessment	Findings	Comments
Marks et al., 2006	Randomized controlled trial The Nambour Skin Cancer Prevention Trial	96 heterogeneous Australian adults consisting of 37 males and 59 females	FFQ adapted to Australian setting from the US Nurses' Health Study FFQ validated against 12-days weighed food over records 12 months	FFQ overestimated food intakes compared to the food diaries. Relative validity of intake estimates obtained by FFQ different for men and women for a large number of foods Adjusted correlations ranged 0.08 vegetables to 0.88 for tea Quartiles of intake ranged from 27% to 63% for the FFQ. >10% of participants were grossly misclassified	Adjusted for gender, age, BMI, school leaving age, occupation, medical condition, us of dietary supplements
Crozier et al., 2008	Cross-sectional	585 pregnant women aged with mean age of 26.4 years	Interview administered FFQ with 100 food items FFQ validated with prospective 4-day food diaries Two datasets – Western diet and "prudent" diet assessed	Correlation coefficient between the FFQ and diary scores for the "prudent" diet component was 0.67 and 0.35 for the Western diet component at $p<0.001$. Low correlations between FFQ and food diary for younger pregnant women with low education levels	No adjustment for energy and confounders

Table 4.8 – Review of studies with validated FFQ in different populations

Study	Study design	Sample	Exposure Assessment	Findings	Comments
Carithers et al., 2009	Cross-sectional study	499 subjects between the ages of 35 to 81 years Sub-sample from the JHS Cohort Study (N=5,302)	Two FFQs interviewed administered: short FFQ (158 food items) and long FFQ (283 food items) FFQ validated with 4day 24-hour recalls Foods that contributed at least 0.5% of food intake was included in the FFQs	FFQ overestimated nutrient intakes Adjusted correlations ranged from 0.20 to 0.70 for the short FFQ and 0.23 to 0.70 30% of participants were classified into the same quartile of intake and 8% were grossly misclassified for both FFQs	Adjusted for energy and BMI
Haftenberger et al., 2010	Cross-sectional study	161 participants between the ages of 18 to 80 years	Self-administered FFQ containing 53 food items Validated with 2-day 24-hour recall	No statistical difference between FFQ and 24-hour recall Correlations between FFQ and 24-hour recall ranged from 0.15 to 0.80 40% of participants were classified into the same quartile of intake and 4.5% were grossly misclassified	No adjustment for energy Subjects grouped into age-groups

Table 4.9 – Review of studies with validated FFQ in different populations

Study	Study design	Sample	Exposure Assessment	Findings	Comments
Jackson et al., 2011	Case-control	70 Jamaican males (validation of FFQ) 159 Jamaican males participating in a case-control prostate cancer study	Study had two components Interview administered FFQ validated with repeated 24-hour recalls Twelve 24-hour recalls collected on consecutive days at 3 month interval for a year Comparison of FFQ with dietary intake data with biomarkers of diet obtained from control subjects	FFQ overestimated energy and carbohydrate intake. No differences in dietary intake for protein and fat between the FFQ and the 24-hour recall. Quartile agreement for energy-adjusted intakes between FFQ and 24-hour recalls ranged from 20.8% - 81.0% for the highest quartiles and 31.8% - 77.3% for the lowest quartile. Low gross misclassification of most nutrients with the exception of protein, vitamin E and retinol. Energy adjusted correlations for nutrients ranged from 0.38 – 0.86	Adjusted for age, energy, body mass index and smoking. FFQ had good relative validity for estimating food group and nutrient intakes.
Streppel et al., 2013	Cross-sectional study	128 men and women (participating in the Leiden Longevity Study were included in this validation study)	Self-administered FFQ designed for the Dutch population with 104-items FFQ included additional questionnaires on use of dietary supplements and adherence to special diets Validated with three repeated 24-hour recalls	FFQ overestimated as well as underestimated absolute intake of various nutrients and foods. Agreement between the FFQ and the 24-hour recall for total energy intake was dependent of intake level. Correlation coefficient between the FFQ and 2hour recalls ranged from 0.21 to 0.78 (mean:0.50) for nutrients and 0.40 to 0.98 (mean:0.65) for food groups	Adjusted for energy Correlation coefficients decreased after adjusting for energy intake

4.4.3 Dietary Intake

The percentage contribution of energy from the macronutrients for males was similar to the NDNS survey, but the percentage energy from fat was notably higher in the Ghanaian women compared to the British female population (37% vs 35% respectively). Fibre intake was notably higher in Ghanaian men and women than in the host population but lower for vitamin C (Whitton et al., 2011). Native Ghanaian staple foods have been found to include rice, yam, beans, corn, millet and cassava (Webster, 1998; Levy, 1999). Data from the FFQ showed that Ghanaian migrants now consume potatoes more than cassava, yam and plantain. Although potatoes were found to be consumed frequently by the population, this is not found in the staple diet of native Ghanaian. Whiles native Ghanaian snacks include kelewele, achumo, gari biscuits and akara, only kelewele was observed to be frequently consumed by the migrant Ghanaian population in the UK. This was observed when both the FFQ and the 24-hour recall were used. This was similar to the survey in Chapter 3.

4.4.4 Low-energy reporting

From the validation of the FFQ, energy under-reporting was 22% for the whole study population. This was higher in females compared to males. It was higher in older females with higher education levels and a high body mass index. For males, it was also higher in those with a high body mass index. It has been reported that females may be possibly more concerned about weight, food and dieting and hence are more likely to be "embarrassed" about their dietary intake compared to men (Briefel et al., 1997; Mendez et al., 2004; Yannakoulia et al., 2007). This means that they are more likely to under-report their energy intake as was evidenced from this study (Macdiarmid & Blundell, 1997; Mendez et al., 2004; Yannakoulia et al., 2007). Several studies have also reported that gender, age and adiposity are some of the factors that can influence energy under-reporting (Price et al., 1997; Harrison et al., 2000; Johansson et al., 2001; Mendez et al., 2004; Carlsen et al., 2010). Besides these confounders, the effect of other socio-demographic factors on energy under-reporting has been found to be inconsistent (Pryer et al., 1997; Bedard et al., 2004; Mendez et al., 2004).

The under-reporting of energy intake among the participants shows that either the whole diet was under-reported as a whole or there was selective under-reporting of different foods. This could lead to further bias in reporting nutrient intake (Carlsen et al., 2010). The degree of low-energy

under-reporting in adults has been found to differ between foods perceived as healthy or unhealthy (Bingham et al., 1998; Lafay et al., 2000).

Although the errors associated with the FFQ are likely to be correlated with the errors associated with the repeated 24-hour recall method, however, for this study because participants were less than highly motivated, the multiple 24-hour recalls was the only reasonable option. The repeated 24-hour recalls were less likely to influence the diet of participants. They were also, usually less demanding for participants compared to the weighed food records (Willett, 1998; Cade et al., 2002; Block et al., 2006; Haftenberger et al., 2010; Jackson et al., 2011).

4.4.5 Summary

The correlations observed for the nutrients between the FFQ and the 24-hour recall method were comparable to other validation studies. The FFQ developed can be regarded as a valid and useful tool to assess energy and macronutrient intake in this Ghanaian population. Both the FFQ and the 24-hour recall have similar error sources because they both rely on memory and the perception of portion sizes. However, whereas the FFQ relies on long-term memory the 24-hour recall relies on short-term memory. The validated FFQ was therefore deemed appropriate to use in the intervention study (Chapter 7) to assess the changes in dietary intake for participants.

CHAPTER 5

OVERWEIGHT AND OBESITY

5.1 INTRODUCTION

Most migrants have been found to be healthier upon arrival to their new host countries (Vissandjee et al., 2004; Antecol & Bedard, 2006; Davies et al., 2006; Hao & Kim, 2009). However, over time, these migrants may eventually assimilate to the less healthy dietary and lifestyle patterns of their host countries leading to an increase in the prevalence of obesity in these populations (Antecol & Bedard, 2006; Hao & Kim, 2009). Evidence from some studies show an increase in the prevalence of overweight and obesity in some migrant populations in the UK (Cappuccio et al., 1997; Landman & Cruickshank, 2001; Health Survey for England, 2004; Averett et al., 2012).

The aim of this chapter is to characterize levels of overweight and obesity in Ghanaian migrants using BMI as well as waist circumference, waist to hip ratio and percentage body fat.

5.1.1 Prevalence of overweight and obesity among Ghanaians

The Accra Women's Health Study, a survey conducted in Ghana in 2003 reported that 66% of the 3200 women surveyed were overweight or obese (Hill et al., 2005). The prevalence of overweight and obesity has also been found to be higher among Ghanaian females compared to males (Amoah, 2003; Osei, 2005; Agyemang et al., 2005). Overweight and obesity has also been found to be more common among the married and employed Ghanaians compared to single and unemployed Ghanaians (Biritwum et al., 2005). There were also more levels of overweight and obesity in the urban upper class residents than in the urban lower class residents (Amoah, 2003). All the studies mentioned above used body mass index to assess levels of overweight and obesity. Ethnic minority groups living in developed countries have been sometimes found to have a higher percentage of overweight and obesity compared to those in their country of origin and their host population (Agyemang & Bhopal, 2003; Agyemang et al., 2005; Misra and Ganda, 2007). A review of studies on Ghanaians and Nigerians observed that whilst obesity among

Nigerian adults in 2000 was reported to be 9%, it was 14% among Ghanaians in 1998 (Amoah, 2003; Abubakari & Bhopal, 2008).

In general, Ghanaians living in developed countries have a higher prevalence of obesity compared to those living in Ghana (Saleh et al., 2002; Agyemang et al., 2008). First generation Dutch-Ghanaians from the Netherlands have been found to have a higher prevalence of overweight and obesity (men 61% and women 80%) compared to 22% and 50% for native Ghanaian men and women respectively (Agyemang et al., 2008). In Australia, first generation Ghanaian migrants have also been found to have a mean BMI that is higher than self-reported mean BMI prior to migration to Australia (Saleh et al., 2002).

5.1.2 Overweight and obesity in other Black African populations

Obesity among people of African descent in the UK has been found to be higher among females than males (Cappuccio et al., 1997; HSE, 2004; Omisore & Davis, 2008; Owusu et al., 2010) and higher in Afro-Caribbeans than in black Africans (HSE, 2004; Timbers et al., 2012). Afro-Caribbeans and South Asian migrants have also been observed to have a higher prevalence of obesity and waist to hip ratio compared to the general white population (Landman & Cruickshank, 2001; HSE, 2004). The Health Survey for England (2004) observed that among the ethnic minority groups in the UK, Afro-Caribbeans and Irish men had the highest prevalence of obesity at 25% when BMI was used to assess levels of obesity. Similar results were also observed when waist circumference was used. Among women, the highest levels of obesity were observed in Black African, Afro-Caribbeans and Pakistanis (HSE, 2004).

Studies in the early 1950s collected anthropometric and dietary information in seven villages in Nigeria and in rural and urban Jamaica (Nicol, 1959; Ashcroft et al., 1966). The mean heights, weights and body mass index from those early studies were compared with data from more recent population-based surveys conducted by the International Collaborative Study on Hypertension in Blacks. The comparison showed increasing mean BMI from West Africa to the Caribbean to the United States for both sexes (Rotimi et al., 1995; Kaufman et al., 1996). This showed a clear east-to-west increasing prevalence of obesity defined as BMI 30.0 kg/m² (WHO, 1998). The prevalence of obesity was lowest for Nigeria a developing country and highest for the United States a developed country. Overweight and obesity in West Africa has more than doubled over the last 15 years with the prevalence estimated to be 10% in adults (Abubakari et al., 2008).

This prevalence has been found to be higher in women and urban dwellers compared to men and rural dwellers (Amoah, 2003; Sodjinou et al., 2008; Owusu et al., 2010; Wahab et al., 2011).

Studies from the United States show that, there is a high prevalence of both overweight and obesity among the Black populations than people from other ethnic groups (Chou et al., 2004; Ogden et al., 2006; Burke & Heiland, 2008; Jackson et al., 2013). African American women have higher prevalence of every category of excess weight as compared to white women. Compared to women from other ethnic groups, African American women have a higher prevalence of overweight and obesity (Ogden et al., 2007; Flegal et al., 2010). Studies from Brazil also show that there are a higher percentage of Afro-Brazilians who are obese compared to other ethnic groups (Monteiro et al., 2000). The racial differences in obesity rates between black women and other ethnic groups could possibly be because of the difference in muscle mass and fat ratios, different BMI cut-offs, sociodemography and genetic disposition (Fernandez et al., 2003; Bouchard et al., 2008; Flegal et al., 2009; Rahman et al., 2009).

5.2 METHODOLOGY

This section looks at the measurements of the body compositions of first generation Ghanaian migrants recruited from Praise Chapel, Faith Baptist Church, Harvest Chapel International and Trinity Presbyterian Church of Ghana. Recruitment of participants is outlined in Chapter 3.

5.2.1 Anthropometric measurements

Measures of body anthropometry are usually a part of clinical examination and can include weight, height, circumferences and skinfolds. Height and weight are the two common anthropometric measures used to assess nutritional status in epidemiological studies because of their ease of collection and simplicity. In adults, measurement of body dimensions and mass can be used to represent direct nutritional status, to describe distribution of body fat, estimate relative body composition and compute the absolute size of the major body parts (Willett et al., 1998). The measurement of relative body composition can be determined more accurately by using underwater weighing techniques, isotope dilution and a variety of other laboratory methods. However, because these methods are more expensive and burdensome, they are inappropriate for epidemiological studies and only used in clinical research settings (Willett, 1998).

Most studies on African populations have used height, weight, BMI, waist and hip circumference to assess levels of overweight and obesity (Rotimi et al., 1995; Kaufman et al., 1996; Amoah 2003; Jackson et al., 2007; Agyemang et al., 2008). For the purposes of this study, it was decided that the following anthropometric measures will be used; height, weight, waist circumference, waist to hip ratio and percentage body fat.

5.2.1.1 Height

Height measurement may be useful in nutritional epidemiology because they reflect the influence of diet in the distant past that may be particularly difficult to measure using other methods (Willett, 1998). For height measurements, the Leicester Height Measure was used. This was placed on a hard and uncarpeted surface. Participants were asked to remove their shoes and stand upright on the platform of the stadiometer, with their feet flat on the centre of the base plate, a straight back, and heels together against the rod with their arms hanging loosely by their sides. The participant's head was moved so that the head of the Frankfort plane was in a horizontal position. The Frankfort plane is an imaginary line passing through the external ear canal and across the top of

the lower bone of the eye socket, immediately under the eye. The participant was instructed to keep their eyes focused on a straight point ahead and to breathe in deeply when measurement was taken. The horizontal beam of the Leicester Height Measure was then lowered on the participant's head. Height was then measured to the nearest 0.5cm. This measurement was repeated twice. The average of the three measurements was used in the analysis.

5.2.1.2 Weight

Even with simple and imperfect conditions, body weight is among the most precise biologic measurements. Factors such as changes in hydration, recent food intake and intended weight change can all lead to increased error in body weight when a single measurement is used to represent weight over a longer period (Willett, 1998). To measure weight, all participants were asked to remove their shoes and as much clothing as possible so that only a light layer of clothing remained over the underwear. A portable bioelectric impedance analyzer (Tanita Co., Tokyo, Japan) was placed on a hard, level surface with no carpet. The centre of the scale platform was tapped with a foot to activate it. When the scale displayed 0.0, the participant was asked to step on the scale The participant to be measured was then asked to stand still on the platform of the Tanita scale with both feet completely on the platform of the scale, with weight distributed evenly between the participant's feet. When the display was stable, participant weight was recorded to the nearest 0.1 kilogram. This measurement was repeated twice and the average of the three measurements used in the analysis.

The Body Mass Index (BMI) was calculated using the formula: BMI = Weight (kg)/ height (m^2). BMI values are usually taken to reflect adiposity and indeed correlate well with other independent estimates of percentage body fat (Nelson et al., 2004). Overweight and obesity were defined as BMI ≥ 25kg/m^2 and BMI ≥ 30kg/m^2 respectively (WHO, 2004).

5.2.1.3 Waist-hip ratio

Measuring body circumferences requires the location of the measuring instrument on the trunk or limb. However in obese people, these reference points may be difficult to locate. Waist circumference (WC) is normally used as a surrogate marker in epidemiological studies to determine the distribution of abdominal fat and the prevalence of risk factors (Lobstein et al., 2004; Nelson et al., 2004). This is because of the precise and accurate measurements of expensive radiological imaging techniques (Klein et al., 2007). Abdominal obesity defined by

waist to hip ratio (WHR) is able to predict risk factors for metabolic and cardiovascular diseases in both sexes (Haffner et al., 1986; Taylor et al., 1998; Janssen et al., 2004; Yusuf et al., 2004). As an anthropometric indicator, WHR increases as waist circumference increases or decreases as hip circumference increases. It however, remains unchanged when both waist and hip circumferences increase by a similar magnitude (Allison et al., 1995; Chowdhury, 1996; Seidell et al., 1997).

For the waist and hip measurements, participants were asked to remove as much clothing as possible so that there was only a thin layer over the underwear. They were asked to stand relaxed and breathe normally. Hip circumference was defined as the level of the greater trochanters and waist circumference as the smallest girth between the iliac crest and the costal margins. In some overweight participants where the abdomen increases from the costal margin downwards, waist was defined as the costal margins. Hip circumference was measured at the maximum circumference around the buttocks posteriorly and indicated anteriorly by the symphysis pubis. Both waist and hip circumference (WC) were measured to the nearest 0.1 cm with a measuring tape. Measurements were repeated twice for both waist and hips. Obesity was defined as the WC ≥ 88cm for women and WC ≥ 102cm for men (Lean et al., 1995). Waist to hip ratio was then calculated by dividing waist circumference (cm) with the hip circumference (cm). Overweight was defined as WHR ≥ 0.80 for women and WHR ≥ 0.95 for men (Croft et al., 1995).

5.2.1.4 Percentage body fat

For body fat, a portable bioelectric impedance analyzer (Tanita Co., Tokyo, Japan) was used. The Tanita scale was placed on a firm, level and carpet less surface. The centre of the scale platform was tapped with a foot to activate it. After turning on the power, the date of birth, gender and height of participant was entered into the Tanita scale. When the scale displayed 0.0, the participant was asked to step on the scale standing with both feet completely on the platform of the scale, with weight distributed evenly between the participant's feet. Percentage body fat was then measured to the nearest 0.1%.

Overweight was defined as % body fat ≥ 20 and ≥ 33 (20-39 years), ≥ 22 and ≥ 34 (40-59 years) and ≥ 25 and ≥ 36 (60-79 years) for men and women respectively. Obesity was defined as % body fat of ≥ 25 and ≥ 39 (20-39 years), ≥ 28 and ≥ 40 (40-59 years) and ≥ 30 and ≥ 42 (60-79 years) for men and women respectively (Gallagher et al., 2000).

Measurement errors in anthropometric measurements can influence both the measurement and the interpretation of nutritional status. To increase the reliability of the measurements, the anthropometric measurements of weight, height, waist and hip circumference and body fat were repeated twice on the same participants.

5.2.1.6 Statistical analysis

Data was entered with the participant's assigned ID instead of the participant's name. Stata 12.0 (2011, Stata Corporation, Texas, USA), was used to perform the statistical analysis. For analysis, basic descriptive statistics including mean values and standard deviations were calculated. Background characteristics and all measurements taken were presented as mean and standard deviation for continuous variables and proportion (%) for categorical variables (e.g. gender). The chi-squared test of significance was used to test for linear trend in proportions for categorical variables. The bar chart was used to represent results graphically. All statistical tests were two-tailed and a P value of 0.05 considered statistically significant.

5.3 RESULTS

5.3.1 Characteristics of the study population

Figure 5.1 to Figure 5.10 shows the relationship between sociodemographic factors and prevalence of overweight and obesity in the study population (n=212). A higher proportion of study participants, between the ages of 40-59 years were overweight (Figure 5.1 and 5.2). Participants between the ages of 20-39 years were the least likely to be overweight and obese compared to the other age groups. Overweight and obesity decreased with increasing education for females (Figure 5.4). Prevalence of overweight and obesity was also lower in males with tertiary education (Figure 5.3). Overweight and obesity was lower in study participants with own homes (Figures 5.5 and 5.6). Levels of overweight and obesity were higher among married Ghanaian migrants compared to those who were single (Figures 5.7 and 5.8). Prevalence of overweight and obesity was also higher in Ghanaians who were manually employed compared to those who were non-manually employed (Figures 5.9 and 5.10).

5.3.2 Body composition

On average, Ghanaian males in the study were shorter and lighter than their British counterparts (Table 5.1). In contrast, Ghanaian females were similar in height and weight to British females when compared to the data from the Health Survey England (2010). The waist circumference of Ghanaian females was also smaller than that of British females when compared to the data from the NDNS (2008/2009) (Bates et al., 2010). The mean waist circumference for the Ghanaian males was found to be lower than that of the British population when compared to recent data from the Health Survey for England, 2010. On average, Ghanaian migrant women had a higher BMI and percentage body fat than men.

5.3.3 Percentage overweight/obese

From Table 5.2, the percentage overweight observed for males in this study when BMI was used was found to be lower than that observed for the British population from the NDNS (2008/2009) (Bates et al., 2010) and from the Health Survey of England (2010). For females, the opposite was observed. For waist circumference, the percentage Ghanaian females overweight was 34%, 26% for females from the NDNS (2008/2009) and 41% for females from the Health Survey for England (2010). Using waist circumference, Ghanaian males were found to have a lower prevalence of overweight compared to British males from both the NDNS, 2004 (Henderson et al., 2004) and

HSE (2010). The prevalence of overweight and obesity observed when waist to hip ratio was used was found to be higher for Ghanaian women compared to British women. British males from the NDNS (2008/2009) (Bates et al., 2010) had a higher prevalence of overweight compared to Ghanaian males when waist to hip ratio was used. The percentage of Ghanaian females who were overweight when percentage body fat was used was 40% compared to 25% for Ghanaian males.

The results from Table 5.3 show that employment, marriage and housing were related to the prevalence of overweight and obesity for Ghanaian males. For Ghanaian females overweight and obesity were influenced by age and housing.

Table 5.1 - Differences in anthropometry between study population and the general UK population

Measurements	Current study (mean (s.d.)		National diet and nutrition survey (2009)		Health Survey for England (2010)	
	Males (n=88)	Females (n=124)	Males	Females	Males	Females
Height (g)	164.1 (8.1)	161 (7.8)	176.0	162.0	175.4	161.9
Weight (g)	71.4 (10.1)	69.5 (8.7)	84.4	69.0	84.6	71.2
BMI (kg/m²)	24.3 (4.8)	27.3 (4.0)	27.2	28.0	27.4	27.1
Waist circumference (cm)	91.4 (10.6)	85.2 (10.0)	95.0	90.7	97.7	88.3
Waist to hip ratio	0.9 (0.1)	0.8 (0.1)	0.90	0.79		
Body fat (%)	20.0 (7.8)	30.6 (8.4)				

Table 5.2 - Comparison of percentage overweight and obesity among Ghanaian adults and general British population

Measurements	Percentage overweight and obese in Current study		National diet and nutrition survey (2009)		Health survey for England (2010)	
	Males (n=88)	Females (n=124)	Males	Females	Males	Females
BMI (kg/m²)	50 (57%)	83 (67%)	66%	53%	68%	58%
Waist circumference (cm)	24 (27%)	42 (34%)	29%	26%	34%	46%
Waist to hip ratio	20 (23%)	38 (31%)	23%	15%		
Body fat (%)	22 (25%)	50 (40%)				

Figure 5.1 - Proportion of overweight and obese Ghanaian males by age (n=212)

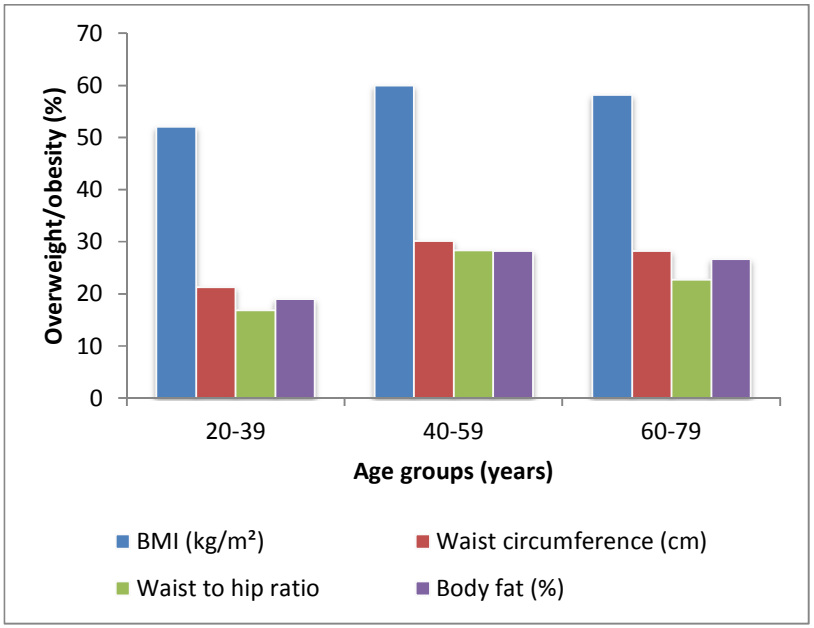


Figure 5.2 - Proportion of overweight and obese Ghanaian females by age (n=212)

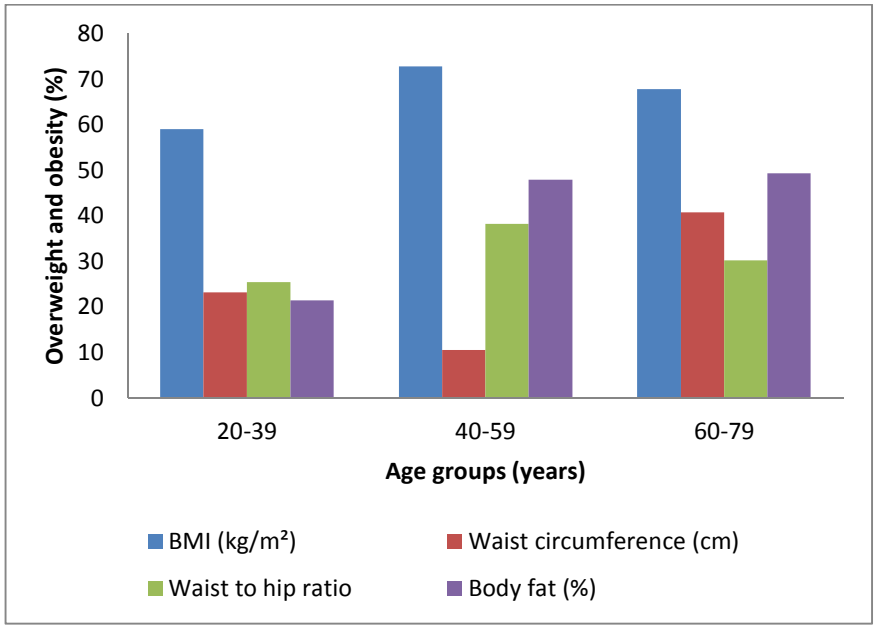


Figure 5.3 - Proportion of overweight and obese Ghanaian males by education (n=212)

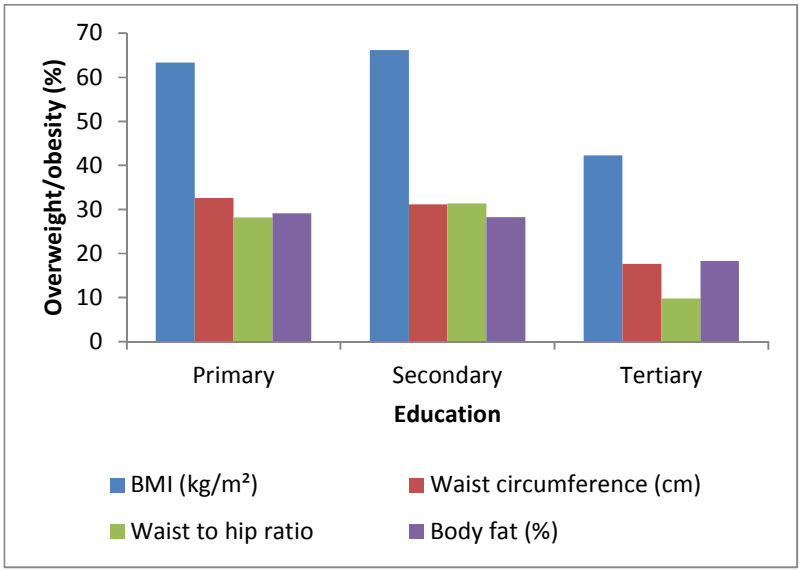


Figure 5.4 - Proportion of overweight and obese Ghanaian females by education (n=212)

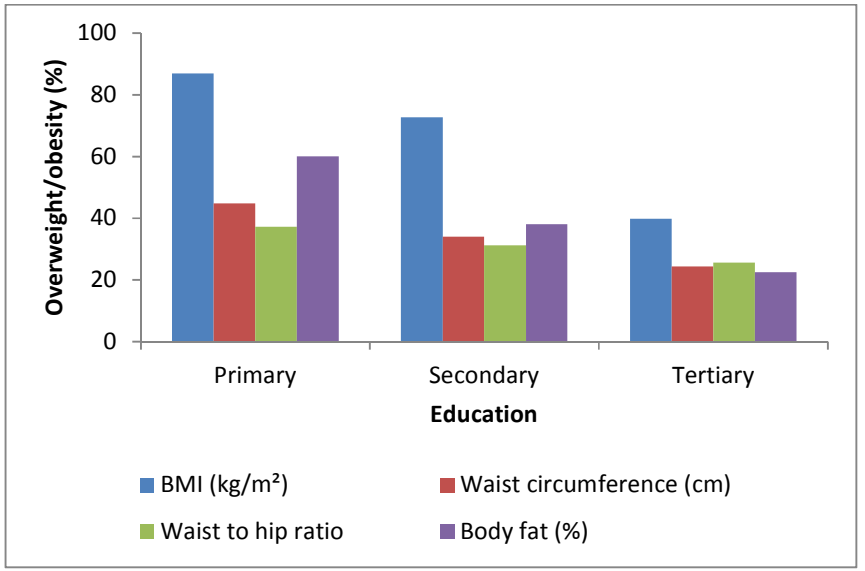


Figure 5.5 - Proportion of overweight and obese Ghanaian males by housing (n=212)

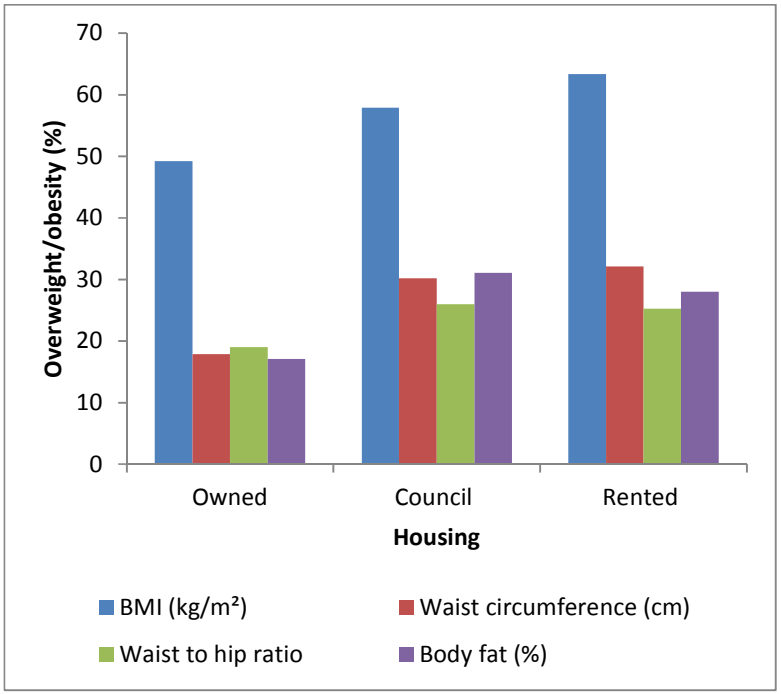


Figure 5.6 - Proportion of overweight and obese Ghanaian females by housing (n=212)

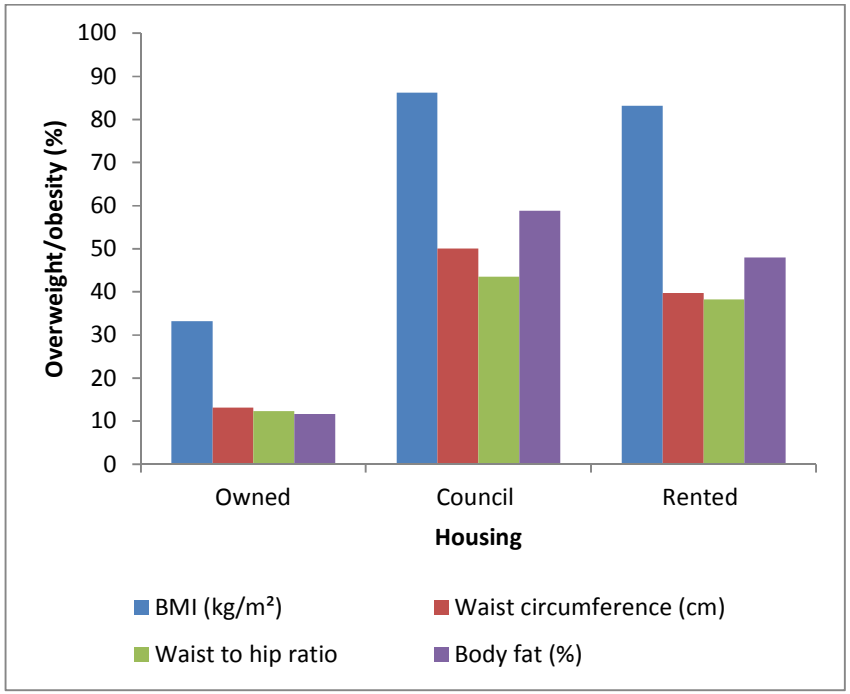


Figure 5.7 - Proportion of overweight and obese Ghanaian males by marital status (n=212)

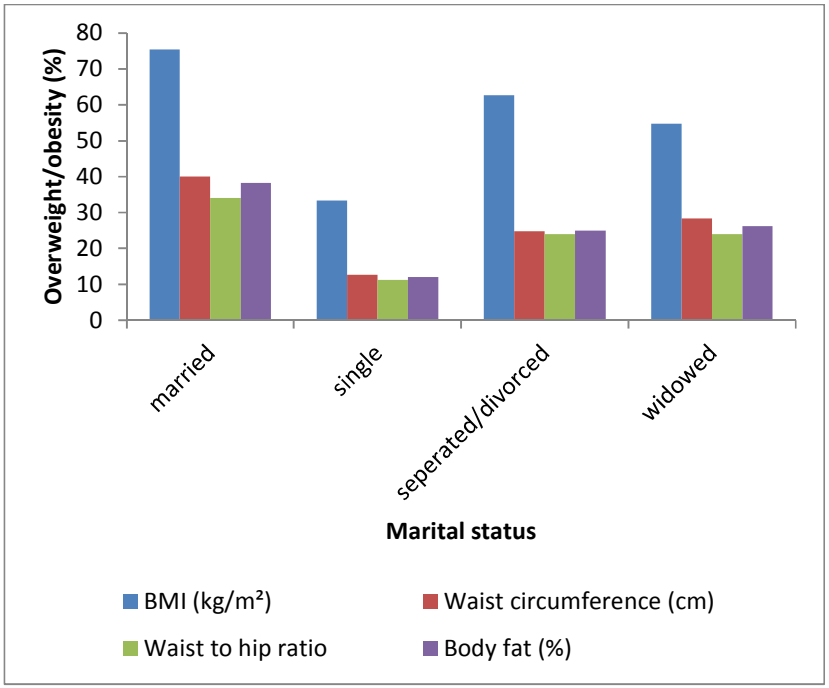


Figure 5.8 - Proportion of overweight and obese Ghanaian females by marital status (n=212)

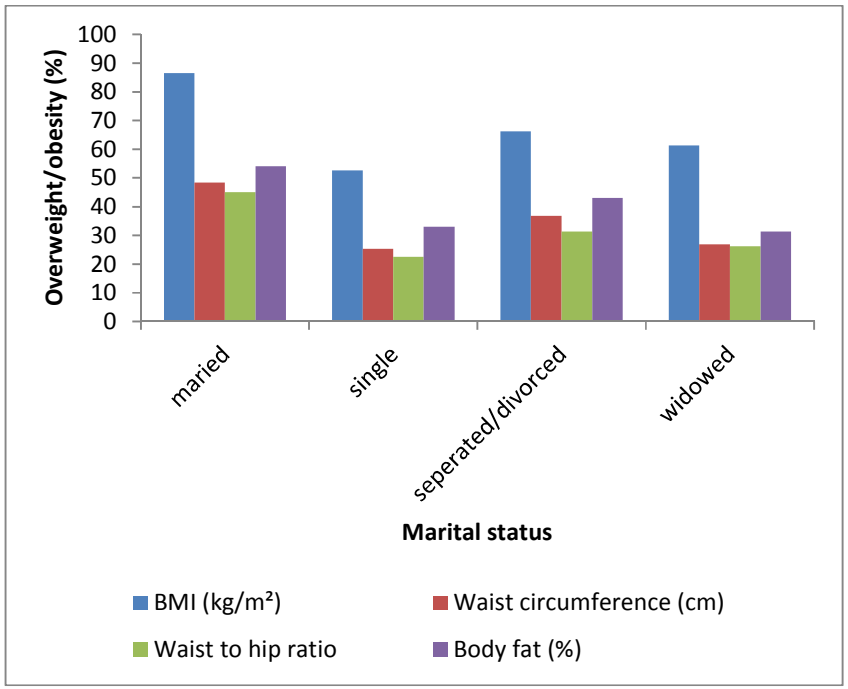


Figure 5.9 - Proportion of overweight and obese Ghanaian males by employment (n=212)

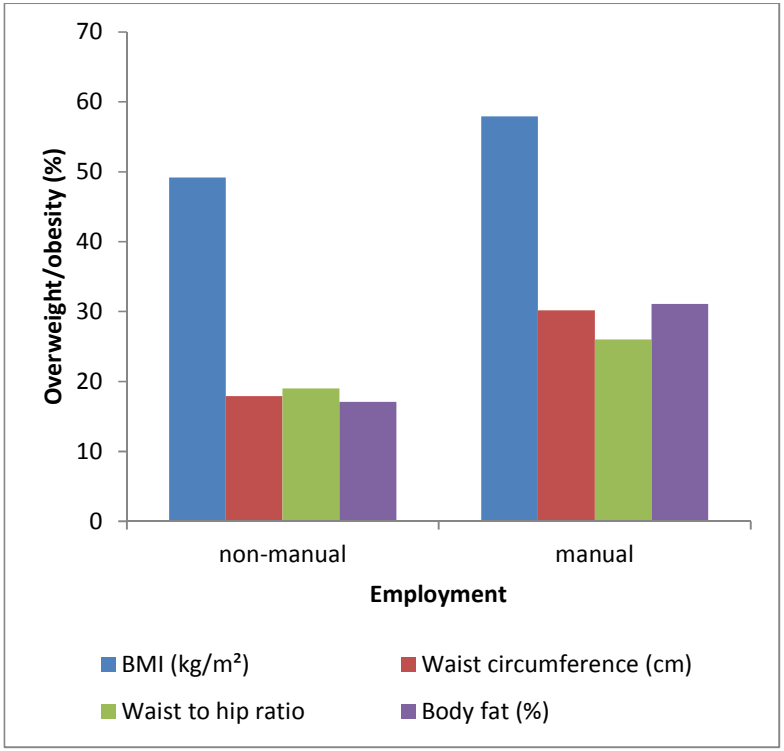


Figure 5.10 - Proportion of overweight and obese Ghanaian females by employment (n=212)

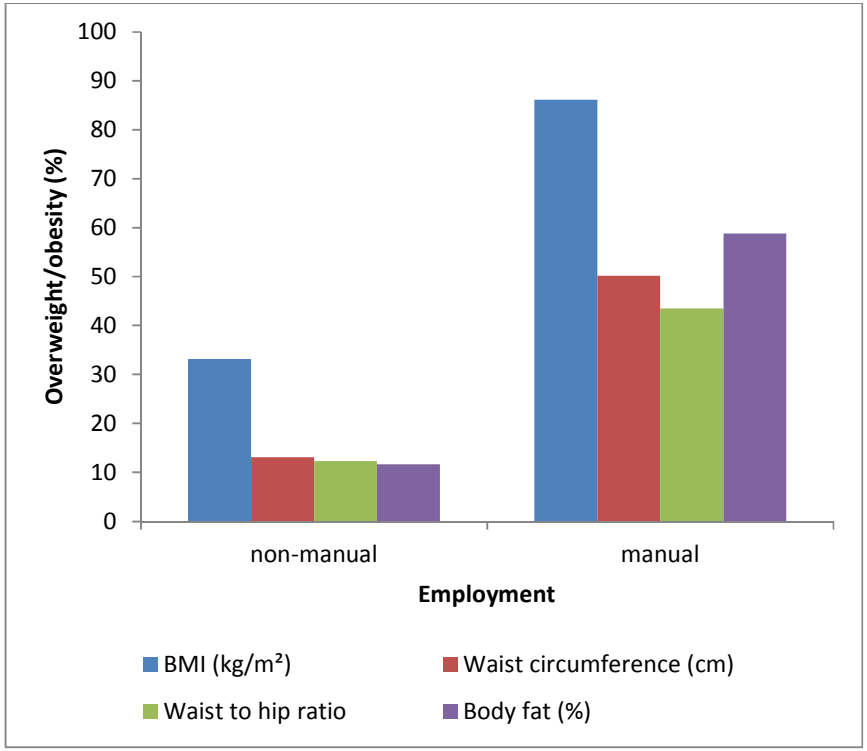


Table 5.3 – Results showing factors associated with overweight/obesity in Study population (n=212)

Dependent variable is overweight/obesity				
	Males		Females	
	Standardized β – coefficient	*P* value	Standardized β – coefficient	*P* value
Age	0.532	0.422	0.709	0.001
Employment	-0.601	0.019	-0.205	0.560
Marriage	-0.052	0.001	-0.448	0.072
Housing	-0.298	0.047	-0.413	0.011

The above table represents the results from the final model. The initial model included level of education but these was excluded in the final model because it was not significantly associated with obesity

5.4 DISCUSSION

The prevalence of overweight and obesity was 57% in migrant Ghanaian males compared to 68% in males in England (HSE 2010) and 67% in migrant Ghanaian females compared to 58% of women in England (HSE, 2010) using BMI. The prevalence of overweight and obesity was lower when waist circumference, waist to hip ratio and percentage body fat was used for both migrant Ghanaian males and females.

5.4.1 Prevalence of overweight and obesity

From the study it was observed that, a higher percentage of Ghanaian females were overweight compared to Ghanaian males and British women. The higher prevalence of overweight and obesity (BMI kg/m²) observed among the female study participants were also observed among first generation Ghanaian migrants in the Netherlands (Agyemang et al., 2008). The authors of the Dutch study explained the higher levels of overweight and obesity observed among Ghanaian migrants could be attributed to their socioeconomic status and lifestyle changes related to migration. Also, most of the Ghanaian migrants in the Dutch study emigrated at a time when most Ghanaians still associated overweight and obesity with attractiveness, affluence and well-being. This could also have played a role in the increasing levels of overweight and obesity found in this study. The levels of overweight and obesity observed when BMI was used was also higher for migrant Dutch Ghanaians than that reported for native Ghanaians. Amoah (2003), also observed that the prevalence of overweight and obesity in Ghanaians was higher for females than males. However, from the national diet and nutrition survey, males were found to have higher levels of overweight and obesity compared to females (Bates et al., 2010).

Overweight and obesity among populations of African origin in Cameroon, Jamaica and the UK have been found to be higher in those who had migrated to the UK than those who live Cameroon or Jamaica (Jackson et al., 2007). This observation has also been made among British Gujaratis who had higher mean BMIs than Gujaratis in India (Patel et al., 2006). This could partly be attributed to lifestyle changes due to acculturation (Patel et al., 2006; Higgins & Dale, 2009).

In some parts of Africa being overweight or obese was and still is associated with attractiveness, prestige, happiness and good healthy living especially in women (Holdsworth et al., 2004; Siervo et al., 2005; Ojofeitimi et al., 2007). A study in Ghana in 2003 observed that Ghanaian men preferred overweight and obese women to thin or slender ones (Amoah, 2003). However, recent

evidence suggests that these purported perceptions may no longer be the case (Duda et al., 2006). Ghanaian migration to the UK started from the 1960s to the early 1990s as a result of economic difficulties, and continued as the economy started to recover. However, recently most Ghanaian migrants immigrated to the UK as students who then stayed on after their studies concluded (Black et al., 2003). Most of Ghanaian migration to the UK took place at a time when cultural perceptions about attractiveness were high; it is possible that this could partially account for the high rates of overweight and obesity found among this population (Van Hear, 1998; Agyemang et al., 2008).

Since BMI is solely based on measurements of height and weight, it does have the disadvantage of giving potentially misleading levels of fatness in lean individuals with more muscular physiques. This could explain why the highest prevalence of overweight and obesity for both males and females was observed when BMI was used to assess body compositions (International Obesity Task Force, 1998; Henderson et al., 2004). Although BMI is the most commonly used measure of obesity, some researchers have recommended that it should be abandoned in favour of more direct measures of body fat (Bouchard, 1994; Roubenoff et al., 1995). There are some studies that have provided evidence to support this recommendation (Wang et al., 1994; Gallagher et al., 1996; Wellens et al., 1996; Deurenberg et al., 2002). From this study, the percentage of participants classified as overweight or obese using body fat was lower than when BMI was used. Prevalence of overweight and obesity in this population was over-estimated by BMI compared to percentage body fat. A study on populations living in Nigeria, Jamaica and America showed that BMI was a relatively good predictor of level of body fat (Luke et al., 1997). They also observed that mean levels of body fat for these populations varied at similar levels of BMI between the populations.

In the United Kingdom, it has been observed that mean BMI increased between 1993 and 2010 in the general population (Table 5.4). Among men, levels increased from 31% to 41% compared to from 40% to 49% among women. As of 2010, the proportion of British men and women who were overweight was 42% and 32% respectively. The proportion of British adults who are obese has also been found to have increased from 13% in 1993 to 26% in 2010 among men. For women, this increase has been found to be from 16% to 26%. Overweight and obesity associated with BMI was observed to increase with age among the British population (Health Survey for England, 2010).

From this study, it was observed that levels of overweight and obesity was found to be associated with socio-economic status. Participants who were manually employed and had no tertiary education were observed to have the highest prevalence of overweight and obesity when BMI, body fat, waist circumference and waist to hip ratio were used. Similar to the results from the Health Survey for England, (2007), the prevalence of overweight and obesity using BMI also increased with increase in age. The mean BMI of Afro-Caribbeans in the UK has also recently been found to be above average by Omisore and Davis, (2009). They observed that the mean BMI reported for females was higher than that reported for males. A survey in London has observed that Black or Black ethnic groups have the highest prevalence of obesity (22.4%) compared to the other ethnic groups (Coyle & Fitzpatrick, 2009). This data has been found to be consistent with national results from the 2004 core Health Survey for England (HSE, 2004).

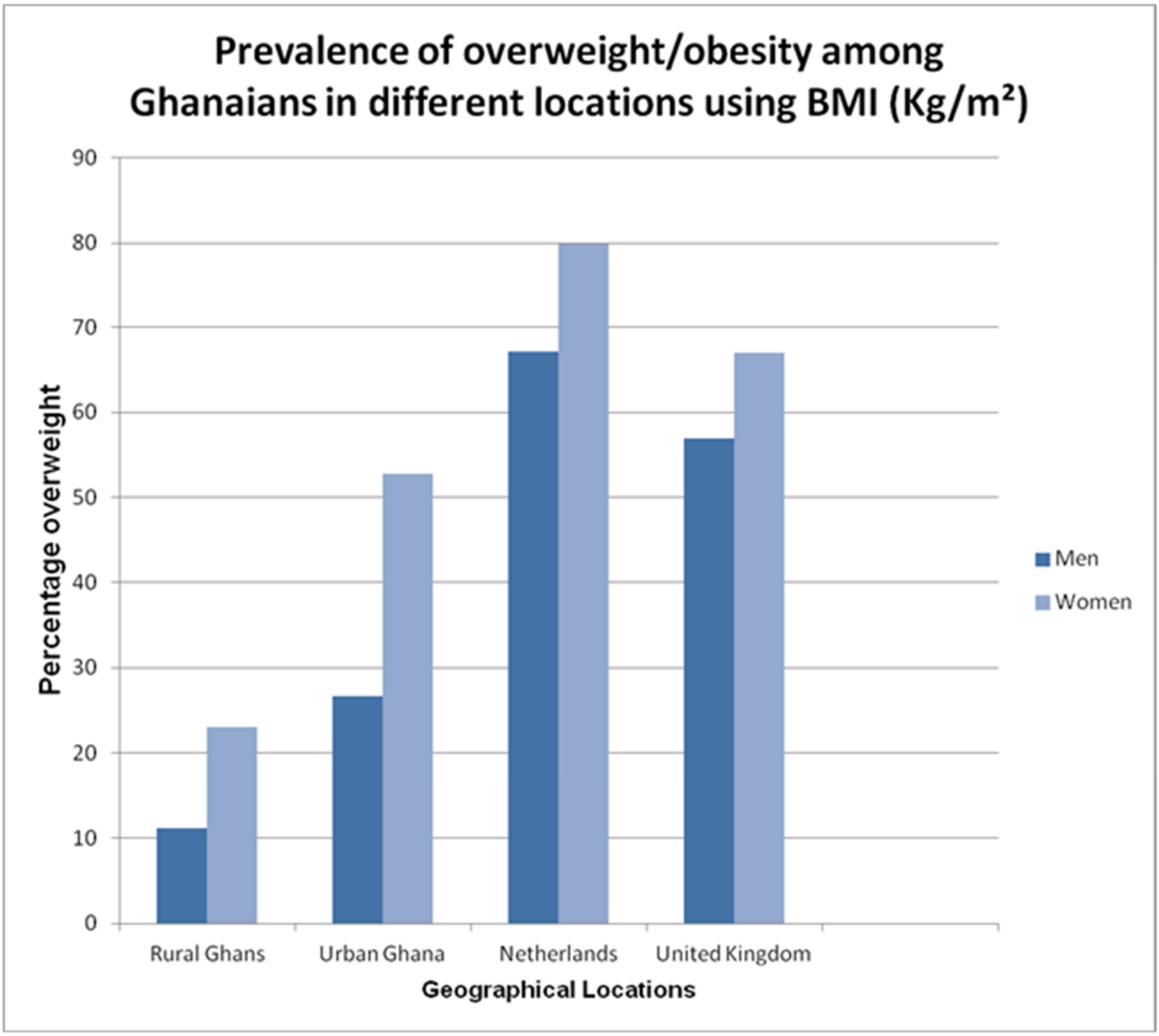
Table 5.4 - Showing changes in levels of obesity in the UK from 2000 to 2010 using BMI (HSE, 2010)

		Year of Survey										
Gender	BMI (kg/m²)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Male	Average weight	33.4	31.1	33.1	30.9	32.0	32.5	33.8	31.7	33.8	32.1	33.2
	Overweight	44.5	46.6	43.4	41.6	43.7	41.8	41.1	43.4	42.6	43.9	43.2
	Obese	21.0	21.0	22.1	26.2	22.1	24.1	23.6	23.7	22.1	22.7	22.2
	Morbidly obese	0.6	0.6	0.8	1.6	1.3	1.1	1.3	1.5	0.9	0.9	1.0
Female	Average weight	43.1	41.9	41.6	42.3	41.2	41.9	41.8	41.6	41.1	40.8	40.4
	Overweight	33.8	32.9	33.7	32.6	33.9	32.1	31.9	32.0	32.0	32.8	31.7
	Obese	21.4	23.5	22.8	23.0	23.2	24.3	24.2	24.4	24.9	23.9	26.1
	Morbidly obese	1.9	2.3	1.4	1.4	1.6	1.4	3.8	3.5	2.8	2.2	2.7

Table 5.5 - Changes in levels of obesity in the UK from 2000 to 2010 using waist circumference (HSE, 2010)

Percentage with abdominal obesity	Year of Survey										
	2000	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***
men (n=88)	n/a	31	31	31	-	31	32	33	34	32	34
women (n=124)	n/a	38	39	41	-	43	41	41	44	44	46

Figure 5.11 – Increasing levels of overweight/obesity in Ghanaians from rural Ghana to Western Europe (Agyemang et al., 2008)



5.4.1.1 Age and obesity

The females from this study were found to be older than the males. Results from Figure 5.1 show that, the prevalence of overweight and obesity was lower for the age groups 20-39 years and over 60s but higher for those between the ages of 40-59 years using all the anthropometric indices. The Health Survey for England (2009) has however observed that overweight and obesity increases with age using BMI and waist circumference. The HSE (2009) observed that over 50% of Black African women aged 35-54 years and 55+ years are obese compared to younger women (16 to 34 years). Afro-Caribbean males have also been found to have high levels of obesity within each group. Prevalence of obesity among the general population of Ghana has been found to be positively associated with age (Amoah, 2003).

5.4.1.2 Socioeconomic status and obesity

For this population, increase in the number of years spent in education was associated with decrease in overweight and obesity. This was consistent for all the anthropometric indices used to assess prevalence of overweight and obesity. Low education attainment is known to be correlated strongly with diseases, health risk and mortality (Winkleby et al., 1998; Avendano et al., 2004; Huisman et al., 2005; Lleras, 2005). Education also influences type of occupation and hence income received (Martelin et al., 1998; Silventoinen & Lahelma, 2002). Social status can influence attitudes, beliefs and values of people (Wilkinson, 1996; Marmot & Wilkinson, 1999). Participants who were employed manually were more likely to be overweight or obese compared to those who were non-manual workers. This trend was consistent for both males and females. Overweight and obesity has also been found to be more common among those who are employed compared to the unemployed in Ghana for both males and females (Biritwum et al., 2005).

The prevalence of overweight and obesity was higher for those participants who were married compared to the single, widowed and separated/divorced. Both men and women who were single were less likely to be overweight or obese. This is comparable to results from studies in Ghana which show that obesity is higher among those who were married and lower among those who were single. The association between marriage and overweight/obesity could be related to age (Biritwum et al., 2005). Research from the UK shows that in general, married men or those who are co-habiting are more likely to be obese (Statistics on Obesity, Physical activity and Diet, 2008). Evidence from the Health Survey for England, 2003 has also observed that for women in England, the prevalence of overweight and obesity is highest for those who are separated or widowed. However, for both men and women, it has been observed that those who are single are

least likely to be either overweight or obese (HSE, 2003). This finding is similar to that observed for the participants in this current study.

Although there were some similarities in the prevalence of overweight and obesity between the study population and that from the Health Survey for England, some differences were also observed. Differences in the prevalence of overweight and obesity between this study population and that of the general British population could be because of the difference in socio-demography between the two populations. It is also highly possible that measurement errors could have affected the results obtained.

5.4.2 Use of BMI in ethnic minorities

The use of BMI in this study overestimated the prevalence of overweight and obesity compared to the other parameters used. BMI is the most commonly used indicator of health risks associated with overweight and obesity even though it is not a direct measure of body fat or lean tissue (WHO, 1998; Health Canada, 2003). BMI has several limitations despite its usefulness as a body weight classification system. Levels of BMI associated with increased mortality are based on studies on primarily white populations (Stern et al., 1990; Flegal et al., 2004; Wen et al., 2009). Some observations show that lower-than-average total mortality has been observed among some populations with high BMI levels (Prospective Studies Collaboration, 2009; Wen et al., 2009; Flegal et al., 2013). It appears that within some populations, there is also no effect of obesity at all or at the BMI levels that are associated with higher mortality in whites (Stern et al., 1990).

BMI is not a very good indicator of risk in individuals or populations with very long legs or short legs relative to torso length (Garn et al., 1986). The long limbs of Australian aboriginals are known to contribute 2kg/m² to their low BMI (Norgan, 1994). BMI underestimates obesity among the tallest individuals and overestimates obesity among the shortest individuals (Bagust & Walley, 2000). BMI also has certain limitations among adults who are very muscular, over 65 years of age or those who belong to certain ethnic or racial groups. Among the South Asian populations, health risks at any given level of obesity using BMI are higher compared to that of Caucasians. This is because South Asians have higher percentages of body fat and lower levels of lean body mass for every level of BMI compared to Caucasians (Misra, 2002; Vikram et al., 2003; Mohan et al., 2007).

For South Asian Indians, the BMI cut-off has been set at 23 kg/m² and 25 kg/m² for overweight and obesity respectively (WHO, 2000). The Chinese in Hong Kong are also known to have high body fat percentage values at low BMIs. Therefore BMI cut-off points of 23 and 26 kg/m² for overweight and obesity has been proposed for this population (Ko et al., 2001). The BMI cut-off point for obesity has also been set at 27 kg/m² for Indonesians (Deurenberg & Deurenberg, 2001). It is now commonly accepted that the risk of ill health increases at lower BMI levels in South Asian populations than in European populations. Therefore, for South Asians in the UK, a cut-off point of 23kg/m² has been recommended by the South Asian Health Foundation (Kumar, 2010).

African-Americans have a higher bone mineral density and bone mineral content than Caucasians. They also have higher muscle mass (Wagner & Heyward, 2000). African Americans have also been found to have less visceral fat matched for age, BMI and circumference ratios compared to Caucasian Americans (Aloia et al., 1999; Hill et al., 1999; Deurenberg & Deurenberg, 2001; Flegal et al., 2010). There are clear differences in the limb length between Caucasians and Blacks (Deurenberg & Deurenberg, 2001). In Blacks, the BMI-related increase in risk for overweight begins at a 1 to 3 kg/m^2 higher BMI levels compared to Whites (Durazo-Arvizo et al., 1997). From the National Health and Nutrition Examination Follow-up Survey, the estimated BMI associated with minimum mortality was 27.1 kg/m^2 for black men and 26.8 kg/m^2 for black women compared with 24.8 kg/m^2 and 24.3 kg/m^2 for white men and women respectively. This can be supported by the data from this study which showed that the prevalence of overweight and obesity in the migrant Ghanaian was lower when percentage body fat was used.

Due to the lack of universal agreement, the National Institute for Health and Clinical Excellence (NICE) has advised that the same BMI cut-off points of should be used to classify overweight and obesity regardless of ethnic groups (NICE, 2006).

5.4.3 Abdominal obesity

From this study, there was a higher prevalence of overweight and obesity in migrant Ghanaian females using both waist circumference and waist to hip ratio compared to their male counterparts. In females, the greater fat distribution in the hip and thigh areas is associated with less metabolic risk. In males, there is greater fat distribution in the upper body region which is associated with greater metabolic risk (Ashwell, 1996; Daniels et al., 1999; Rattarasarn et al., 2004; Hamdy et al., 2006). Similarly, greater fat deposits in the trunk region relative to other parts

of the body have also been linked to health risks (Williams et al., 1997; Hoffman et al., 2005; Carroll et al., 2008). There are gender and ethnic differences in the distribution of abdominal fat. Males have more abdominal fat compared to women (Lemieux et al., 1993; Marini et al., 2007; Lovejoy & Sainsbury, 2009; O'Connor et al., 2011). These gender-related differences in body fat distribution are related to the regional differences in the release of free fatty acids (Goodman – Gruen & Barrett – Connor, 1996; Blaak, 2001). An upper, central or abdominal body fat distribution independent of the total body fat regardless of gender is a risk factor for hyperlipidemia, cardiovascular risk factors, type II diabetes, and other morbidities (Okosun et al., 2000; Lurbe et al., 2001).

While women in this study had the highest prevalence of overweight when waist to hip ratio was used, the opposite was observed when this was compared to the data from the National Diet and Nutrition Survey (2004) where men had a higher prevalence of overweight (Henderson et al., 2004). A study in West Africa has also observed that using waist to hip ratio; men had the lowest prevalence of obesity compared to females (Kamadjeu et al., 2006). The prevalence of overweight using waist circumference was also higher for females than males in this study. From the National Diet and Nutrition Survey (2008/2009), the opposite was observed where levels of overweight were higher in males compared to females (Bates et al., 2010).

In the UK, the few anthropometric studies that have been conducted on the black population focused more on Afro-Caribbeans or combined populations from the Caribbean and Africa. In a typical example, a study in Manchester used a validated questionnaire to assess physical activity type and its duration and levels of overweight and obesity using measures of waist and hip circumference and height and weight to determine the BMI of Afro-Caribbeans, South Asians and White Europeans (Riste, 1997). It was observed that using BMI, waist circumference and waist to hip ratio, South Asian men were the most obese among all the ethnic groups. Both the waist circumference and waist to hip ratio in the Afro-Caribbean men were significantly lower than that in the European and South Asian men. However, among the females, Afro-Caribbean women were found to be the most obese when mean BMI (30.2kg/m^2) was used as a cut-off. The waist to hip ratios was found to be lower in the European women (0.81) and highest in South Asian women (0.88) (Riste et al., 2001). These observed ethnic and gender differences in the waist to hip ratio could be as a result of the differences in the size and shape of the pelvis. This is because the pelvic skeleton is important for determining the hip circumference. In a population, given the same amount of adipose tissue and muscles, those with a wider pelvis will have a larger hip circumference (Mikhail et al., 1996; Welborn et al., 2003).

For the general British population, over a third of the adults have been observed to have high waist circumference with the prevalence of high abdominal obesity increasing with age. This trend has also been reported when BMI was used to assess overweight and obesity (HSE, 2010). As observed in this study, women in the UK have also been found to have a high prevalence of abdominal obesity compared to the men when waist circumference is used (HSE, 2007). The Health Survey for England has also observed that as of 2010, there has been an increase in the average waist circumference of the general British population. Among men, mean waist circumference increased from 93.2cm in 1993 to 97.7cm in 2010. For British women, this increase was from 81.7cm to 88.3cm over the same period of time. The proportion of men with abdominal obesity among the general British population increased from 20% to 34%, while the proportion of women with abdominal obesity rose from 26% to 46% (HSE, 2010).

The interpretation of results from waist circumference measurements depends on ethnicity. A study in Canada showed that the observed waist circumference cut-off points for that study were significantly different from the currently set cut-offs due to the ethnic diversity of the subjects (Dobbelstyn, 2001). Other studies from Nigeria, Cameroon, Jamaica, St Lucia and Barbados also showed that the predictive waist circumference cut-offs were poorer and different than the specific cut-offs for the individual population groups (Okosun et al., 2000).

5.4.4 Summary

Obesity classification using BMI may not be the same for Black populations as the host population. BMI overestimated the prevalence of overweight and obesity in both Ghanaian males and females compared to the other anthropometric measures used in this study. There was also a gender divide in the prevalence of overweight and obesity as evidenced in other studies on Ghanaians and other Black populations.

CHAPTER 6

BODY IMAGE AND PERCEPTIONS OF MIGRANT AND NATIVE GHANAIANS

6.1 BODY IMAGE: A BACKGROUND

Body image describes the perception and attitude about the human body (Pruzinsky & Cash, 2002). A large body size was valued throughout history, because fatness represented abundance and wealth. This showed physical and political power (Cassidy, 1991; Sobal, 1991; Swami, 2007; Swami & Furnham, 2008). There are cross-cultural, temporal and individual differences in attitudes toward body weight and obesity (Cassidy, 1991; Swami et al., 2007; Swami et al., 2008). Physical attractiveness and body acceptance has in recent years generated a great deal of attention in the psychological and biological sciences.

Cross-cultural differences suggest that in Westernised societies, slimness is the preferred ideal body size for those with high socioeconomic status (Swami, 2007). In developed societies where the ideal is thinness, individuals tend to rate slender or underweight figures from the figure rating scales as being maximally attractive (Calogero et al., 2007; Smith et al., 2007; Swami & Tovee, 2005). However, in most developing countries, overweight or large body sizes are usually associated with psychological traits of fertility, sexuality and attractiveness (Brown, 1991; Teti, 1995). In many of these communities, obesity or extreme weight gain is culturally acceptable for women, especially in the period leading to marriage (Popenoe, 2003). Indeed, in some parts of Africa and the South Pacific, there are “milking huts” where adolescents from wealthy families are fed high-fat diets in preparation for marriage (Brink, 1995; Popenoe, 2003). In Fiji, where large and robust bodies are traditionally considered beautiful, people are encouraged to eat with the purpose of putting on weight (Becker, 2004). Individuals from these societies where overweight or obesity is viewed positively are also less likely than those in developed societies to perceive themselves as overweight or obese even when they are extremely large (Brewis et al., 1998; Frederick et al., 2008).

Body weight ideals have been found to be associated with resource security or availability (Anderson et al., 1992). In societies where resources are unpredictable or scarce, the population will normally have a preference for large body sizes (Sobal & Stunkard, 1989). In these situations, individuals come to idealize large body sizes as fatness is associated with access to resources (Marlowe & Wetsman, 2001). There is a consistent association of greater preference for large female figures with decreasing socioeconomic status in some countries (Swami & Tovee, 2007). It has been observed that in both Britain and Malaysia, people from high socioeconomic status idealized slender women with BMIs of about 19-21kg/m² whereas participants with low-socioeconomic status in rural Malaysia preferred women with BMIs of about 23-24kg/m² (Swami & Tovee, 2005).

The objective of this chapter can be summarized as:

- To compare the “ideal body image” and “size” between native and migrant Ghanaians.

- To use focus groups to identify gaps in knowledge in health and utilize this information in the development of the nutrition education programme.

6.2 METHODOLOGY

6.2.1 Eligibility and recruitment

This survey was conducted in two geographical locations; the UK and Ghana. First generation Ghanaian migrants were recruited from a selection of black majority churches in London with predominantly West African congregation. London, known to have a high population of Ghanaian migrants was used as catchment area for the study (Chapter 1) (Arthur, 2008). In Ghana, participants were also recruited from 2 Churches in Accra and Kasoa to participate in the research. Participants from London (n = 45) were 18 men and 27 women. There were seventy nine participants from Ghana (32 men and 47 women). Eligible study participants were between the ages of 18-65 years. Participants from London were required to have been born in Ghana and should have lived in the UK for a minimum of 5 years. Women who were pregnant or breastfeeding were excluded from this survey.

6.2.2 Survey

This was a cross-sectional study that recruited Ghanaians living in England, (London) and Ghana (Accra and Kasoa). The interviews were conducted in English and consent obtained from participants. All participants completed socio-demographic questionnaires at the beginning of the meeting to collect information on age, education level, marital status and type of employment and body size and shape related questions. The height and weight of participants were then measured.

After collecting, the above information, the participants were then invited to participate in the focus group discussions. The focus group discussions were divided into two sections. The first section addressed participants' cultural and personal factors related to their perceptions of their current and ideal body size and shape. The second section addressed the reasons why participants will like to lose weight and the topics they wanted to be discussed under the nutrition intervention programme. This qualitative method of collecting data was used because it is quick and convenient. It also encouraged participants to talk to one another and explore their knowledge and experience. These focus group meetings helped the participants to identify how they think and why they think that way. It was also a way of identifying the participants' experiences of diet and disease and their knowledge of what to do to improve their health. All interviews were conducted by the same investigator for this study.

6.2.3 Figure rating scale

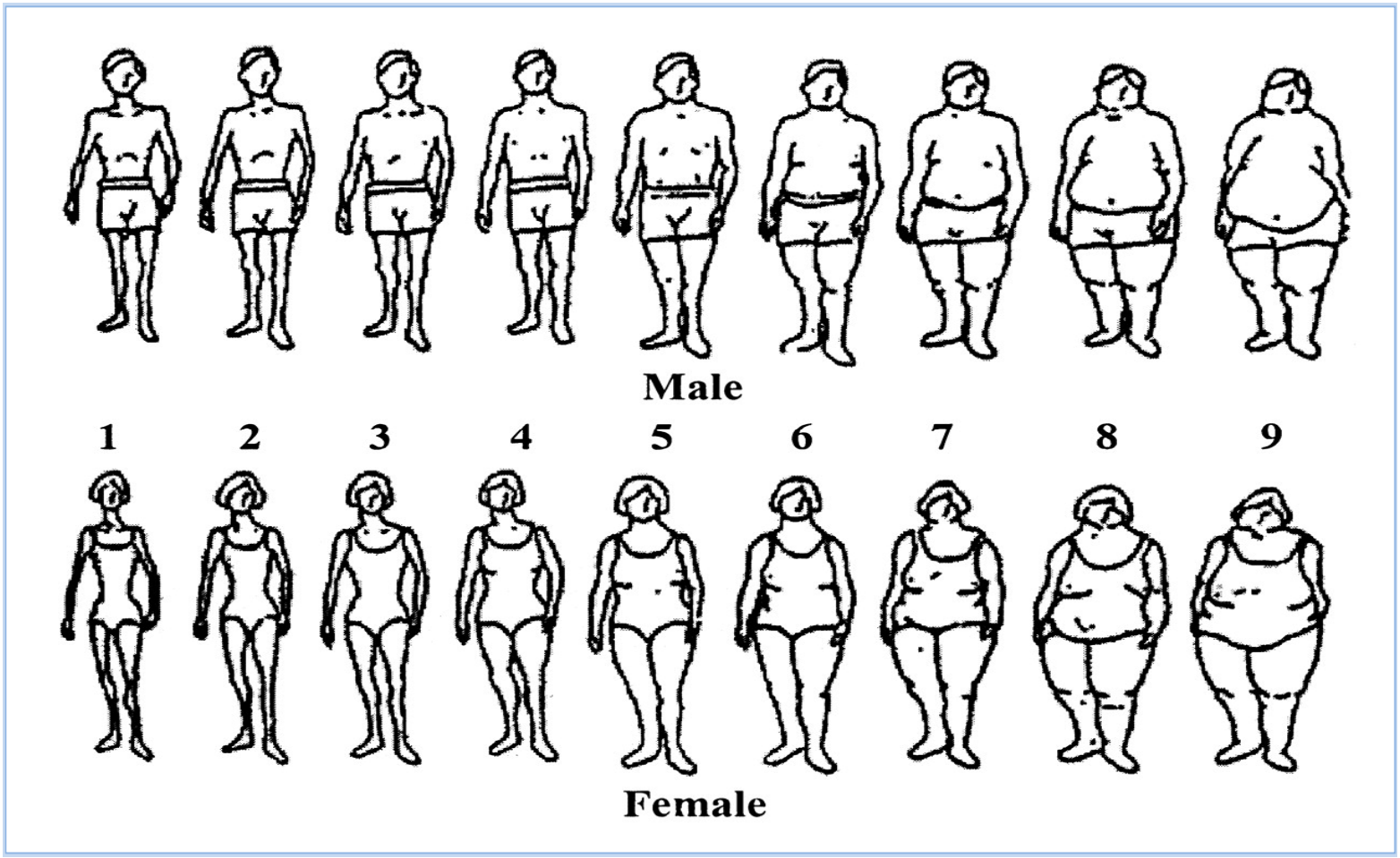
Participants completed questionnaires to collect information on their ideal size and shape and other body-shape related questions using the Figure Rating Scale (FRS) below (Figure 6.1) (Viladrich et al., 2009). The FRS consisted of nine male and female shapes that ranged from very emaciated (1.0) to very obese (9.0). Participants were asked to use the FRS to answer the following questions; (1) what is your current shape and size? (2) The size and shape you would most like to be, (3) The size and shape you feel is the most attractive, (4) The size and shape you feel Ghanaian men find the most attractive, (5) The size and shape you feel Ghanaian women find most attractive, (6) What influences your perception about the ideal weight? These methods were similar to procedures used by other researchers (Jumah & Duda, 2007; Viladrich et al., 2009). From the FRS, figure 1 and 2 were considered underweight, 3 and 4 considered normal weight, 5 and 6 overweight and 7, 8 and 9 considered to be obese.

Additionally, participants were asked whether they would like to lose weight or not and the reasons why they wanted to lose weight.

6.2.4 Focus group meetings

Two focus group-meetings were held with the participants in the UK. This was conducted to collect information on why participants wanted to lose weight and what they would like to be discussed under the nutrition intervention programme that was to be implemented later. All the focus group sessions were held in the church and lasted for 45 minutes. At the beginning of the session, questionnaires were completed by the participants to collect basic sociodemographic characteristics such as age, employment, marital status, education level and body shape related questions. The focus group sessions addressed participants' cultural and personal factors related to their perceptions of body weight, why participants wanted to lose weight, what they perceived to be the possible barriers to losing weight and the knowledge they needed to enable them lose weight and maintain weight-loss successfully. The sessions were tape recorded for transcription and analysis.

Figure 6.1 – Figure Rating Scale used to determine ideal body size and shape



(Viladrich et al., 2009)

6.2.5 Anthropometry

Anthropometric indices of height and weight were obtained. Height was measured to the nearest 0.5cm using a metal tape measure without shoes. For height, participants were required to stand upright with their head in the Frankfurt position. Weight was measured on a calibrated portable digital Salter scale to the nearest 0.1kg. BMI was calculated as weight (kg) divided by the square of height in meters. Overweight and obesity were defined as BMI ≥ 25kg/m² and BMI ≥ 30kg/m² respectively (WHO, 2004).

6.2.6 Statistical analysis

The data was coded and entered into SPSS version 14 for Windows (SPSS, Inc., Chicago, IL). Pearson product moment correlation coefficients were calculated to assess the association between the parameters measured. The chi-squared test of significance was used to test for linear trend in proportions for categorical variables. Data analyzed also included frequency distributions and dissatisfaction scores (current body image – ideal body image). Participants were stratified by gender and geographical location. Because individuals who report that they were overweight may or may not be overweight, the proportions of perceived overweight across BMI categories (normal weight, overweight, and obese) was compared

6.3. RESULTS

6.3.1 Sociodemographic characteristics

From Table 6.1, a total of 50 males and 74 females living in both the UK and Ghana participated in this survey. Native Ghanaian males were significantly older than migrant Ghanaian males. There were no significant differences in age between females. A higher proportion of native Ghanaian males were significantly employed as non-manual workers. Native Ghanaians females were likely to have completed tertiary education (p=0.04). A higher proportion of native Ghanaian males were married (p=0.01).

6.3.2 Results from the figure rating scale

Tables 6.2 and 6.3 shows the actual weight (using BMI) and perceived weight of participants using the FRS, it was observed that a greater proportion of participants perceived their body size and shape to be normal. This was more pronounced among the migrant Ghanaian females with eight underestimating their body size to be normal when they were actually overweight or obese. Only two migrant Ghanaians underestimated their body size to be normal when they were actually overweight. Nineteen migrant Ghanaians perceived themselves to be overweight using the FRS. Using BMI to determine actual body size, 53% of Ghanaian males were found to be overweight. Majority of those classified as obese using BMI perceived themselves to be of a smaller size for both migrants and natives. The results also showed that there were a few participants who were underweight but overestimated their body size to be normal (for both genders) from the migrant and native populations.

Table 6.4 shows that a higher percentage of Ghanaian males (56%) living in UK thought that normal size was the size most attractive to Ghanaians compared to 44% of females living in the UK. For those living in Ghana, a higher percentage of females selected normal weight to be the size that is most attractive to Ghanaians. Only a small number of Ghanaians selected obese body shape and size to be the most attractive to Ghanaians (4% and 5% for migrant Ghanaians and native Ghanaians respectively). Eighty four percent of overweight participants wanted to lose weight compared to 47% of those who were obese. Participants who wanted to lose weight were mostly influenced by health, attractiveness, society and to a lesser extent self-esteem. Health and attractiveness were the dominant factors that influenced ideal body size for migrant Ghanaians and native Ghanaians respectively (Figure 6.2).

Table 6.1 - Socio-demography of participants

Measures	Migrant Ghanaians Males (n=18)	Native Ghanaian males (n=32)	*P value*	Migrant Ghanaian Females (n=27)	Native Ghanaian Females (n=47)	*P value*
Age (years)	35	45	0.05	38	37	0.57
Employment						
Manual	67	38		56	55	
Non-manual	33	72	0.03	44	39	0.12
Unemployed	0	0		0	6	
Education						
Primary	6	13		19	15	
Secondary	28	25	0.07	33	23	0.04
Tertiary	66	62		48	62	
Marital Status						
Married	56	75		70	75	
Single	28	25	0.01	26	21	0.25
Divorced	11	0		4	2	
Widowed	5	0		0	2	

Table 6.2 – Difference between actual weight and perceived size of Ghanaian females using the figure rating scale (FRS)

Measures	Migrant females (n=27)		Native females (n=47)	
	Actual weight using BMI	Perceived weight using FRS	Actual weight using BMI	Perceived weight using FRS
Normal weight	7 (26%)	15 (56%)	26 (56%)	33 (70%)
Overweight	18 (67%)	11 (41%)	16 (34%)	13 (28%)
Obese	2 (7%)	1 (3%)	5 (10%)	1 (2%)

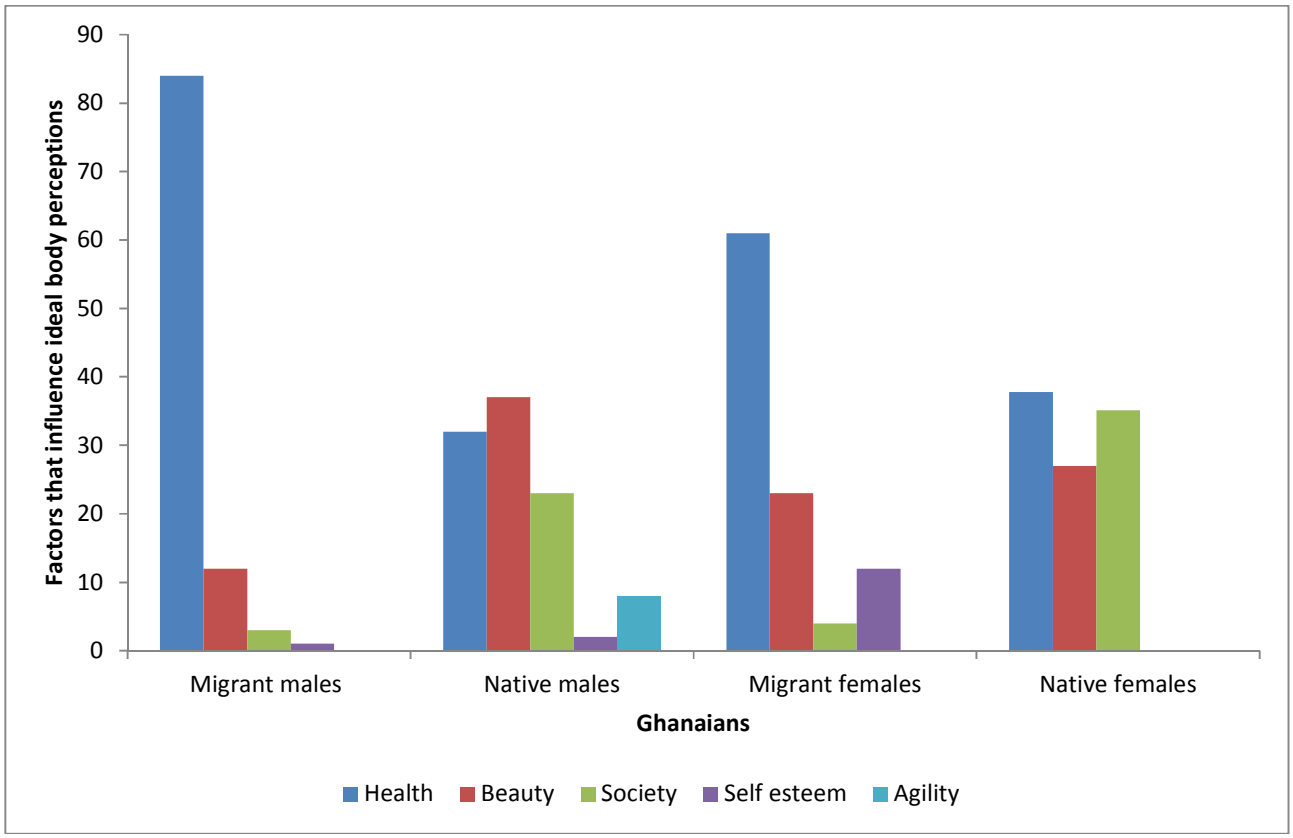
Table 6.3 – Difference between actual weight and perceived size of Ghanaian males using the figure rating scale (FRS)

Measures	Migrant males (n=18)		Native males (n=32)	
	Actual weight using BMI	Perceived weight using FRS	Actual weight using BMI	Perceived weight using FRS
Normal weight	7 (40%)	9 (50%)	17 (53%)	21 (65%)
Overweight	10 (53%)	8 (44%)	13 (42%)	11 (35%)
Obese	1 (7%)	1 (6%)	2 (5%)	0

Table 6.4 - Body Size and shape most attractive to Ghanaian males

Measures	Migrant Ghanaians		Native Ghanaians	
	Men (n=18)	Women (n=27)	Men (n=32)	Women (n=47)
Normal weight	11 (63%)	15 (55%)	18(57%)	23 (50%)
Overweight	6 (34%)	11 (40%)	12 (37%)	22 (46%)
Obese	1 (3%)	1 (5%)	2 (6%)	2 (4%)

Figure 6.2 - Factors that influence perception of ideal weight



6.3.3 Results from the focus group meetings on health and nutrition education

During the focus group meetings and interviews, the participants generally shared their opinions on what influenced their ideal body size and shape and also raised concerns about what they thought the nutrition intervention programme should be focused on. Although all participants expressed their opinions on what they felt the nutrition intervention programme should be about, there were some emergent topics which were more popular among all participants.

6.3.3.1 Cultural perceptions

The results from the focus groups showed that there were some cultural perceptions that influenced the participants' ideal body size and shape. Although these participants thought that the Ghanaian culture expected them to be overweight or obese, they were willing to go against their perceived cultural norms to lose weight or maintain a healthy normal weight for other reasons. In the participants' own words, they gave reasons why they thought the Ghanaian culture put pressure on them to be overweight or obese:

Participant 1: *"The Ghanaian society gives respect to you when you are overweight because they associate overweight and obesity with wealth, riches".* Several participants at this comment nodded their heads in agreement. For the next two minutes, some of the participants gave the same reason as why they thought the Ghanaian society gave more prominence to people who are overweight.

Participant 2: *"Some members of our society also associate overweight and obese with well-being and peace of mind".* Although some participants also agreed with this, another participant raised an objection by saying *"I think this ideology is changing and will probably die out with the older generation".* And once again, several participants agreed with this comment by nodding.

Participant 3 added *"About 10 years ago when I was in Ghana, I used to think that men preferred women who were bigger or should I say women with more meat on their body. Back in my home in Ghana we used to laugh at people who were slim. We even had a special name for them but now I don't think it's the same anymore".*

Participant 4: *"I think in the British culture, thinner is more acceptable, so you have no choice but to change your perception to fit with the society that you are in now".*

From the discussion, it seemed that there was an awareness of a cultural shift and even if some participants wanted to stay the way they were, because of expectations from the society in which they currently found themselves, they could not do so.

6.3.3.2 Health

Many of the participants thought that health was important to having the ideal body size and shape whether of normal weight or not. Health was of the utmost importance to almost all the participants involved. The participants reported the media as being the most dominant force that influenced their health choices. In spite of also getting health information from other sources, the participants expressed that without the media, it would have been impossible for them to be this health conscious.

Some of them said *"The media has been instrumental in informing me of why I need to lose weight. There is a website I visit quite frequently where I get all the health information that I need"*. Participant 2: *"I subscribe to and purchase health magazines weekly because I get some really good titbits from them"*. Other participants also said that their GP's and the NHS website have also made them realise why health is so important and why they have to take it seriously.

The participants expressed that health was important because they wanted to live long while living healthily and peacefully. Participant 3 said *"I do not want to be told I have diabetes or high blood pressure so I think the earlier I make lifestyle changes, the better.* Another said *"I just want to live healthily for as long as I can without any dependence on medication or people".* Most of the participants seemed to agree with the reasons given by giving responses of "yes". From this, it can be observed that health was important to the Ghanaian migrants in this study.

6.3.3.3 Weight-loss

Another important topic that emerged during the focus group meetings was weight-loss. Most of the overweight and obese participants expressed their willingness to lose weight. Some participants had already tried to lose weight in the past but had failed. Others had been asked by

their GP's to lose weight and had in the past joined some weight-loss groups but could not finish the programmes due to several reasons. It was obvious that some of the participants had been left frustrated by their failed past attempts to lose weight.

Participant 1 said *"I want to get married, and in this society it looks like the thinner you are, the more beautiful you look. I strongly believe that "the day I each my target weight, I will get married".* At this comment, there was both laughter and nods of agreement.

Participant 2: "*I think I will be healthier if I lose weight".* All the participants agreed with this when asked if they thought weight-loss was important to health. To help lose weight, participants decided that choosing healthier options, food portions and planning meals and shopping should be considered.

Participant 3: "*I am the only person in my house that is overweight. All my sisters and my parents are slender. It makes me feel like an outsider especially when we go out. So with all my heart, I will really like to lose weight. It is as simple as that."*

6.3.3.4 Choosing healthier options

Participants were aware of low-fat, low-sugar and low-salt food varieties but were confused by all the different information. They were also confused about food labels and thought that addressing these issues will greatly help them. They gave several reasons why this was important to them.

Participant 1: *"For health reasons, my GP has told me to cut down on fat and salt and switch to low fat or salt varieties. I think about how I can do this not just once in a while but make it a lifestyle. He gave me some information on this and I have tried to do this by myself but I always go back to full-fat foods. Besides, low-fat and low-salt foods are not as tasty as full-fat or salty foods."* Participant 2: *"I do not know how to read food labels. I have seen the ones that have the red, yellow and green colour – almost like a rainbow. For me I thought it will be easier for me to read it but that is not the case. I look at it and try my best to understand but I get confused so I have given up".*

Participant 3: *"Last year both my parents died from high blood pressure. This year my sister, who is just 42 years has been diagnosed with diabetes. This has made me very afraid for the future. I must admit that I like both salt and sugar a lot. When I eat in the homes of my friends or family I*

always find their food to be bland because they do not use as much salt as I use in my food. With what happened to my parents and now my sister, I realise I cannot be careless anymore. It is time to be proactive. I have talked to my GP and he has recommended some books for me to read but I think going through a class with others will help me more and even motivate me. At this moment in my life being able to reduce my salt intake is very important to me indeed".

Participant 4: *"I have a family history of hypertension and I do not want to live the rest of my life on medication. I hate that. To me that is not living. So in order to prevent this, I think I should learn about how to reduce my salt intake. Or don't you think so? It will be good for me, won't it? Yes, I believe this will totally change my life. I just got laid off recently too and I am single so that means I have free time on my hands at the moment. I can come for the lessons if and when they begin, unless I have a job by then".*

Participant 5: *"Hmmm, both my husband and my father are hypertensive. And I know that high salt intake is a contributing factor. My husband still behaves as if he hasn't got any high blood pressure. I want to help him and also help myself in the process so that I won't have to go through what he is going through. This is why I think having a class on how to reduce salt intake will be beneficial".*

From this discussion, it emerged that the participants were worried about reducing their fat, salt and sugar intakes for health reasons.

6.3.3.5 Food portions

Participants also expressed their desire to be able to control their portion sizes which they felt was instrumental to their weight-loss and health.

Participant 1 said *"For me, I just want to learn how to control my portion sizes so I can lose weight. I do not want to die young like my father did. I believe this will be the right step for me".*

Participant 2: *"Is it at all possible for me to reduce what I actually eat? If it is, then I want to know about this. I have actually heard that the plates we use now are bigger than let's say plates from 10-20 years. My wife gives me too much food and when I tell her that I am trying to control my weight she gets offended. So today we both came. We both want to learn how to reduce our*

portion sizes. My wife is the one who needs this the most but I will give her moral support when the time for the teaching comes".

Participant 3: *"Simply put, I eat too much but I want to reduce what I eat. I know it is difficult but with the right lessons and encouragement, I believe I can do this. So please help me."*

6.3.3.6 Planning meals and shopping

Several participants thought that not only was it important for them to know how to plan their meals but also how to shop for healthy ingredients.

Participant 1: *"They are always saying 'eat healthily, reduce this, cut out that" but no one tells you how to shop for these things. How can we buy more healthy foods when these are more expensive? I want to change my lifestyle but this has to be affordable for me, otherwise what is the point? Any help or suggestions in planning my meals will be greatly appreciated. I am a very busy mum with 2 young children so any tips on this issue will come in really handy".*

Participant 2: *"Someone once said, you can't put a price on health. Well is this true? I think all those people who can't afford to buy more expensive brands will disagree with this statement. How do I go to the supermarket, and buy healthy foods whiles still saving cost. For me truly, if there's any way that this can be done, I would like to know about it. Who doesn't want a good thing? But if that good thing is not affordable then, to me that ceases to be a good thing".*

Participant 3: *"I am trying to lose weight at the moment. I am also employed full time and also a student. As much as I want to eat healthily, most of the time I am too busy and I'm too tired, I don't know what to do. Shopping and planning meals are the two issues I am always thinking about now. I want to improve my life and I think really knowing how to shop for healthy foods and also planning healthy meals will really bring a positive change into my life".*

There were some participants who felt that although this topic was important, they could not give reasons why they thought it was important.

6.3.3.7 Beauty

In spite of the fact that most of the discussions centered on health because most participants wanted to lose weight for health reasons, there were some few who wanted to lose weight to look more attractive.

Participant 1: *"I know we all talking about health here, but for me I think more about how I look than whether I am healthy or not. I really want to lose weight to feel more confident. I want to fit into all the nice looking clothes. The ones for bigger people look weird to me and yet these are the ones I have been buying and wearing for the past decade."*

At her comment, some participants started laughing. But there were some others who shared the same sentiments.

Participant 2: *"I agree with what participant 1 said. This is also an issue for me. I must say that although I hear from people that I have to reduce my weight to improve my health, I don't think about the health benefit of losing weight at all. Being overweight I think makes me look less attractive which in turn makes me unhappy. So how can I be unhappy and think about health? So for me beauty and self-confidence first and then health last. The more I lose weight, the healthier and more attractive I will become. It's a win-win situation for me."*

Participant 3: *"Thanks for bringing up the importance of beauty in weight-loss. I wanted to raise the topic but thought people will think I was not serious. And like my sister said, this is something that we overlook although it is so important. People have committed suicide because they were so unhappy with the way they looked."*

Participant 4: *"I understand what you are all saying and I see the importance but is beauty really a strong motivator for weight-loss?"*

At this comment, there were loud "yeses" from several of the participants present.

6.3.3.8 Setting weight-loss goals

The last topic to come up for discussion was how to successfully lose weight and keep it off. At this, it was obvious that this topic was very important for those who had tried to lose weight in the past but had failed.

Participant 1: *"I think this is also important. How do we lose weight and actually keep it off. Is it difficult for some of us to lose weight because we don't set goals? This is what my friend said but since I don't know anything about this topic, I couldn't say anything. Any help here will be greatly appreciated"*.

Participant 2: *"I think we should talk about how to set or determine how much weight to lose and how fast we should lose this. I don't know if this is important or not but my GP said I should consider this when trying to lose weight".*

Participant 3: *"I have been trying to lose weight for years and still I haven't been able to keep it off. I lose and then gain it all back. Lose and gain again. I think I know what my problem is; I try to lose too much weight at once. I am always in a hurry to get rid of the weight. How do I lose weight at a pace and a rate that I can keep it off? And also how do I motivate myself to continue with the weight-loss without losing focus. I need motivation, I need help".*

Participant 4: *"Do you know the number of times I have lost weight and put it back on? Uncountable times. And this has been going ever since I was a teenager. I am now in my thirties and I am still struggling with the same issues. If there is a magic pill to make the weight stay off, then I will take it. So I would really like to know how to lose weight and keep it off forever. I am tired of going back and forth on this weight-loss thing."*

After talking about this topic, participants reported that they were satisfied with the discussions so far and felt that all their concerns had been examined especially in respect to the nutrition intervention programme. And although there were other issues that could be discussed under the nutrition intervention programme, most participants acknowledged that the topics discussed above were of utmost importance. From the focus groups, it was observed that although the participants showed a lack of knowledge about general nutrition and health, there was a willingness to learn to improve their lives.

6.4 DISCUSSION

6.4.1 Perceived and ideal body size

Among Ghanaians it is generally accepted that Ghanaian men prefer women who are slightly plump. But so far only a few studies have been able to establish whether this observation is actually true or not (Duda et al., 2006; Jumah & Duda, 2007). Results from the focus groups, showed that the perception of the ideal body size for Ghanaian migrants in London was influenced mostly by health reasons. About 65% of women reported that they were currently trying to lose weight. The strongest motivator for those trying to lose weight was dissatisfaction with body size; women who were not satisfied with their current body size and shape were more likely to report trying to lose weight than those who reported they were satisfied with their weight. Another motivator for wanting to lose weight or currently trying to lose weight was age.

Both migrants and natives Ghanaians perceived themselves to be thinner than they were. The "ideal body size" was perceived to be normal size in both migrant and native Ghanaians. The idea that Ghanaian men preferred "plump" or big women has also been found not to be true in a study by Jumah & Duda, (2007). In the study, the researchers found that 69.7% of Ghanaian men preferred women who were of normal weight. In comparison about 56.5% of the women sampled preferred to be of normal weight and 48.4% stated that they believed men preferred women in the normal BMI range.

6.4.2 Gender and ideal body image

The study showed that there were some differences between men and women in relation to ideal body size or the most attractive body size. A higher proportion of migrant Ghanaian males found females with normal body weight to be desirable. This was in contrast to their female counterparts who thought that most Ghanaians males preferred females who were overweight. However, for native Ghanaians, the opposite was observed. This could be because of age differences or because of the influence of westernisation on native Ghanaian females. In Nigeria, researchers have also found out that both hypertensive and diabetic people preferred to see the opposite gender with some visible fat (Okoro & Oyejola, 2008). Thompson et al., (1996) observed that most African American men generally prefer larger women than white men. In the United States, black American men have been found to prefer females with larger bodies while black American females prefer slightly thinner body types for males (Jackson & McGill, 1996). Within this culture,

black men have been found to value women with wide hips and round buttocks and black women valued full lips and muscular legs. Black African American adolescents have also been found to prefer a heavier ideal female body size than white adolescent males (Thompson et al., 1996). These African American adolescents were also convinced that their parents and both male and female friends would also select a heavier female body size as the ideal body type they preferred. In some of these settings, overweight and obesity are more likely to be seen in positive terms (Thompson et al., 1996; Gipson et al., 2005).

6.4.3 Body dissatisfaction

Body dissatisfaction is the difference between the ideal body size and the current body size. From this study, it was observed that Ghanaian females were more likely to be dissatisfied with their current body size compared to Ghanaian ales. A study in Nigeria observed that Nigerian females were more likely to be less satisfied with their existing body shape compared to males (Okoro & Oyejola, 2008). Almost all the overweight females in London reported the desire to want to lose weight through the nutrition intervention programme or through any other weight-loss programme available. Only a small percentage of males wanted to change their overall body size. This could be because most of the males were of normal body size.

Body dissatisfaction and the desire for normal weight have been found to be common among people of high socio-economic status across most world regions (Swami et al., 2009). In a sample of overweight black and white female dieters, it was found that BMI contributed more to body dissatisfaction scores more in white women than black women (Caldwell et al., 1997). Socioeconomic status was also more predictive in identifying important body image factors for both black and white female dieters in the above study. However, race did not predict differences in body dissatisfaction, self-esteem, discrepancies between actual and ideal shape and weight or the relationship between self-esteem and body dissatisfaction. However, in a study among female college students, Adkins, (1999) found that while there are no significant racial differences in perceived current body size or self-reported weight, black female students were more likely to select a larger size as their ideal body size from the figure rating scale. The black female students were also more likely to describe less body dissatisfaction, a lesser fear of body fat and a lesser drive for thinness than white female student (Adkins, 1999). Black female college students have also been found to be more tolerant of a variety of body sizes (Gipson et al., 2005).

Simon et al., (2003), has also observed that the body image of adolescents has also been found to differ among 3 different ethnic groups in the Caribbean country of Trinidad. The overweight African adolescents in the above study were found to be satisfied with their weight compared with South-Asians and those from a mixed race background. Among the thin adolescents, the South Asians were more likely to be satisfied with their weight compared to the other ethnic groups. It was however, interesting to observe that while the majority of the sample associated normal body size with good health, they associated overweight and obesity with wealth and happiness (Simon et al., 2003). In the focus group, there were some older participants who also associated overweight and obesity with health and peace of mind, however, because of health reasons, these participants believed that being of normal weight was important.

6.4.4 Focus groups on nutrition intervention

From the focus group discussions, it was observed that most of the participants were interested in the nutrition intervention education. Although the overweight and obese participants were mostly interested in losing weight, those of normal weight were interested in improving their knowledge on nutrition and health to improve their overall health and safeguard their future. Based on the information obtained here, a nutrition intervention programme was developed. To make this programme more successful, input and advice from the Obesity Clinic at The London Metropolitan University was sought, and its current nutrition and weight-loss programme was used as a template for the nutrition intervention programme.

6.4.5 Summary

The study showed that there was a cultural shift in acceptability of overweight and obese body sizes and shapes among Ghanaians. Migrant females were more likely to underestimate their perceived body sizes. First generation Ghanaian migrants in the UK wanted to have smaller body sizes for health reasons whereas native Ghanaians wanted to be thinner to look more attractive to the opposite sex and improve their social status. The sample size used for this study was small and not necessarily representative of the whole Ghanaian population in the UK. Data was qualitative but nevertheless useful.

CHAPTER 7

NUTRITION INTERVENTION PROGRAMME FOR FIRST GENERATION GHANAIAN MIGRANTS IN LONDON

7.1 NUTRITION INTERVENTIONS – WHY, HOW AND IMPORTANCE

Nutrition interventions address specific goals or targets by directly changing intake or indirectly influencing factors that affects the behaviour of populations (Margetts, 2004). Interventions can either be delivered to individuals or to populations. Reviews of several nutrition and health interventions reveals that most people who want to lose weight want to do this with minimum change to their regular dietary intake (Bronner & Boyington, 2002).

A review of some nutrition interventions programmes has revealed that, the most successful ones were ethnically and culturally appropriate and of usually long durations (Kumanyika et al., 1992; Kumanyika, 1993; McNabb et al., 1993; McNabb et al., 1997; Holm et al., 1998; Bronner & Boyington, 2002; Sahay et al., 2006). Also employing multiple programmes and strategies within an intervention can contribute to the success of the programme (Roe et al., 1997; Pignon et al., 2002). Effective interventions should be based on educational and behavioural frameworks and have a strong focus on behaviour change (Pignon et al., 2002; Eyles & Mhurchu, 2009). Successful interventions should also have programmes for self-monitoring, evaluation and adherence/maintenance and should employ the use of highly trained researchers or personnel to conduct the intervention (Pirie, 1990; Silberman & Auerbach, 1990; Roe et al., 1997; Brunner et al., 2005; Sahay et al., 2006; Neville et al., 2009; Merrit & Taylor, 2012).

Several media can be used to promote nutritional changes in individuals. This includes skills training in cooking, planning meals, shopping, how to read labels, managing a budget or counseling (Turner et al., 1995; Ard et al., 2000; Resnicow et al., 2000; Christie et al., 2010). Using prompt sheets with agreed weekly or monthly targets can help achieve and maintain dietary changes in individuals (Roe et al., 1997; Margetts, 2004). The mass media and posting of

flyers or leaflets can also be used to raise awareness about issues and to educate the public (Grilli et al., 1997; Reger et al., 1999; Nestle & Jacobson, 2000; O'Cathain et al., 2002).

7.1.1 Settings for nutrition interventions

The settings for the interventions can be churches, schools, health care settings, workplaces, communities or the commercial sector (Biener et al., 1999; Campbell et al., 1999; Margetts, 2004; Reynolds et al., 2004; Thorogood et al., 2007). These settings are relatively controlled communities that provide an atmosphere for peer support and leadership. It also provides opportunities for implementation of special programmes and activities as well as lasting changes relating to attitudes about food and drink (Thorogood et al., 2007). Most community or population based intervention studies are non-randomized controlled trials with a before and after evaluation design (Croft et al., 1994; Forester et al., 1995; Albright, 1996; Reger et al., 1998; Reger et al., 1999; Reger et al., 2000; Stables et al., 2002; Holdsworth et al., 2004; Huot et al., 2004).

7.1.1.1 Nutrition Intervention in Churches

In most African communities, the church community is the primary source of social support and community leadership (WHO, 2009). Many black or African churches now include health promotion as part of their overall church programme (Clay et al., 2005). These churches include health awareness days or health events through special ministries and committees set up by the church (Lasater et al., 1997; Resnicow et al., 2002). Churches can be excellent research settings because of the ease of participant identification, selection, recruitment and tracking. Churches can also be used to access populations from different socio-demography because normally the congregation is made of people from different professions, ages, marital status and education level. This makes it easier to include participants from different social classes (Campbell et al., 1999; Resnicow et al., 2001; Resnicow et al., 2002; WHO, 2009).

The majority of church-based intervention programmes have been conducted in the USA on African Americans (Turner et al., 1995; Campbell et al., 1999; Yanek et al., 2001; Bowen et al., 2004; Lin et al., 2007, McDowell et al., 2011). In the African American communities in the United States, churches are well accepted sites for cancer screening, blood pressure control, weight-loss programmes, cholesterol education, smoking cessation, diabetes education, stroke prevention and physical activity and nutrition education (Campbell et al., 1999; Fitzgibbon et al., 2005; Winett et al., 2007; Watkins et al., 2010; McDowell et al., 2011). The objectives of these intervention

studies have ranged from increasing fruit and vegetable consumption, decreasing fat and total calorie intake, decreasing cardiovascular risk factors while increasing positive lifestyle factors, increasing physical activity, to a combination of two or more of the above (Yanek et al., 2001; Thorogood et al., 2007)

7.1.1.2 Nutrition interventions in other settings

Nutrition interventions in schools, the workplace and health care centres are quite common. Schools can be one of the most effective and efficient ways to reach a large proportion of the population including children, school staff, families and communities (Perry et al., 1997; Lytle et al., 2001; Sahota et al., 2001; Birnbaum et al., 2002; Lowe & Horne, 2002; Podrabsky et al., 2007; Mwanga et al., 2008). The workplace has a relatively stable population and is an easy access to a large number of people at the workplace. This working community can offer positive peer support to people (Hunt et al., 1993; Heimendinger et al., 1995; Biener et al., 1999; Fries et al., 1999; Marcus et al., 2001; Fiske & Cullen, 2004; Anderson et al., 2009; Conn et al., 2009). Health care based interventions can be unique settings to promote healthy nutrition and physical activity especially in countries where a significant majority of the population is registered with a doctor (Fletcher & Rake, 1998; Margetts, 2004). This setting can be an effective setting for preventing chronic diseases (Brunner et al., 1997; Santana & Barreto, 2005; Couch et al., 2008; Perry et al., 2013). See Tables 7.1 to 7.4 for reviews on selected intervention studies conducted in settings other than churches.

7.2 STUDY OBJECTIVES

The objectives for this chapter were to design and administer a culturally tailored nutrition intervention programme for Ghanaian migrants in London using the churches and evaluate the effectiveness of the intervention programme.

Table 7.1 – A review of a nutrition intervention study at the workplace

Author	Study design	Sample	Exposure assessment	Findings	Comments
Hunt et al., 1993	Randomised control study	16 worksites 2365 participants at baseline 1762 participants at baseline and follow-up Intervention and control groups	Use of self-administered 67 item food frequency questionnaire Education to increase fruit and vegetable, whole grain and high fibre foods. Reduce fat intake Use of classes, taste test and food demonstrations to educate employees Follow-up at 15 months	Change on fruit intake between the two groups was not significant (6.420 servings/month vs 2.948 servings/month for the intervention and control group respectively, p=0.21) Significant differences of $p<0.02$ for vegetable intakes between the groups Greater reduction in intake of processed margarine and butter in intervention group	Changes in intervention group was higher compared to changes in control group

Table 7.2 – A review of a nutrition intervention study at the workplace

Author	Study design	Sample	Exposure assessment	Findings	Comments
Marcus et al., 1998, 2001	Randomised control study	1706 participants (78.9% females) Over 18 years Intervention and control groups	Baseline telephone assessment of demographics and fruit and vegetable intake Short series of educational and motivational sessions with emphasis of increasing fruit and vegetable consumption for intervention group only Re-assessment of fruit and vegetable intake at 4 weeks, 4 months and 12 months For control group, only baseline and follow-up assessments only with no education sessions Use of 24-hour recalls and food frequency questionnaire	1022 completed a 12 month follow-up At baseline no difference in fruit and vegetable consumption between intervention and control groups (3.79 vs 3.73, $p>0.05$) At 4 weeks intake was 4.7 for intervention and 3.82 for control group, $p>0.001$. At 4 and 12 months, intakes for intervention group were higher than that for the control group ($p>0.001$).	Increased fruit and vegetable consumption in the intervention group

Table 7.3 – A review of a nutrition intervention study in a school

Author	Study design	Sample	Exposure assessment	Findings	Comments
Sahota et al., 2001	Randomised controlled study	636 children between the ages of 8-10 years Intervention group; 314 children Control group; 322 children 10 schools in Leeds	Use of 24-hour recall and 3-day diary at baseline and 12 months Use of health promotion targeting whole school community including teachers, parents and catering staff Teacher training, modification of school meals, curriculum development, physical education and playground education Control group received usual school curriculum	Children in the intervention group had a higher vegetable intake after the study Weighted mean difference in vegetable intake was 0.3 serving (95% CI 0.2-0.4). this is 50% of baseline intake The 3 day diet diary did not report any significant changes	Small but meaningful change observed in intervention group

Table 7.4 – A review of a nutrition intervention study in two primary schools

Author	Study design	Sample	Exposure assessment	Findings	Comments
Lowe & Horne, 2002	Non-randomised controlled study	748 children in two primary schools in deprived areas of South London Ages of 5-7 years Intervention group; 364 children Control group; 384 children	Children in the intervention school received the 16 day Food Dude programme which consisted. Children in this group were taught to name fruits and vegetables with reinforcement using a video. Prizes were awarded to children who consumed sufficient amounts of targeted fruits and vegetables Both groups received a supply of fruits and vegetables at snack and lunch time 10 week maintenance phase and 4 month follow-up	Consumption of fruits and vegetables was significantly higher at lunchtime at follow-up than at baseline for the intervention group. Fruit and vegetable intake increased from 36% to 79% during intervention and remained raised at 61% at 4 months. During snack time, fruit intake increased from 75% to 87% ($p<0.001$) during the intervention. However this reduced back to baseline levels at follow-up	Over 80% of children in the study were from an ethnic minority group

7.3 METHODOLOGY

This section looks at the development, implementation and evaluation of the nutrition intervention programme in first generation Ghanaian migrants recruited from the churches.

7.3.1 Why use a culturally tailored intervention programme

Most researchers agree that health promotion and intervention programmes should be culturally sensitive to the population of interest (Marin et al., 1995; Resnicow et al., 2000). A culturally sensitive intervention programme enhances and determines the overall impact of the programme (Airhihenbuwa et al., 1992; Resnicow et al., 2002; Thorogood et al., 2007). Developing a culturally sensitive programme involves matching intervention materials and messages to observable behavioural, cultural and social characteristic of the target population (Resnicow et al., 2002). It should also fit within the experience of the target population (Resnicow et al., 2002; McDowell et al., 2011). These programmes should also understand the influence of religion, family, sociodemography, economics, society and government on the population of interest (Airhihenbuwa et al., 1992; Resnicow et al., 2002; Thorogood et al., 2007).

These may involve the use of foods, people, places, language, locations, brand names, music and clothing familiar to and preferred by the population of interest (Resnicow et al., 2002; Thorogood et al., 2007). It also involves identifying the settings and channels that are most appropriate and suitable for administering the programme. Because intervention programmes are interested in modifying behaviours, it is important to understand the characteristics of the intended change. Thus for an intervention programme to be successful, it should reflect the extent to which the programme will correspond to the needs and preferences of the target population (Yanek et al, 2001; Resnicow et al., 2002; Thorogood et al., 2007; Watkins et al., 2010).

7.3.2 Developing the intervention programme

The purpose of this chapter was to develop a competent and culturally appropriate nutrition intervention programme for Ghanaian migrants in London. The process of developing the programme involved; recruiting church participants, assessing the diet and anthropometry of participants and designing a church based programme to address all dietary and lifestyle issues among this population.

Before initiation of the nutrition intervention programmes, two focus groups of about 45 people were organised with study participants from two different Ghanaian majority churches. This meeting lasted for approximately 45 minutes and was conducted in an informal setting in the church with the Pastors' wives included. All present were encouraged to participate and not just be observers. Participants were invited to freely discuss their understanding of nutrition and health. They were also asked their input on what they would like to be included in the topics to be covered under the nutrition intervention programme. Special care was taken to ensure that participants were at ease at all times. All sessions were recorded on tape recorders. Participants were made aware that the sessions were being recorded so they could speak clearly and slowly. The materials and information gathered from the focus groups were used to develop a nutrition education programme for this population. Input and advice from the Obesity Clinic at The London Metropolitan University was sought, and its current nutrition and weight-loss programme was used as a template for the nutrition intervention programme.

Topics discussed under the intervention programme includes

- Balanced diet
- Planning your meals and shopping
- Fat and Food labelling
- Food portion control
- Salt and Sugar
- Setting realistic weight-loss goals

7.3.3 Initial Contact

Initial contact was made with about 35 eligible churches and about 10 agreed to participate in the intervention. Further meetings were held with Pastors and church leaders to discuss the intervention further and also agree on possible day to start the intervention. However, after several months of discussions and further meetings, the number of churches willing to participate reduced to 2 Churches in Newham and the Tower Hamlets.

Reasons cited for these included;

- Scheduling conflicts and time available
- Unwillingness of Pastors and leaders to participate

- Change in church leadership
- Access to church venues for the sessions

After agreeing to participate, initial announcements were made by the Pastors about the intervention programme during church services on Sunday. The principle investigator was also allowed to talk to the congregation and present the intervention programme in greater detail. After this, further announcements were made by the church leaders or Pastors prior to the commencement of the intervention. Notices were also placed on the church notice boards to broadcast this further. A week before enrolment, the principal investigator visited the churches again to remind participants about the intervention programme. On the day of enrolment, final announcements were made from the pulpit by both the pastor and the study principal investigator inviting all eligible participants aged 18 years and older to attend a recruitment meeting after the church service.

7.3.4 Eligibility criteria and Consent processing

Although the intervention programme used was designed at the individual level to enhance self-efficacy, it was implemented in group sessions to ensure strong support among the participants. The study aims, designs and requirements were explained to all participants by the principal investigator. Once participants were found to be eligible for and interested in the study, they were given the fully informed written consent form to read and sign. All participants had to be literate and able read and write in English. Participants were also told verbally that they remained free to end their participation at any time without explanation. Below is the inclusion and exclusion criteria used to screen participants for the intervention (Table 7.5).

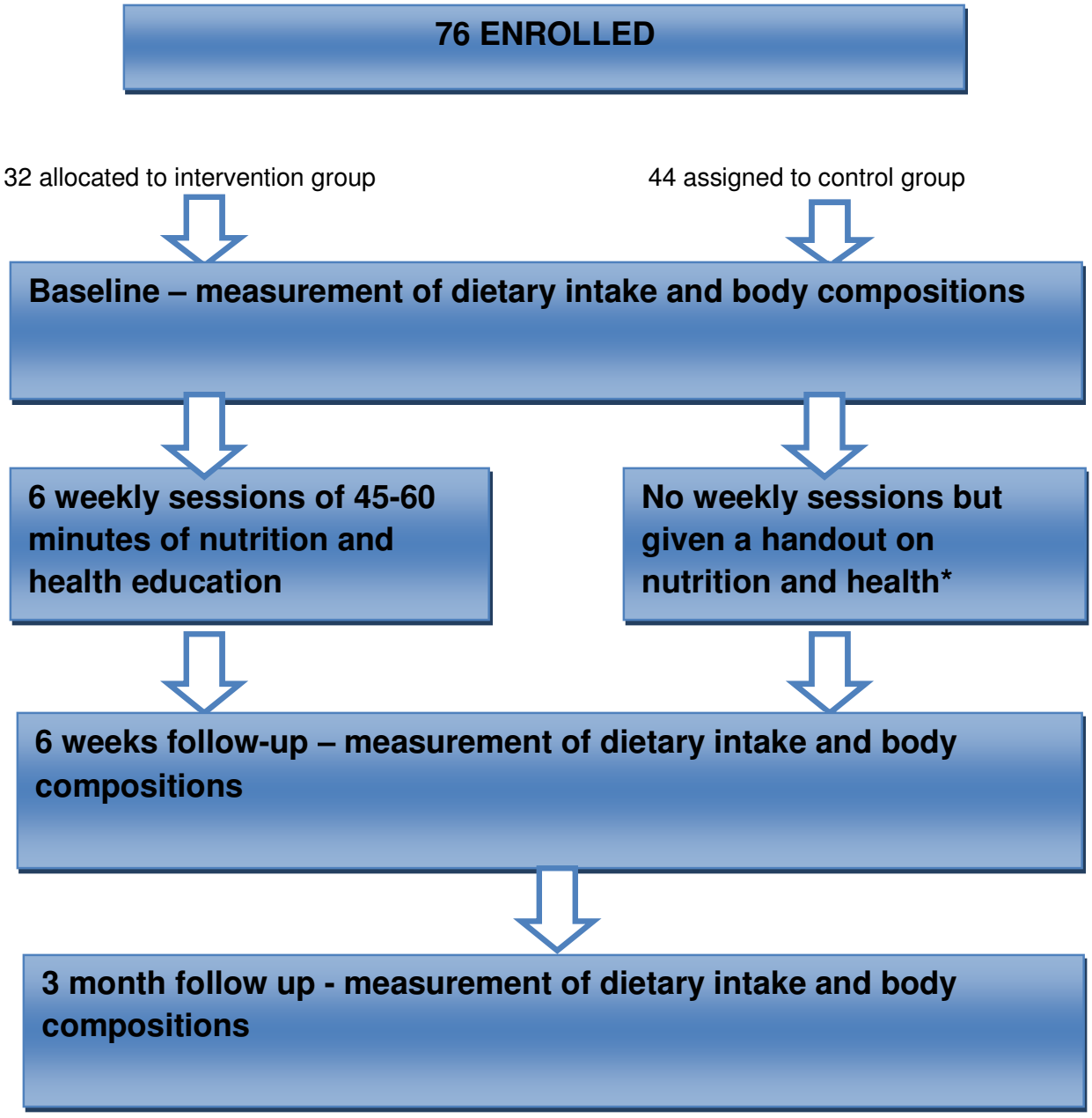
Table 7.5 – Inclusion and Exclusion criteria used

Inclusion Criteria – Participants were	Exclusion criteria (Participants were excluded if they had conditions that might interfere with the research)
• At least 18 years • Male or female • Ghanaians • In a stable medical condition • BMI ≥ 25kg/m² • Ability to shop for/prepare meals • Ability to independently perform physical activities	• Depression • Alcohol or drug addiction • Inability to attend all sessions • Inability to read and write in English • Chronic diseases or any other disease • Not on any other weight-loss programme • Pregnancy

7.3.5 Recruitment and group allocation

Before enrollment, potential participants were informed that there will be 2 groups for the intervention programme, one that attends weekly class sessions for 6 weeks and the other as the control group. Participants from one church were assigned to the intervention group and those from the other church assigned to the control group. An overview of the recruitment and group allocation of study participants can be found in Figure 7.1.

Figure 7.1 – Overview of group allocation and study design



* Information included in the handouts was the same as that delivered to participants in the weekly sessions.

7.3.6 Implementing the intervention programme

The aims, design, requirements and risks associated with the intervention were explained to all participants by principal investigator before the commencement of the intervention. At the beginning of the intervention, all participants in both groups were encouraged to form weight-loss buddies and keep a food journal which they were asked to bring to the next session. Participants from one church were assigned to the control group and the other assigned to the intervention group (Refer to Figure 7.1).

Participants from the intervention group attended six 45 minutes to 1-hour educational sessions that mimicked Christian prayer and bible study followed by a further 30 – 45 minutes of a questions and answer segment. The first session lasted for longer than the rest of the sessions because of the baseline measurements taken. The sessions were run on Sundays for 6 consecutive weeks. This intervention programme was presented as a tool to gear participants to make significant but small changes in their dietary and lifestyle activities to improve their overall health. Models were used when necessary to help participants understand the sessions better. The topics of the core sessions presented to the participants are shown below (A more detailed information on all the topics discussed under the intervention programme can be found in Appendix B).

Table 7.6 – Topics discussed under the nutrition intervention programme

Sessions	Session topics and Overview
Session 1	Introduction: Overview of study, sessions, Obesity and balanced diet (Balanced diet being the main topic taught).
Session 2	Planning your meals and shopping: This focused on how participants can save time by planning their meals, eating out and shopping strategies that will help them buy healthier foods whiles saving money.
Session 3	Fat and food labelling: This included ways to reduce their fat intake and how to read the different nutrient and food labels.
Session 4	Food portion control: This included information on how to reduce food portion size and alcohol intake and how to make easy food substitutions
Session 5	Salt and sugar: Material included how to read salt and sugar labels and how to reduce salt and sugar intake
Session 6	Setting realistic weight-loss goals: This was the last session. Session discussed ways on how to set realistic weight-loss goals, to keep motivated, monitor weight and maintain weight

Table 7.6 above shows the topics that were discussed under the nutrition intervention programme. Each session of the intervention programme began and ended with prayers. The weekly sessions included praise and worship sessions, teaching and questions and answers segments. The six experimental group sessions held with the participants had a basic format and structure. Each session had a strong focus on making dietary changes and improvements with some focus on physical activity. At the beginning of each session, there was a group discussion where participants shared what dietary or lifestyle changes they managed to make during the week. They also discussed what problems they faced and how they managed to overcome them. The educational component of each session was followed by a short question and answer session. Participants were also given pedometers to monitor their steps. At each session,

participants were also encouraged to freely talk about whatever difficulty they faced trying to implement what they learned into their schedules and lives. All the sessions were interactive and included opportunities for all the participants to share the successes and struggles they faced trying to implement the new changes in their lives. Unlike other intervention programmes, there were no physical activities in all the sessions. This was because of the cost, time and health and safety regulations that had to be met in order to employ a qualified fitness instructor. However, participants were encouraged to practice what they had learnt on physical activity during the week.

There were no weekly sessions for the control group. However, there was a short group session where participants were shown how to use the educational materials. Although participants were also given pedometers and handouts on nutrition and health, no further help was given to participants except the contact details of the principle investigator. Table 7.7 shows the parameters that were measured at baseline, 6 weeks and 3 months for both the intervention and control groups.

7.3.6.1 Socio-demography

Participants were interviewed to collect background information on age, gender, marital status, occupation and level of education. The questionnaire has been piloted on a sub-sample of the study population to ensure that wording was culturally sensitive and also logically set out.

7.3.6.2 Anthropometric measurements

Before the commencement of the intervention programme, baseline anthropometric measurements and usual dietary intake was assessed. Anthropometric indices of height, weight, waist and hip circumference was obtained as well as percentage body fat. Weight and percentage body fat was measured to the nearest 0.1kg and 0.1% respectively after removal of shoes, heavier clothing and pocket contents using a portable bioelectric impedance analyzer (Tanita Co., Tokyo, Japan). Participants were also encouraged to void their bladders prior to the measurement. Height was measured to the nearest 0.1cm using the Leicester Height Measure for each measurement. For each height measurement, participants were asked to keep their feet flat on the ground and look ahead. Participants were required to be barefoot and they were instructed to stand with their heels together and back and buttocks pressed against the stadiometer. They were then asked to inhale deeply and exhale. During the process of exhalation, the moveable

headboard was brought down until it touched the head such that the hair was compressed. Height was measured and BMI calculated as weight (kg) divided by the square of height in metres (m^2) (WHO, 2004). Both WC and HC were measured after removal of heavier and outer garments. Waist to hip ratio was then calculated by dividing waist circumference (cm) by the hip circumference (cm). A more detailed report on how measurements were taken can be found in Chapter 5.

7.3.6.3 Dietary Intake

A validated food frequency questionnaire (Chapter 4) was administered to participants to assess individual nutrient intake measures of energy, total fat, protein, sodium and fibre. The FFQ was used because it contained food items relevant to the study intervention and allowed for the separation during analysis of the majority of the food items into the major food groups. The FFQ was designed to record additional information on if and any supplements taken, method of cooking, the type and amount of fat used and the consumption of fat on meat. After completion, the FFQ's were checked to ensure that all questions had been asked for completeness. After 6 weeks and at 3 months, the efficacy of the nutrition intervention programme was measured through re-administration of the food frequency questionnaire and re-collection of anthropometric indices to assess changes in nutritional knowledge and body composition. The McCance & Widdowson food composition tables and the Ghana food composition table were used to find the average dietary intake of Ghanaian migrants of the study participants (Food Standard Agency, 2002; Tayie & Lartey, 2000). Average macronutrients and micronutrients served as the primary indicators for assessing change in diet.

Table 7.7 – Schedule of Outcome Measures

Measure	Baseline	6 Weeks	3 Months
Age*	**X**		
Education level*	**X**		
Occupation*	**X**		
Marital status*	**X**		
Attendance	**X**	**X**	**X**
Food Frequency Questionnaire	**X**	**X**	**X**
Weight	**X**	**X**	**X**
Height	**X**	**X**	**X**
Waist circumference	**X**	**X**	**X**
Hip circumference	**X**	**X**	**X**
Waist to hip ratio	**X**	**X**	**X**
Body fat	**X**	**X**	**X**

X – Indicates when outcomes were measures

* Age, education level, occupation and marital status was not determined after 6 weeks and 3 months because it was assumed that this will remain the same as the information obtained at baseline.

7.3.7 Statistical analysis

Data was analyzed using Stata 12.0 (Stata 2011 Corporation, Texas, USA). Although all collected data were coded using a numeric participant identity code (ID) assigned during enrolments, records were not anonymous so as to allow for calculation and analysis of change scores. Data were entered with the participant's assigned ID instead of the participant's name. Background characteristics and all measurements taken were presented as mean and standard deviation for continuous variables (e.g. energy intake) and proportion (%) for categorical variables (e.g. employment). Outcome measures collected allowed for a comparison of changes in variables between the intervention group and the control group (i.e. a between group analysis). For continuous variables, between groups differences were analyzed using the 2-tailed independent Student's t-test on the change scores of the control group vs the intervention group. In addition, a within group analysis was also performed on all participants in both intervention and control groups using the 2-tailed, paired Student's t-tests on the before and after scores at 6 weeks and 3

months. The Pearson's correlation coefficient were used to calculate the within group change scores for each time period for the continuous variables. A multiple regression was used to identify and adjust for education and marital status.

7.4 RESULTS

7.4.1 Characteristics of intervention population

Baseline characteristics are shown in Table 7.8 Participants in the intervention group were on average older than those in the control group. All participants had completed secondary school. Tertiary education was significantly higher in the control group compared to the intervention group. Differences in employment between the two groups were not significant. Marital status was significantly different (p=0.04) between the intervention group and the control group. There were no significant differences in type of employment and housing between the two groups.

7.4.2 Retention and dropout

Results for retention and dropout rates can be observed in Table 7.9. A total of 76 participants were recruited for the study; Thirty two (42%) and forty four (58%) participants for the intervention and control group respectively. Of the 32 intervention group participants, 16% had dropped out by the end of 6 weeks. By the end of the 3 month period, there were twenty three participants left in the intervention group. For the control group, at the time of measurement at the 6 weeks period, there were thirty five participants remaining and nineteen participants at the 3 months period. In total, 45% of participants dropped out from the study. When the participants who were dropped out were asked for the reasons, they cited the following; personal reasons, too much effort needed to make changes, not ready to make changes yet, emigrated to Ghana, work commitments, unavailable at the times of the measurements and difficulties in finding a babysitter. However, most of the participants who remained expressed their desire for the study to be extended and if possible home visits made available. It's worth noting that although, the phone number and email address of the principle investigator was made available to the study participants, only 3 made contact.

7.4.3 Change in dietary intake

Tables 7.10 and 7.11 on above summarizes the within group changes in dietary intake variables for both groups as determined by the food frequency questionnaire analysis.

7.4.3.1 Changes at 6 weeks

On average, there were more changes in the intervention group compared to the control group showing a small reduction in total dietary intake at 6 weeks. Changes in energy intake for the two groups were not significant. Changes in protein and fat intake were significant ($p<0.05$) for the intervention group but not for the control group. Changes in sodium, iron and vitamin E were significant for the intervention group compared to the control group. Change in vitamin C was significant for both groups.

7.4.3.2 Changes at 3 months

After 3 months, decrease in fat intake were significant for both the intervention ($p=0.000$) and control ($p=0.041$) groups. Changes in energy, protein and carbohydrate were not significant for either group. Change in fibre, iron and vitamin C were significant for both groups.

7.4.4 Changes in body composition

Table 7.12 and 7.13 above summarizes the within group changes in body compositions for both groups at 6 weeks and 3 months.

7.4.4.1 Changes at 6 weeks

At 6 weeks, average change in body weight was -1.0kg for the intervention group compared to a decrease of 0.3kg in the control group. However, these observed changes were not significant. There was a decrease in average BMI for both groups at 6 weeks. Change in waist circumference and body fat were significantly higher for the intervention group compared to the control group.

7.4.4.2 Changes at 3 months

At 3 months body weight decreased significantly from 72.6kg to 70.3kg ($p=0.001$) for the intervention group and, mean body weight also decreased for the control group by 0.9kg at $p=0.05$. The change in BMI across both groups decreased significantly for both the intervention and control groups. The decrease in waist circumference was significantly higher for the intervention group (3.3cm, $p=0.04$) compared to the control group (1.9cm, $p=0.006$). The change in waist to hip ratio was the same for both intervention and control group. Average percentage

body fat decreased for both groups but these changes was only significant for the intervention group at 3 months.

Table 7.8 - Differences in socio-demographic variables between Intervention and Control group

Characteristics		Intervention (N=32)	Control (n=44)	P value
Age		43	36	
Education level	*Primary*	0%	0%	
	Secondary	57%	50%	0.05
	Tertiary	43%	50%	
Employment	*Manual*	48%	50%	
	Non-manual	52%	50%	0.52
Marital status	*Single*	19%	31%	
	Married	67%	65%	0.04
	Widowed	7%	2%	
	Separated/divorced	7%	2%	
Housing	*Owned*	19%	35%	
	Council rented	55%	44%	0.4
	Private rented	26%	21%	

Table 7.9 – Table showing retention and dropout rates

Time	Intervention		Control	
	Retention	Dropout	Retention	Dropout
Baseline	32	0	44	0
6 Weeks	27 (84%)	5 (16%)	35 (80%)	9 (20%)
3 Months	23 (85%)	4 (15%)	19 (54%)	16 (46%)

Table 7.10 – Change in dietary intake within groups at 6 weeks

Outcome measures	Intervention (n=27)				Control (n=35)			
	Mean (SD)				Mean (SD)			
	Baseline	6 Weeks	Change	p value*	Baseline	6 Weeks	Change	p value*
Energy (g)	2119 (225.5)	1869 (101.3)	250	0.421	2080 (445.3)	2054 (222.1)	-135	0.093
Protein (g)	62.3 (23.4)	65.8 (16.6)	+3.5	0.0001	70.2 (14.6)	88.2	+18.0	0.061
Fat (g)	76.5 (31.2)	72.7 (21.4)	-3.8	0.042	77.3 (23.1)	75.2 (19.2)	-2.1	0.224
Carbohydrate (g)	253.7 (28.8)	237.9 (95.7)	-15.8	0.231	279.9 (68.5)	256.1 (77.2)	-23.8	0.239
Fibre (g)	18.2 (2.8)	18.5 (3.6)	+0.3	0.325	16.7 (4.6)	16.9 (4.4)	+0.2	0.575
Sodium (mg)	2944.6 (340.0)	2852.9 (118.2)	-124.7	0.037	3021.2 (758.0)	2879.2 (244.7)	-142	0.149
Iron (mg)	11.0 (2.1)	11.9 (1.4)	+0.9	0.026	11.1 (1.3)	11.3 (1.3)	+0.2	0.427
Vitamin B12 (µg)	3.2 (1.4)	3.2 (0.1)	0.0	0.285	2.5 (0.3)	3.9 (0.8)	+1.4	0.0001
Vitamin E (mg)	9.7 (2.1)	8.8 (1.5)	-0.9	0.021	9.8 (2.0)	8.8 (1.6)	-1.0	0.331
Vitamin C (mg)	63.2 (9.9)	74.2 (11.2)	+11	0.0001	76.8 (11.1)	87.0 (15.1)	+10.2	0.044

Notes

Significance of within group comparisons P for intention to treat student's paired t test comparing baseline and follow-up measurements.

*Significance difference after adjusting for education and marital status

Table 7.11 – Changes in dietary intake within groups at 3 months

Outcome measures	Intervention (n=23)				Control (n=19)			
	Mean (SD)				Mean (SD)			
	Baseline	3 Months	Change	p value*	Baseline	3 Months	Change	p value*
Energy (g)	2022 (282.4)	1976 (119.3)	-55.6	0.218	2072 (384.5)	2058 (365)	-14.4	0.118
Protein (g)	66.8 (24.4)	70.2 (19.3)	+3.4	0.014	70.2 (30.0)	67.1 (15.9)	-3.1	0.061
Fat (g)	75.9 (37.1)	68.6 (39.0)	-7.3	0.0001	83.7 (8.0)	73.3 (24.5)	-10.4	0.041
Carbohydrate (g)	268.0 (23.2)	269.5 (56.9)	+1.5	0.083	279.8 (96.7)	274.3 (67.2)	-5.5	0.072
Fibre (g)	17.1 (4.5)	18.9 (3.7)	+1.8	0.047	16.9 (5.0)	14.2 (3.9)	-2.6	0.004
Sodium (mg)	2989.5 (188.2)	2965.3 (531.8)	-24.2	0.056	2992.8 (313.0)	2985.9 (262.9)	-6.9	0.025
Iron (mg)	10.8 (2.2)	11.3 (2.1)	+0.5	0.045	10.5 (1.8)	11.1 (1.4)	+0.7	0.038
Vitamin B12 (µg)	3.4 (1.5)	3.3 (0.1)	-0.1	0.438	2.6 (1.3)	3.4 (1.3)	+0.8	0.311
Vitamin E (mg)	7.9 (3.6)	10.0 (2.2)	+2.1	0.127	10.1 (1.9)	9.7 (2.2)	-0.5	0.062
Vitamin C (mg)	61.6 (11.3)	70.3 (1.3)	+8.7	0.024	68.4 (9.7)	77.5 (7.7)	+9.0	0.009

Notes

Significance of within group comparisons P for intention to treat student's paired t test comparing baseline and follow-up measurements. Significance of between group comparisons

*Significance difference after adjusting for education and marital status

Table 7.12 – Changes in anthropometry within groups at 6 weeks

Outcome measures	Intervention (n=27)				Control (n=35)			
	Mean (SD)				Mean (SD)			
	Baseline	6 Weeks	Change	P value	Baseline	6 Weeks	Change	P value
Weight (kg)	73.6 (1.3)	72.6 (1.7)	-1.0	0.102	68.6 (2.6)	67.8 (6.2)	-0.3	0.064
BMI (kg/m²)	27.5 (0.5)	26.9 (3.1)	-0.6	0.070	25.3 (0.9)	25.1 (2.2)	-0.2	0.072
Waist circumference (cm)	90.6 (1.2)	88.4 (0.9)	-2.2	0.050	88.5 (5.8)	87.4 (0.5)	-0.6	0.055
Waist to hip ratio	0.8 (0.02)	0.70 (0.1)	-0.1	0.082	0.9 (0.03)	0.88 (0.03)	-0.02	0.107
Body fat (%)	29.5 (2.3)	27.7 (4.2)	-1.8	0.057	27.0 (1.6)	26.6 (2.1)	-0.4	0.076

Notes

Significance of within group comparisons P for intention to treat student's paired t test comparing baseline and follow-up measurements.

*Significance difference after adjusting for education and marital status

Table 7.13 – Changes in anthropometry within groups at 3 months

Outcome measures	Intervention (n=23)				Control (n=19)			
	Mean (SD)				Mean (SD)			
	Baseline	3 months	Change	P value	Baseline	3 months	Change	P value
Weight (kg)	72.6 (1.3)	70.3 (8.7)	-2.3	0.001	68.1 (3.8)	67.2 (2.0)	-0.9	0.050
BMI (kg/m²)	27.5 (0.5)	26.1 (3.0)	-1.4	0.001	25.5 (1.2)	24.4 (1.0)	-0.7	0.064
Waist circumference (cm)	91.6 (1.2)	88.6 (1.6)	-3.3	0.040	90.1 (5.6)	88.5 (4.2)	-1.9	0.006
Waist to hip ratio	0.8 (0.02)	0.7 (0.1)	-0.1	0.055	0.9 (0.03)	0.8 (0.01)	-0.1	0.031
Body fat (%)	29.2 (2.3)	27.2 (2.1)	-2.0	0.014	27.1 (3.9)	26.4 (4.4)	-0.7	0.173

Notes

Significance of within group comparisons P for intention to treat student's paired t test comparing baseline and follow-up measurements.

*Significance difference after adjusting for education and marital status

7.5 DISCUSSION

Using culturally sensitive dietary interventions to change lifestyles and reduce the incidence and prevalence of overweight and obesity in high risk populations is an international accepted public health practice (Resnicow et al., 2000; Paschal et al., 2004; Centre for Disease Control and Prevention, 2010). For several years now, church-based nutrition and health intervention programmes have grown in the United States particularly within African American churches (Winet et al., 2007). Using churches as settings for interventions have been found to have the greatest impact in the African American community leading to significant behavioural changes (Hampton et al., 2010). Church settings are often used to access and intervene in populations who share similar values and social networks (Lasater et al., 1991). The focal point in the lives of many people who go to church is the importance and meaning of spirituality/religion to their culture (Mattis, 2000). The importance of church life in the lives of people can therefore be used to positively affect health behaviours and outcomes (Miller, 1995).

Churches selected for participation in the intervention programme were selected on the basis of their availability. The main aim of this intervention programme was to facilitate a dietary and lifestyle change in Ghanaian migrants in London. This study shows the potentially important behavioural risk modification effect of nutrition interventions in church-based settings. There were improvements in body compositions and to a lesser extent dietary intake. Different churches assigned to different groups meant that there was no communication between participants from the different groups which could have led to “contamination” and affected the over-all results obtained.

Recent advances in obesity treatment have led to a variety of strategies and health policies with a focus on dietary, behavioural, activity-focused, pharmacological and even surgical methods. Selecting the appropriate method can be difficult and must take into account ethnicity, culture, sustainability, safety and overall cost (Hill & Peters, 1998). The strength of behavioural modification is related to the type of tools given to individuals to effect the necessary changes (Pignon et al., 2002; Sahay et al., 2006; Thorogood et al., 2007). How participants use the tools given to them can also affect behaviour modification. These can therefore influence the success of nutrition intervention programmes (Anderson & Wadden, 1999; Thorogood et al., 2007; McDowell et al., 2011). The modest but improved changes in dietary intake and body composition from this present study suggest that the programme used in this study appears to be instrumental in enhancing the overall health status of study participants.

7.5.1 Attrition

Participants were reassessed at the end of 6 weeks and 3 months. Assessment was conducted at 6 weeks to assess the immediate success of the intervention programme. It takes about two months to establish a new habit (Lin et al., 2007). Based on this, participants from both groups were asked to be available for reassessment at the end of the 3 month period. Similar to other intervention studies, there were some participants' drop-outs from this study. Although attendance and participation was very encouraging initially, by the end of the intervention this has reduced considerably. Only 42 (55%) participants were available for reassessment after the end of the 3 month period. This drop-out rate was higher in the control group compared to the intervention group. The major reasons given for discontinuing with the intervention programme varied from lack of time, not enough motivation, work commitments, emigration to Ghana and difficulties in finding a baby sitter.

Most intervention studies have been found to have low to high dropout rates depending on the criteria and study design used (Warren et al., 2003; Resnicow et al., 2002; Yannakoulia et al., 2007; Anderssen et al., 2008). However, a recent study by McDowell et al., (2011), showed that it is possible to retain 100% of study participants. From this study (McDowell et al., 2011), participant retention was 100% and none of the one hundred and forty two participants who participated in the intervention programme dropped out before the end. The above study was able to maintain 100% retention of participants by encouraging participants to increase their intake of fruit, vegetable and whole grains and watch their portion size and with an exercise programme. The investigators also used an exercise psychologist to counsel participants.

In this study, there was a higher drop-out rate from the control group. This could have been because of lack of motivation, support and inability to fully understand how to use the intervention materials which can lead to discouragement and slow weight-loss experience (Bronner and Boyington, 2002). Retention of participants in intervention studies can be maintained by keeping regular contacts with participants and by finding ways to motivate participants. This can also be promoted by fee payment and the use of committal forms (McNabb et al., 1993; Holm et al., 1998; Levkoff & Sanchez, 2003; Fouad et al., 2004; Zayas et al., 2004). In many behavioural modification programmes, significant and sustained weight-loss is usually seen in just a small number of participants (Airhihenbuwa et al., 2000). Follow-up reinforcement classes can be an effective means of maintaining long-term behavioural changes (National Centre for Health Statistics, 1988; Pleas, 1998; Levkoff & Sanchez, 2003; Yancey et al., 2006).

7.5.2 Weight-loss changes

Most church based nutrition and health education programmes have depended on pastors to promote these programmes. Success in most cases has been achieved due to the pastor's active participation and involvement (Clay et al., 2005). This is because pastors are respected in most communities and are well-suited for organizing and stimulating change among their congregations (Lincoln & Mamiya, 1990; WHO, 2009). In this study, pastors were relied on to generate interest and involvement among their congregations. From the results, there were improved dietary intake and anthropometric measures in both study groups. These changes were however, more prominent in the experimental group than the control group.

The results from this intervention programme were generally similar to other church-based nutrition programmes in that there was a change of some sort even if the magnitude of change was modest. The weight-loss from this programme was smaller compared to other intervention programmes. Participants who remained in the control group for this present study were probably more motivated. This could be the reason why weight-loss changes were observed in the control group compared to other studies which reported weight increases in their control groups (McNabb et al., 1997; Bell et al., 2001). Weight-loss was also observed to increase slowly but gradually with time. The PATHWAYS study, an African-American church-based intervention programme showed a total weight-loss of 4.5kg and waist circumference decrease of 6.4cm in the intervention group after 14 weeks. In the control group, there was however weight gains of 0.9kg and waist circumference increment of 1cm (McNabb et al., 1997). Another intervention programme on African Americans also showed a modest weight-loss of 1kg after a period of 10 weeks (Oexmann et al., 2000).

Table 7.14 – Comparison of weight-loss changes with other studies

	Present study (12 weeks)		PATHWAYS (14 weeks)		Lighten-up (10 weeks)
	Intervention	Control	Intervention	Control	Intervention
Body weight (kg)	-2.3	-0.9	-4.5	+0.9	-1.0
Waist circumference (cm)	-3.3	-1.9	-6.4	+ 1.0	

A study by Kumanyika and Charleston, in 1992, also showed an average weight-loss of 2.7kg after a period of eight months. In this study, the researchers administered an 8-week weight control programme of weekly diet and exercise sessions. All the studies mentioned here had a strong focus on weight-loss and improving dietary and lifestyle changes (Yanek et al., 2001). However, there were also some important differences between this current study and other nutrition intervention studies. Follow-up for this study was shorter occurring 12 weeks after programme initiation and 6 weeks after education sessions ceased in the intervention group. Furthermore, whereas this programme focused on globally healthy lifestyles, most other intervention programmes only focused on a single behavioural goal such as improving fruit and vegetable consumption or weight-loss. There was also greater weight-loss in the control group in this study compared to the weight-loss in control groups from other studies (McNabb et al., 1997; Yanek et al., 2001).

In a study by Kennedy et al., 2005, it was observed that after an intervention period of 6 months, there was a modest but significant mean weight-loss and fat loss in all participants. An intervention study on Samoans in New Zealand also reported weight-loss in the intervention group which had sessions on nutrition education and aerobic exercise sessions. The weight-loss for the study was just 0.4kg compared to this study which reported a higher decrease in weight-loss. However, unlike this present study, the New Zealand study reported no weight-loss in the control group but rather a weight increase (Bell et al., 2001). The changes observed in this study show the effect of the intervention programme. This is encouraging. Although the weight-loss changes in the control group was smaller than that in the intervention group, it was still higher than expected considering the fact that participants did not participate in any form of educational sessions. This shows that beneficial behavioural change was not only related to the number of educational sessions attended but also to the level of motivation. This shows that the most motivated participants achieved the greatest benefits (Yanek et al., 2001). Participants available for assessment for follow-up was lower than expected for this study although comparable to other church based intervention programmes (McNabb et al., 1993; Voorhees et al., 1996; Yanek et al., 2001). Follow-up could have been influenced by the inability of participants to achieve goals set out at the beginning of the programme.

The intervention for this study was not “very” intense as only six educational sessions were held over the period. Unlike other intervention programmes, no physical activity or exercise sessions were offered for the participants. This could have affected the results obtained. Changes in body

composition could have been greater if the duration of the intervention was longer. This is because the success of an intervention programme is directly proportional to the length of the intervention (Holm et al., 1998; Bronner & Boyington, 2002; Bronner et al., 2002; Sahay et al., 2006).

Table 7.15 – A review of nutrition intervention studies in churches

Author	Study design	Sample	Exposure assessment	Findings	Comments
Kumanyika et al. 1992	Quasi-experimental	Churches 187 Overweight participants on (184 African Americans and 3 whites) Utilized external control group Mean age 51	8 weekly sessions of 2 hours of nutrition education and exercise sessions Individual behavioural modification sessions	Mean immediate post-intervention weight-loss 6 lbs. 97% women lost some weight. Mean weight-loss after follow-up 6 lbs. 65% of women remained at or exceeded their 8 week weight-loss.	Weight-loss significant
McNabb et al., 1997	Randomised controlled study	39 obese African American women Experimental group (n=19) Control group (n=20). Control group receiving intervention after the first 14 weeks were completed)	14 week weight-loss programme Nutrition education and physical education	Experimental group lost an average of weight-loss 10.0lb. Waist circumference decreased by 2.5 inches Control group gained an average of 1.9lb Difference in weight-loss between the two groups was $P < 0.0001$	Weight-loss was meaningful

Table 7.16 – A review of a nutrition intervention study in a church

Author	Study design	Sample	Exposure assessment	Findings	Comments
Campbell et al., 1999	Quasi-experimental	50 Black Churches 2519 participants (73% female, 27% male). 98% African American, 1% multi-racial, 1% other Average age 58.5% 55% married, 67% at least high school education, 59% with household annual incomes below $20,000 Intervention group vs delayed group	20 month study Use of questionnaire to assess demographic characteristics Use of validated 15 item FFQ to assess fruit and vegetable intake Nutrition and educational sessions, cookbooks and recipe tasting, gardening sessions, increased servings of fruits and vegetables at church functions	0.6 -0.8% increase in fruits and vegetable servings after 1 year follow-up. After 2 years follow-up fruits and vegetable servings increased to 4.45 (SE =0.08) for intervention group compared with 3.60 (SE=0.08) for the delayed group Proportion meeting 5-a-Day goal increased to 33% for the intervention group and 21% for the delayed group (P < .0001). Increased fruit consumption accounted for most of the improvement	Adjusted for demographic characteristics and baseline data

Table 7.17 – A review of a nutrition intervention studies in a church

Author	Study design	Sample	Exposure assessment	Findings	Comments
Resnicow et al., 2000	Experimental multi-component intervention	14 Churches 1011 African Americans predominantly female (average age 43 years) 50% married/living with partner, 33% with income greater than $50,000 and at least a college education 1. Comparison group (usual nutrition education), 2. Culturally-sensitive multicomponent intervention with one phone call, 3. Culturally sensitive multicomponent with four phone calls	Motivational counselling Validated FFQ and 24-hour recalls to asses fruit and vegetable intake Measurement of psychosocial variables Nutrition education and the use of 18 minute video, project cookbook, printed health education materials, several cues	Increase in fruit and vegetable consumption after intervention Mean fruit and vegetables from all groups ranged from 3.45 to 4.28 servings/day. Correlations ranged from 0.51 to 0.55 Completion rates for the remaining three calls ranged from 79% to 86%	Adjusted for psychosocial, behavioural and demographic variables

Table 7.18 – A review of nutrition intervention studies in churches

Author	Study design	Sample	Exposure assessment	Findings	Comments
Bell et al., 2001	Quasi-experimental	1 year programme in New Zealand 3 Samoan churches 2 intervention churches (n=365), 1 control (n=106) Age range 20 years to 77 years	Use of focus groups to determine appropriate nutrition and exercise intervention to implement weekly nutrition and exercise sessions	Average weight-loss for intervention churches 0.4 ± 0.3 kg/m^2 Control group gained an average of 1.3 ± 0.6kg/m^2 10% increase in physical activity for intervention group	Adjusted for age, employment and education
Yanek et al., 2001	Quasi-experimental	16 churches 529 African American women with age ≥ 40 years 3 groups; 1. Standard group – weekly sessions, 2. Spiritual group with behavioural model supplemented with a spiritual and church cultural component and 3. Self-help group	1 year intervention Screening at baseline and after 1 year Intervention churches received nutrition education about fat and aerobics sessions	Significant weight-loss of 1.1 lbs and decrease in waist circumference of 0.66 inches in intervention groups Decrease in total dietary energy, total fat and sodium by 117kcal, 8g and 145mg respectively No significant change in self-help group	Adjusted for intra-church clustering Significant clinical improvements in cardiovascular risk profiles after 1 year for intervention group

Table 7.19 – A review of a nutrition intervention study in a church

Author	Study design	Sample	Exposure assessment	Findings	Comments
Christie et al., 2010	Church-based community intervention	383 African American females	24 week intervention 1.5 hour nutrition education, cooking demonstrations and social support Assessment of BMI, waist-to-hip circumference, arterial blood pressure, non-fasting glucose and daily minutes of activities Measurements at baseline, 12 weeks and 24 weeks	Retention rates at 12 weeks was 60.5% and 57% at 24 weeks Weight decreased from 207lb at baseline to 200lb at 24 weeks BMI decreased from 35kg/m² at baseline to 33kg/m² at 24 weeks Waist-to-hip ratio decreased from 0.85 at baseline to 0.83 at 24 weeks Time for exercising increased from 64 minutes/week at baseline to 169 minutes/week at 24 weeks	Church based settings can offer the opportunity for longer and more established support networks with retention of positive outcomes even after the end of the intervention..

Table 7.20 – A review of a nutrition intervention studies in a church

Author	Study design	Sample	Exposure assessment	Findings	Comments
McDowell et al., 2011	Quasi-experimental	10 Churches 142 African American females (114) and males (28) Mean age 55 years 78% overweight/obese 32% with diabetes	2 year study 20 week intervention with nutrition sessions, physical activity and motivational sessions delivered once every 2 weeks Sessions began and ended in prayer	100% retention 4% decrease in body weight 2.5% decrease in BMI over the 20 week period Weight-loss lower in the first year compared to the second year Church based interventions more effective over longer periods of time	Majority of participant were African American females aged 45 years or older making generalization of results difficult

7.5.3 Dietary changes

Results from this study showed a slight but significant decrease in total energy intake for the intervention group. This was higher than the change observed for the control group. Fat intake decreased and protein and carbohydrate intakes increased for the intervention group after 3 months. This could be because the educational session on reducing fat intake was well understood by the participants. In the control group, there were decreases in intake for all the macronutrients at 3 months. Change in fat intake for the intervention group in this study was also higher than that of the control group. "Project Joy", another church based intervention programme also observed a greater decrease in fat intake for the intervention group compared to the control group (Yanek et al., 2001). This observation was also made in the 'Eating for a Healthy Life', a church-based intervention programme which also reported a decrease in fat intake for the intervention group compared to the control group (Bowen et al., 2004). Sodium intake in both groups decreased. This is particularly of importance since people of West African origin are known to have a high propensity towards high blood pressure (Cooper et al, 1997).

Fibre intake increased for the intervention group whilst it decreased for the control group in this study showing an increase in the intake of fruits and vegetables. 'Body and Soul', a church-based nutrition intervention programme on African Americans showed significant and increased fibre intake and consequently an increase in fruit and vegetable at a 6 month follow-up. The 'Body and Soul' study consisted primarily of church-wide nutrition activities, distribution of self-help materials and motivational interviewing. Although the method used in that study was different from that employed in this study, both studies reported an increase in fruit and vegetable intake (Resnicow et al., 2002). The 'Black Churches United for Better Health' another church based intervention programme also reported an increase in the knowledge of the 5-a-day recommendation of fruit and vegetable intake after a 20-month education period. There was an increase in fruit and vegetable intake and fibre intake among the intervention group after a 2 year follow up (Campbell et al., 1999; Campbell et al., 2000; Demark-Wahnefried, 2000).

It is not known whether the changes observed could have been better had more support or a continued education intervention been offered since the degree of change has been found to be proportional to the intensity of the intervention offered (Anderson & Wadden, 1999; McCauley et al., 2002). Observed changes in dietary pattern during the intervention period, shows it is likely that there was a shift to a whole foods, low-salt, low-fat and plant-based diet. Although the changes in dietary intake were small, this change may be potentially meaningful. So while

meaningful changes likely occurred, these changes may not have been maximal. This could be because the intervention was tailored to each group but not (to a large degree) to each individual. Dietary education offered on a one-to-one basis could have been more useful in maximizing change in each individual and therefore within the whole group (Guilbert, 2002).

Although the aim of this intervention was to change individual perceptions and promote dietary and lifestyle changes, the programme did not address the environment in which these changes would occur. For example, cost and time constraints made it impossible to visit participants in their homes or workplaces to help make these changes possible. This also made it difficult to encourage family support. Getting the support of the family can aid in initiating and maintaining behavioural changes in individuals (Barnard et al., 1995).

7.5.4 Summary

This study demonstrates that a church-based nutrition intervention programme can be a successful setting to access the Ghanaian population in the UK. The modest, but encouraging, positive changes achieved in dietary intake and body composition suggests this could be a feasible setting for nutrition interventions in the future.

CHAPTER 8

CONCLUSION AND IMPLICATIONS FOR PUBLIC HEALTH POLICY

8.1 SUMMARY

This study is unique because it is the first study to be conducted on Ghanaian migrants in the UK; to assess habitual dietary intake and prevalence of overweight and obesity, to develop and validate an FFQ for use in Ghanaian migrants and implement a nutrition intervention programme using the Black Churches as the setting.

- This study in first generation Ghanaian migrants in the UK was possible because of the access of recruitment through the Black Churches; the researcher was bi-lingual and the congregants were further motivated by the involvement of the Pastors and their wives.
- The migrant Ghanaian diet and nutrient intake overall was similar to that of the host population. Energy under-reporting in this population was comparable to other studies.
- The validated food frequency questionnaire performed adequately as a dietary assessment tool and can therefore be seen as a valid and useful tool to assess dietary intake in this population.
- There was a higher prevalence of overweight and obesity among migrant Ghanaian females compared to the host population and their male counterparts. The BMI also overestimated levels of overweight and obesity in the study population compared to % body fat.
- The implementation of a culturally and ethnically appropriate church based nutrition intervention programme may encourage and maintain weight-loss and lifestyle changes in Ghanaians.

8.1.1 Dietary Intake

Thirty one percent (n=21) of the study population were classified as low-energy reporters of which 38% (n=8) were males and 62% (n=13) females. Energy under-reporting was influenced by age, education and BMI. Average daily macronutrient intakes were higher on weekends than on

weekdays similar to other studies. The minimum number of days needed to obtain true habitual intake was 5 days for the macronutrients.

There were some limitations in this study. Firstly, the sampling frame for this study was churches. Therefore migrants who do not go to church as a result of lack of time, or follow different religions or other reasons for non-attendance were excluded from participation. Although this approach was used to ensure that the sample used for this study would include people from different socio-economic backgrounds who are part of a church community, it was not possible to verify this because of lack of information on the Ghanaian population in the UK. The sample size of 68 Ghanaian migrants was relatively small. Another limitation was that participants were recruited only from London excluding those Ghanaians living in other parts of the UK. It is quite possible that Ghanaians living in different parts of the country could have different lifestyles which could have either positive or negative impact on their dietary intakes. Lack of census data on Ghanaians made it difficult to determine if the study population was representative of the general Ghanaian population in the UK. There was also no comparative dietary data on native Ghanaians and other Ghanaian migrants in other countries.

Errors may also have occurred in the calculation of energy and nutrient contents of food. This is because some of the food items reported to be eaten by some participants could not be found in the food composition table. The Ghana food composition table used was outdated and incomplete. Calculated energy and nutrients from reported food intake may have been influenced as a result of the different recipes and cooking methods used by the participants to the ones used to calculate the nutrient content of similar foods on the food composition table. Furthermore, a larger sample size would have been better to capture habitual intake from a representative Ghanaian migrant population, if cost and time were not limited.

8.1.2 Validation of a Food Frequency Questionnaire

The study sample for the FFQ was relatively large (n=212). The FFQ interviews were administered face-to-face and although this method is time consuming the alternative of allowing the participants to self-complete the FFQs could have affected data quality. Average energy intake was higher for the participants using the food frequency questionnaire (2071 kcal) compared to (1987 kcal) for the multiple 24-hour recalls. Percentage contribution of fat to total energy was similar for the food frequency questionnaire and the 24-hour recall (35.2% and 35.3% respectively). Correlations between nutrients from both the food frequency questionnaire and the

24-hour recall after adjusting for energy ranged from 0.5 to 0.7. The FFQ performed well relative to the multiple 24-hour recalls and 39% to 54% of participants were correctly classified into the same or adjacent quartile of nutrient intake compared to 3% to 9% of participants who were misclassified into opposite quartiles. Bland – Altman plots were within limits for the macronutrients.

As was observed for the multiple 24-hour recalls, errors may have been introduced in the calculation of energy and nutrient contents of food. The limited food list of the food frequency may not have been appropriate for all participants. Nutritional assessment methods that are prone to random and systematic errors may be inadequate to detect many associations of diet with disease, even when a strong relationship exists (Patterson & Pietinen 2004). Also, both the FFQ and the repeated 24-hour recall methods rely on memory and may be biased due to under-estimation or over-estimation of nutrient intakes. It has been suggested that multiple reference methods including dietary methods and biochemical analysis should be used in validation studies to increase the accuracy of results (Cade et al., 2002; Pritchard et al., 2010).

The face-to-face interviews used also served as a deterrent to getting more participants involved. Though they were willing to have their measurements taken, most of the congregants would only complete the questionnaires if they were allowed to take them home. The reasons cited for this were a lack of time and length of the questionnaires. Although this could have increased the number of participants for this study, it could have possibly affected data quality.

8.1.3 Overweight and obesity in Ghanaian migrants

The prevalence of overweight and obesity was lower when percentage body fat was measured (males 25%, females 40%) compared to BMI (males 57%, females 67%). In general overweight and obesity levels using BMI was higher compared to the other anthropometric measures of obesity. Overweight and obesity increased with age when BMI and percentage body fat was used for females. Prevalence of overweight and obesity also decreased with increasing number of years spent in education for both males and females. Ghanaian migrants who were married and employed manually were also more likely to be overweight or obesity.

BMI was higher compared to the other anthropometric measures of obesity. BMI can overestimate the prevalence of overweight and obesity especially in lean individuals who are muscular (IOTF, 1998; Henderson et al., 2004). It is possible that observations made on African

Americans which identify them as having a higher bone density and bone mineral content can be extended to other people of African descent and in this instance Ghanaians. This suggests that BMI used in this population overestimated levels of overweight and obesity (Aloia et al., 1998; Deurenberg & Deurenberg, 2001). To my knowledge, there is currently no relevant data on the reliability of the Tanita scales in ethnic minority populations, thus making it difficult to determine whether the results obtained are accurate.

8.1.4 Nutrition intervention education for migrant Ghanaians in London

Energy, fat and carbohydrate intake decreased after 6 weeks for both the intervention and control groups. Protein increased significantly for the intervention group (+3.5g p=0.000) compared to the control group. Changes in body composition were greater for the intervention group compared to the control group for all the anthropometric measurements used at 6 weeks. However, only change in waist circumference for the intervention group was significant (-2.2cm p=0.05). After 3 months, decrease in fat intake was significant for both the intervention (0.000) and control (0.041) groups. After 3 months, there were significant changes in body weight (-2.3kg p=0.001, -0.9 p=0.05), waist circumference (-3.3cm p=0.04, -1.9cm p=0.006) respectively for the intervention and control groups. Changes in BMI and % body fat were -1.4kg/m² (p=0.001) -2.0% (p=0.014) for the intervention group.

There was a high drop-out of participants from this study from both the intervention and control groups. Other intervention studies have also found drop-out rates to be high by the end of the intervention programme (Warren et al., 2003; Resnicow et al., 2002; Anderssen et al., 2008). The small changes in dietary intake could be because this intervention programme was tailored to the group and not necessarily to the individual (Guilbert, 2002).

The duration for the nutrition intervention programme was short and this could have possibly had an impact on the results. Increasing the weekly intervention sessions and extending the period to follow-up could have influenced the results obtained. However, there was no way to do this because of lack of time and lack of support from the Pastors for the continual use of the church premises as venues for the intervention programme. Several studies have shown that increasing the duration of a culturally appropriate intervention programme can increase the success of the programme (Kumanyika, 1993; McNabb et al., 1993; Holm et al., 1998; Bronner & Boyington, 2002; Sahay et al., 2006). The small sample size of the participants could also have increased the likelihood of a type 2 error where a dietary change occurred but could not be detected

(Thompson & Subar, 2001). This study in effect did not address the financial barriers to access and participation. It also did not address working hours and family issues and other socio-economic issues that made it difficult for subjects to participate in the intervention (Netto et al., 2010).

As a setting for nutrition intervention, churches possess the physical space within which health services can be provided. This makes it unnecessary to construct a new health compound making it cost effective. Churches are also viewed as crucial and beneficial to whole populations and communities. However, limited financial and human resources, the absence of systematic monitoring and evaluation especially after completion of the intervention and the lack of strategic tools for continuing care can hinder the success of an intervention programme. Using the churches as setting for nutrition interventions also made it impossible to include other Ghanaians who are not Christians. This can potentially influence the results and the conclusions made from these study. Selection bias could also have affected the results since the congregants that agreed to participate in the study were probably already interested in improving their health status. These participants may be different from those who did not participate. Lack of available church venues also made it impossible to randomise the participants to either the intervention or control group; one Church served as the intervention and the other as the control. Additionally, recruitment at the church level was limited to the churches who agreed to participate in the geographical areas used for this study. All this makes it difficult to generalize the results obtained to other churches. The results from the study showed that it is likely that changes in both dietary intake and body composition was related to level of motivation. This could possibly mean that only the most motivated participants achieved the greatest changes in lifestyle (Yanek et al., 2001).

Although this study was the first UK public health nutrition programme to access West African Churches in London, further studies are needed to explore this not only in London but in different geographical areas in the UK taking into consideration all the limitations mentioned above. In terms of public health, this will be a useful way to modify health behaviours and also serve as a platform to launch nutrition intervention programmes for all West Africans in the United Kingdom.

8.2 IMPLICATIONS FOR PUBLIC HEALTH

8.2.1 Black Churches as a setting for nutrition intervention programmes in the UK

Nutrition intervention is much more common in most churches now. Almost all the churches that were contacted to discuss the nutrition intervention programme with made it known that they now include health or nutrition education as part of the church activities for the year. However, all these churches said that the health education programme conducted in their churches were just conducted once or twice yearly. These churches designate a week or two as health week/s and invite nurses or other health workers in the churches to talk to the congregation about nutrition or health. There is however, no way of verifying if these informal health or nutrition programmes have ever led to a change in lifestyle for some of the congregants. From this study, we were able to show modest but improved average changes in both dietary intake and body composition after assessing the efficacy of the intervention programme. This changes show that this programme can be instrumental in changing the health and lifestyle of Ghanaian migrants. This can be enhanced further if improvements are made based on lessons learnt during the development and implementation of the programme (Yanek et al., 2001; Thorogood et al., 2007).

Weight-loss changes at the end of the intervention programme were small. To increase weight-loss, follow-up classes can be conducted. This is known to maintain long-term behavioural changes (Pleas, 1998; Levkoff & Sanchez, 2003; Yancey et al., 2006). The greater changes in weight-loss observed in the intervention group compared to the control group are quite encouraging. It is even more encouraging to know that there was some measure of weight-loss in the control group as well. Although there were some limitations with this intervention, the implementation of a culturally sensitive church-based intervention programme for Ghanaians and to a larger extent West Africans could have an impact on this high risk population. To address some of the issues raised above, churches can partner with outside individuals and organisations. It is also possible that with funding and time, this intervention programme can be improved on and adapted to overcome all the barriers to access and participation.

8.2.2 FFQ as a valid dietary assessment tool for other large epidemiological study

The population in this study were still maintaining part of their traditional diet. However, it was quite obvious that they had also adapted the diet of the host population. Future studies can

include Ghanaian populations living in other parts of the UK. This can provide important information on whether Ghanaians living in different geographical locations in the UK are still maintaining their traditional diet or adapted a more Westernised diet and how this relates to the diet-disease relationship. The FFQ that was developed to estimate the usual diet of Ghanaian migrants is valid and reproducible. The validated FFQ can contribute greatly to future epidemiological studies in other Ghanaian migrants in the UK. It is also possible that the FFQ could have similar validity among other West African groups.

8.2.3 Overweight and obesity

Obesity is a major risk factor for diabetes and hypertension. The results from this study have implications for the health and well-being of Ghanaian migrants and also for future nutrition intervention programmes in this population. The high prevalence of overweight and obesity in this population is of concern especially since this population is known to be at risk of chronic diseases such as diabetes and hypertension (Amoah, 2003; Agyemang et al., 2005; de Graft-Aikins, 2007). Additional research should therefore attempt to explain the factors that promote weight gain in this population. This study also indicate the need to further assess migration-related factors that can lead to increases in overweight and obesity among migrant populations and their impact on overweight and obesity-related diseases in these populations. Different anthropometric cut-offs especially BMI for the general population may not be appropriate for this population due to their higher muscle mass and increased prevalence of chronic diseases. There is on-going debate on the appropriate cut-offs for this population. The National Institute for Health and Care Excellence (NICE) has suggested that lower BMI cut-off points could be used for Black African and Afro-Caribbeans, Asian and other minority ethnic groups in the UK to prevent chronic diseases such as diabetes, myocardial infarction or stroke in these populations compared to the White European population.

8.2.4 Lack of information on Black Africans

Ghanaians form part of the growing population of Black Africans in the UK. There is currently no census data on sub-groups of this population. There is also a lack of current dietary and anthropometric data. The information on the prevalence of chronic diseases in this population is also outdated although there are indications that it is higher than the general population. They are the least studied ethnic minorities in the UK in terms of health and nutrition and nutrition-related diseases. It is hoped therefore that this study may provide the impetus for future work in this area.

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List of Abbreviations

- BMI Body Mass Index
- BMR Basal Metabolic Rate
- CHD Coronary Heart Disease
- CM Centimeter
- COMA Committee of Medical Aspects of Food Policy
- CSFII Continuing Survey of Food Intake by Individuals
- DH Department of Health
- EI Energy Intake
- FAO Food and Agriculture Organisation
- FFQ Food Frequency Questionnaire
- FSA Food Standard Agency
- G Gram
- HC Hip Circumference
- HSE Health Survey for England
- LER Low-energy Reporting
- NDNS National Diet and Nutrition Survey
- NICE National Collaborating Centre for Primary Care
- NFCS Nationwide Food Consumption Survey
- R Correlation Coefficient
- RNI Reference Nutrient Intake
- SD Standard Deviation
- WC Waist Circumference
- WHR Waist to Hip ratio
- WHO World Health Organisation

APPENDIX A1: LETTER TO CHURCHES

Dr Dee Bhakta
Senior Lecturer in Human nutrition
Faculty of Life sciences
London Metropolitan University
166-220 Holloway Road,
London
N7 8DB

Rev Kofi Manful
Faith Baptist Chruch
33 Firs Park Gardens
Winchmore Hill
Enfield
N21 2PX

Dear Sir,

I am writing to ask for your help. We are conducting research into the diet and health of West African migrants in the United Kingdom. This is particularly important in this community because of their increased risk of obesity and chronic disease. This is especially important since to date, only a few dietary studies have been conducted on people of African origin and even fewer studies on West African migrants in the UK. We think you could help us because you have predominantly large West African congregation.

We would like to approach your members and ask them to volunteer to participate in the survey. This would involve a standard questionnaire, approximately 30 minutes in duration, which would ask about their diet, history of any disease, health beliefs and other background information. In addition, we would need to measure their height, weight and waist. Joycelyn Adinkrah who is

originally from Ghana and currently working with us on this project would conduct most of the data collection.

If you feel you can be of help to us, we would like to set up a meeting with you to discuss this further. We will try contacting you by telephone in the next week. Please be assured that all data will be treated in the strictest confidence and we are currently in the process of obtaining ethical approval for this project. We would be more than willing to offer healthy eating advice tailored to your congregation and feedback from our survey, to help improve the diet and health of the community as a whole.

We look forward to hearing from you.

Yours faithfully,

Dr Dee Bhakta
Registered Dietitian
Senior Lecturer in Human Nutrition

<u>Research Team</u>

Dr Dee Bhakta - Senior Lecturer in Human Nutrition
Dr David McCarthy - Reader in Human Nutrition
Ms Joycelyn Adinkrah - Research student.

APPENDIX A2: INFORMED CONSENT FORM TO PARTICIPANTS

First generation West African migrants in the UK; dietary patterns, anthropometric indices and nutrition intervention through UK Black Church

1 agree to take part in the above London Metropolitan research project. The project has already been fully explained to me. I understand that agreeing to take part means that I am willing to

- Be interviewed by the researcher
- Complete questionnaires asking about my usual food intake, socio-demographic background and lifestyle habits.
- Allow anthropometric measurements to be taken from me
- Make myself available for a further interview should that be required

I understand that all the information I provide is confidential, and that no information that could lead to my identification will be disclosed in any reports on the project, or to any other party. No identifiable data will also be published or shared with any other organisation. Information obtained will only be used for the purposes stated in the research.

I also understand that my participation is voluntary and that I can choose to withdraw from the survey. I can therefore withdraw at any stage of the survey without being penalised or disadvantaged in any way.

Signature:…… Date: .....

APPENDIX A3: GENERAL QUESTIONNAIRE

SECTION 1: GENERAL BACKGROUND INFORMATION

I.D. Number					

- Are you? a. male □ b. female □
- What is your present age and date of birth?

Please check if giving ACTUAL date of birth and not OFFICIAL date of birth as maybe used on official documents

a. Age……years not known
b. Actual date of birth □□/□□/□□□□ not known □

3a. In what country were you born?
a. name of country _____
b. name of province/county _____
c. was this in an
a. urban area (town) □ or b. rural area (village) □

3a. At what age or date did you first come to the UK to live?
Please state _____

4. What is your marriage status at the moment?
Please state _____

5a. Are you currently in employment?
a. yes □ b. no □

If yes, what is your current occupation? _____
If No, please give reasons? _____

5b. Are you satisfied with your current job?
a. yes □ b. no □

If Yes, please give reason (s) _____
If No, please give reason (s) _____

5c. Do you consider your current job to be?
a. very physically active □ b. fairly physically active □
c. not very physically active □ d. not at all physically active □

SECTION 2: LIFESTYLE AND GENERAL HEALTH QUESTIONNAIRE

9a. Do you exercise daily? And if so, please state how long this states
Please state _____

9b. How many times do you do light household activities such as dusting, washing dishes etc.
a. everyday □ b. most days □
c. once a week □ d.1-3 times/month □

9c. How many times do you do heavy household activities such as washing floors and hovering?
a. everyday □ b. most days □
c. once a week □ d.1-3 times/month □

10. Do you currently smoke?
a. yes □ b. no □

11a. How would you rate your health status at the moment?
Please state _____

11b. What health condition do you have at the moment?
Please state _____

12a. Are you satisfied with your weight?
a. yes □ b. no □

12b. Would you like to lose some weight?
a. yes □ b. no □

12c. Would you like to take part in a nutrition education programme?
a. yes □ b. no □

APPENDIX A4: FOOD FREQUENCY QUESTIONNAIRE

This section will now ask about your general food habits.

1. Do you consider the food you eat to be generally healthy?
   a. Yes □ b. No □

2. Do you read nutrition labels on food items?
   a. Yes □ b. No □
   If so, what information do you normally look _____

3. Do you follow any special diet?
   a. Yes □ b. No □
   If so, please state what it is _____

4. Have you taken any vitamin, mineral or other food supplements during the past year?
   a. Yes □ b. No □
   If yes, please state type _____

5. Please state how you normally cook you vegetables.
   _____

6. What kind of milk do you normally use?
   _____

7. What sort of fat or oil do you usually use for cooking or frying?
   _____

8. What kind of butter, margarine or spread do you usually use?
   _____

9. When you eat chicken or poultry, do you remove the skin before eating it?
   a. almost always □ b. often □
   c. sometimes □ d. rarely or never □

10. When you eat beef, pork, lamb or ham, how often did you remove the fat?
    a. almost always □ b. often □
    c. sometimes □ d. rarely or never □

11. How often do you eat fruits and vegetables?
    Please state _____

This section will ask you about your usual diet over the past 12 months. For each food item, there is an amount shown, either what is a common household unit such as a slice of bread or teaspoon or what we think is a medium serving. Please tick a box to indicate how often, on average, you have eaten the specified amount of each food during the past year.

Please try and answer every question and as best as you can

CEREALS	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/ Rarely	Daily	Weekly	Monthly
Oats/maize/wheat porridge	1 bowl				
Sugar coated cereals e.g. frosties	1 bowl				
High fibre cereals e.g. muesli, branflakes	1 bowl				
Low fibre cereals e.g. cornflakes, rice krispies	1 bowl				
Kenkey/banku/	1 med. serv.				

BREAD AND OTHER STAPLES	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/Rarel y	Daily	Weekly	Monthly
White bread/roll	1 slice				
Whole meal bread/roll	1 slice				
Brown bread/roll	1 slice				
pancake	1 pancake				
flour chips/achumo	1 handful				

RICE AND PASTA DISHES	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/Rarely	Daily	Weekly	Monthly
White rice cooked	1 ladle				
Jollof rice	1 ladle				
Fried rice	1 ladle				
Waakye	1 ladle				
White pasta e.g. Noodles, macaroni	1 med. serv.				

Whole meal pasta	1 med. serv.				

ROOTS AND TUBERS	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/Rarely	Daily	Weekly	Monthly
Boiled/instant potatoes oven baked potatoes	1 med. serv.				
Fried potatoes chips	1 med. serv.				
Roast potatoes	1 med. serv.				
Fufu	1 med. serv.				
Yam, cassava or cocoyam	1 med. serv.				

PULSES AND LENTILS	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/Rarely	Daily	Weekly	Monthly
Kidney beans	½ cup				
Soya beans	½ cup				
Black eyed beans	½ cup				
Baked beans	½ cup.				
Chick peas	½ cup.				
Runner/green beans	½ cup.				
Soya bean curd/tofu	½ cup				

MEAT, FISH AND POULTRY	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/Rarely	Daily	Weekly	Monthly
Beef/lamb/pork	1 med. serv.				
Chicken/other poultry	1 med. serv.				
Bacon	1 med. serv.				
Ham	1 med. serv.				
Sausage/luncheon meat/corned beef	1 med. serv.				
Fish	1 med. serv.				
Fish fingers	1 med. serv.				
Fish fried in butter	1 med. serv.				
Shell fish e.g. crabs, prawns	1 med. serv.				
Pizza	2 slices				
Burger	1 med. serv.				

DAIRY PRODUCTS AND FATS	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/ Rarely	Daily	Weekly	Monthly
Milk	½ pint				
Full fat yoghurt	½ cup.				
Low fat yoghurt	½ cup				
Fruit/sweet yoghurt	1 carton.				
Full fat cheese	1 med.				
Low fat cheese	1 med.				
Egg boiled/poached	1 egg				
Egg fried/omelette	1 egg				
Salad cream/French dressing/mayonnaise	1 tsbp.				
Other salad dressing	1 tsbp				
Butter/margarine	1 tsp				

SOUPS, STEWS SAUCES AND STAPLES	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/ rarely	Daily	Weekly	Monthly
Tomato stew	1 ladle				
Melon seed and spinach stew	1 ladle				
Palm nut soup	1 ladle				
Red-Red	1 ladle				
Ground nut soup	1 ladle				
Hot pepper sauce	1 ladle				
Tomato ketchup	1 tsp				
Jam, marmalade, honey	1 tsp				
Marmite	1 tsp				
Peanut butter	1 tsp				

NUTS	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/ rarely	Daily	Weekly	Monthly
Cashew nuts	1 handful				
Ground nut/pea nuts	1 handful				
Almond/hazelnut	1 handful				
Pistachio	1 handful				
Coconut	1 med. Serv.				

VEGETABLES-FRESH, FROZEN OR CANNED	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/Rarely	Daily	Weekly	Monthly
Sweet corn	1 med. serv.				
Plantain	1 med. serv.				
Okro/Nkruma	1 med. serv.				
Gardenegg/aubergine	1 med. serv.				
Avocado	1 med. serv.				
Garden peas/peas	1 med. serv.				
Mushroom	1 med. serv.				
Broccoli/cauliflower	1 med. serv.				
Carrots	1 med. serv.				
Cabbage	1 med. serv.				
Brussels sprouts	1 med. serv.				
Spinach	1 med. serv.				
Spring onions	1 med. serv.				
Onions	1 med. serv.				
Tomatoes	1 med. serv.				
Sweet peppers	1 med. serv.				
Lettuce	1 med. serv.				
Cucumber	1 med. serv.				
Coleslaw	1 med. serv.				

FRUITS, FRESH FROZEN OR CANNED	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/Rarely	Daily	Weekly	Monthly
Banana	1 med. serv.				
Pears	1 med serv.				
Pomegranates	1 med serv.				
Mangoes	1 med serv.				
Pineapple	1 med serv.				
Grape fruits	1 med serv.				
Orange/Satsuma	1 med serv.				
Grapes	1 med serv.				
Melon	1 med serv.				
Kiwi fruit	1 med serv.				
Apple	1 med serv.				
Peach/plum/nectarine	1 med serv.				
Strawberries/cherries	1 med serv.				
Pawpaw	1 med serv.				
Sultana/raisins/currants	1 handful				

SWEETS AND SNACKS	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving size	Never/Rarely	Daily	Weekly	Monthly
Crisp/pocket snacks	1 pack				
Fried plantain chips	1 handful				
Sugar added to cereals, tea, coffee	1 tsp				
Cakes/scones/doughnuts	1 med. serv.				
Ice cream/frozen deserts	1 scoop				
Sweet biscuits e.g. short bread	1 biscuit				
Salty biscuits e.g. cream crackers	1 biscuit				
Chocolate coated sweet biscuits	1 biscuit				
Chocolate/chocolate bar	1 bar				
Milk puddings e.g. custard, rice pudding	1 med. serv.				
Sweets, toffees, mints	1 sweet				
Regular popcorn	1 handful				
Buttered popcorn	1 handful				

ALCOHOLIC AND NON ALCOHOLIC BEVERAGES	*Amount*	*Frequency of eating the listed food items*			
	Medium Serving Size	Never/ Rarely	Daily		Monthly
Tea	1 cup				
Coffee	1 cup				
Cocoa, bounvita	1 cup				
Horlicks	1 cup				
Milkshake	1 glass				
Real fruits juice	1 glass				
Fruit squash	1 glass				
Fizzy soft drinks	1 glass				
Low calorie fizzy drink e.g. diet coke	1 glass				
Beer/larger/cider	1 pint				
Port/sherry/liqueur	1 glass				
Spirits e.g. gin	1 tot				

APPENDIX A5: TABLE FOR 24-hour recall INTERVIEW

Meal type	Time of eating	Type of food	Quantity or portion size	Description of food including Brand name	Preparation method	Activity	Day of the week
Breakfast							
Snack							
Lunch							
Snack							
Supper							
Snack							

APPENDIX A6: FOOD PHOTOGRAPHS USED TO ESTIMATE PORTION SIZES

Ladle

Bowl

Cup

Plate

Tablespoon

Teaspoon

APPENDIX A7: BODY IMAGE QUESTIONNAIRE

- What is your current shape and size?
- The size and shape you would most like to be?
- The size and shape you feel is the most attractive?
- The and shape you feel Ghanaian men find the most attractive?
- The size and shape you feel Ghanaian women find most attractive
- Would you like to control your weight?
- Why do you want to control your weight?
- What do you think influences your perception about ideal weight

APPENDIX B: NUTRITION INTERVENTION PROGRAMME

Welcome to the Churches for healthy eating programme

Who we are and what we are doing

I am Joycelyn Adinkrah a research student from London Metropolitan University interested in nutrition, wellbeing and reducing risk of heart disease, diabetes and high blood pressure in West Africans in the UK.

This healthy eating programme is based on a successful weight-loss programme being run at London Metropolitan University.

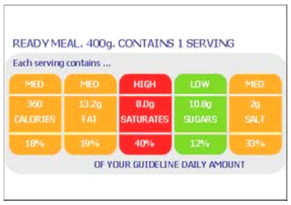
We are offering this programme to help us work with local West African communities and promote the idea of Church-based weight management programme. This is also to help us with research about reducing risk of diseases and nutrition intervention.

Our philosophy on weight-loss is that all advice should be evidence-based. It should be based on healthy eating habits and increased physical activity. Diets should be lower in energy and fat. Food portion sizes should be lower and expected weight-loss not more than 1kg (2lb) per week.

This programme focuses on

- Balanced diet
- Planning meals and shopping

- Fat and food labelling
- Portion sizes
- Salt, sugar and food labelling
- Monitoring weight



At the beginning, we would like to

- Introduce the programme and give out pedometers
- Take baseline waist, hips, weight, height and body fatness using tape measure Leicester Scale Height Measure and Tanita scale
- Fill out questionnaires to find out average dietary intake

After 6 weeks and 3 months, these measurements will be repeated again to find out possible changes in body composition and dietary patterns.

1. ***Do you know if your health is at risk?***

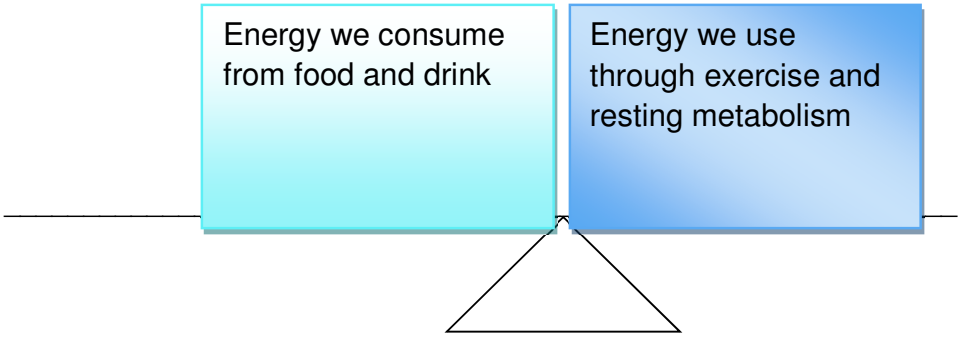
- Waist circumference (WC) can be used to access levels of overweight and obesity. This is a better measure of health risk.
- Health Risk in Men increases when WC is ≥ 40'' (102cm) and for Women: ≥ 35'' (88cm).
- If your Body mass index (BMI) is ≥ 25 (0verweight) and BMI ≥ 30 (obese) for both men and women.

- High percentage body fat can also increase your risk for chronic diseases like overweight and obesity.

- Health risk increases when percentage body fat for men is > 27% and for women > 32%.

Energy balance

In weight-loss we have to realize the importance of energy balance. Energy balance is the balance of energy intake and energy output. The energy you take in the form of food or drink should be equal to the energy you expend through exercise.



(The same amount of ENERGY IN (calories consumed) and ENERGY OUT (calories burned) over time means weight stays the same)

- When your calorie intake is more than your calorie expenditure over time, you gain weight.
- When your calorie intake is less than your calorie expenditure over time, you lose weight.
- Having a balance of energy overtime will help you stay at a healthy weight for the long term period.

Setting your weight-loss goals

- Following a healthy diet plan is only half of the weight-loss equation. Studies shows that exercise also promote weight-loss and maintenance by burning more calories. The best way to reach a healthy weight-loss goal and to stay there is by changing lifestyles gradually.

To do this,

- Set a realistic goal of how much weight you want to lose. Set a realistic goal of losing 1-2 pounds a week. Aim to burn between 500 to 1000 calories a day by eating less and more healthily, exercising more or both.
- Be realistic about the time frame you will want to lose the weight. Example, if you want to lose about 30 pounds, set a time frame of about three and a half month weight-loss programme. Track your progress by keeping records of dietary intake, exercise sessions and weekly measurements.
- Set short term goals and break the weight-loss programme into smaller, more achievable mini goals which can be monitored regularly. Example, on Monday 25th august, 2010- my goal for the day is to exercise for more than 30 minutes and snack only on vegetables.

Now that you have set your goals, let's start living the healthy lifestyle. To do this, you should aim to eat

- 1/3 of starchy foods e.g. Potatoes, rice, bread etc
- Lots of fruit and vegetables
- Less sugar and sugary drinks
- Less fat and fatty foods
- Go easy on alcohol
- Drink plenty of water and don't skip breakfast
- Get active

Eat breakfast every day. This is a good strategy for weight-loss. Breakfast helps you avoid mid-morning snacking. Include some high fibre and high protein food such as peanut butter or low fat cheese and some fruit or vegetable. For snacks, opt for healthy ones.

Balanced diet

A balanced diet contains a variety of food, including lots of fruit and vegetables and starchy foods such as whole meal bread and wholegrain cereals; some protein-rich foods such as meat, fish, eggs and some dairy foods.

The Healthy Eating Plate Model

Use the **Eat Well Plate** above to get the balance right. This shows how much of what you eat should come from each food group! This is how it should go. Fill up your plate with the following;

- 1/3 from starchy foods
- 1/3 from fruits and vegetables
- 1/3 from meat, fish and other alternatives, milk and dairy foods and foods containing fat and sugar

Some Easy food substitutions

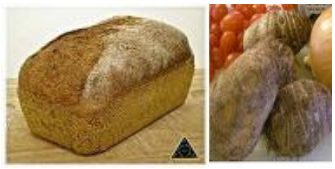
If you usually have this	***Replace with***
• Sugar coated cereals	• Whole meal porridge/ muesli with fruit
• Mayonnaise on salad	• Balsamic vinegar/olive oil
• Potato chips	• Carrot sticks
• Fried plantain	• Roasted or boiled plantain
• Palm nut soup with fufu	• Light soup with fufu
	

2. Planning your meals

What do you have in your fridges? Think about the reasons why you have these things. What are the barriers to you changing what you have in your fridges? If you can do something about this, then please do.

Foods to avoid/reduce intake

Foods to eat frequently



Foods in your fridge/cupboard

When planning meals,

- Check what food you have available in your home and fill your menu plan using these items first.
- Make a collection of nutritious and economical recipes that your family likes and serve them often. This will reduce wastage.
- Think about how much time you will have for preparing food in the coming week when planning your shopping list and menus.
- If too busy, healthy meals can be prepared in advance and frozen for later use.

Planning your meals

- Can balance your week and improve your health
- Saves money and food waste
- Help you to lose weight

Shopping strategies

- Check what food you have available in your home and make a list of what you need to purchase.
- To save money, use supermarket and local shop advertisement to see if there are weekly sales and make use of store coupons and loyalty cards.
- Check labels on food and choose the ones that are lower in fat and saturated fat, salt/sodium and sugar.
- Do not to shop for food when hungry. Fill shopping cart with the most important and more nutritious foods like fruits, vegetables, protein and starchy foods first.
- Shop for the basic ingredients you are going to use in your meals and not pre-prepared items. This helps save money.
- Stay out of the empty calorie aisles where you are likely to find crisps, toffees and fizzy drinks.

Hunger strategies

- Healthy weight-loss should not include hunger so please eat when hungry! If you starve yourself or deny yourself of food, you can become unhappy and your body will feel deprived of food. This can then cause you to binge eat. Binge eating can make you feel guilty, and drastically reduce food intake or put on weight.

- Depriving yourself of food can make you feel weak and tired whereas eating regular meals with controlled portion sizes can help your body burn fat, make you slimmer and give you control over your body.

In order to feel fuller for a longer period of time, you should

- Eat Regularly
- Eat foods with low Glycaemic Index (GI). These helps you feel fuller longer between meals. Examples of these foods include grains, nuts, legumes, fruits and vegetables.
- Fibre
- Protein

Eating out

- Before eating out, eat small healthy snack about 1-2 hours before leaving the house.
- Choose restaurants with varied menus when eating out as this makes it easier to find something healthier and tastier.

- Avoid restaurants and eating places that promote entertainment eating where the food is one of several attractions.
- Reading the nutrition labels on foods like sandwiches before buying.

- Avoid “all you can eat” restaurants especially when trying to lose weight.
- Resist fatty and sugary deserts. Try fruits with no added sugar or syrups for deserts.

- Portions and prices for children's menu are smaller. Try and choose from this menu for yourself.
- Choose water instead of other beverages. Water is healthier than most beverages on the menu.

Getting active

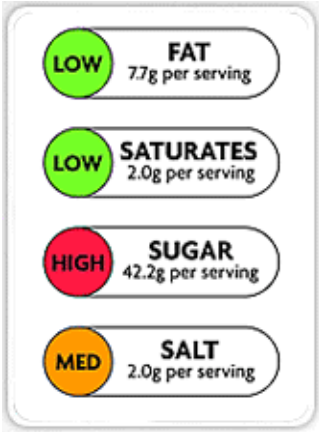
Exercise is key to losing and maintaining your weight

- Some of the ways of getting active is by joining a gym or even trying to fit in as much walking as can be done into a daily routine.
- Slowly aiming for at least 30 minutes of moderate intensity activities 3 to 5 times a week.
- Go for a brisk walk every day, taking part in sports activities like football and swimming or even gardening.

Look for hidden opportunities for exercise such as;

- Going to the bathroom upstairs instead of going to the one down the hall.
- Walk to the shops, rather than driving.
- Get down one stop before your bus-stop so you can walk a longer distance home.
- Use the stairs instead of the lift or escalator.
- Cut down on TV, COMPUTER.

3. Fat and food labelling



There are two main types of fat

- Saturated fat - having too much can increase the amount of cholesterol in the blood, which increases the chance of developing heart disease
- Unsaturated fat - having unsaturated fat instead of saturated fat

While fat is a necessary and important part of a healthy diet, it's important to cut down on food that is high in saturated fat and have foods that are rich in unsaturated fat instead.

Saturated fat

A diet high in saturated fat can lead to high cholesterol. This in turn may lead to coronary heart disease and stroke. Though saturated fats can be found mainly in animal products, it's also in some plant products.

- Try to eat foods high in saturated fat less often or in smaller amounts. Examples of these include
    - Palm oil
    - Coconut
    - Chin chin
    - Sausages, meat with visible fat
    - Butter and lard
    - Cakes, biscuits and meat pies

Unsaturated fat

- Unsaturated fats can be used in place of saturated fats. Use them in smaller quantities to control your weight. Examples of foods with unsaturated fats include
    - ❖ Fish like salmon, sardines, mackerel, herring and tuna
    - ❖ Avocados, nuts and seeds
    - ❖ Vegetable oils such as soybean, corn, canola, sunflower and olive o

Hidden calories in food

- Calorie is the standard measure of energy. 'Calories' usually refers to kcal.
- Energy can be expressed as kilojoules (kJ) or kilocalories (kcal).
- Calories from food:

    Carbohydrates = 3.75 kcal per gram

    Protein = 4 kcal per gram

    Fat = 9 kcal per gram

    Alcohol = 7 kcal per gram

Reading food labels

- Food labels allows us to compare products and provides information on serving sizes, calories, total fat, protein, cholesterol, sodium, total carbohydrates, dietary fibre, vitamins and minerals. It also helps to compare the nutrient contents of similar foods.

When trying to lose weight, look at:

- Energy
- Total Fat
- Saturated fat
- Sugar
- Fibre

Traffic Light Labelling

This type of labelling uses the colours below to help you make right choices.

- Green = good option
- Amber = be careful
- Red = only have occasionally

- Alternatively look at ingredient list listed in descending order by weight. This will tell you the percentage of the ingredients used in the product.

Let's beware of fat!

- Controlling fat intake is one of the best ways to help lose weight. Each gram of fat contains 9 calories. This is twice as much as the calories found in a gram of protein foods or starchy foods. Foods that are high in fat pile on the calories and can increase risk of getting heart diseases.

- To reduce total fat intake,
  - ❖ Select the ones that are lower in fat and saturated fats.
  - ❖ Eat fatty foods and snacks in smaller portions and less frequently.
  - ❖ Sauté meats and poultry in stock or spices and roast or bake instead of frying them in oil or fat.
  - ❖ Substitute mayonnaise and salad cream on salads with vinegar, lemon juice or olive oil.
  - ❖ Use skimmed, semi-skimmed or reduced fat instead of full fat dairy products.
  - ❖ For a healthy choice, use just a small amount of vegetable oil or a reduced-fat spread instead of butter.
  - ❖ During cooking, use fats or oils sparingly.
  - ❖ Bake/ roast or boil potatoes, yam and plantains instead of frying them.

- ❖ When frying foods like potatoes, yam or plantain, cut them in larger sizes.
- ❖ Reduce intake of foods high in saturated fats like sausages, meat pies, and fatty cuts of meats, butter, cream, cheese, chocolate, ice creams, pastries, cakes and biscuits.
- ❖ And when having meat, choose lean cuts and cut off any visible fat.
- ❖ Prepare own meals

Fat labels

Phrase	What it means
Fat free	Less than 0.5 grams of fat, with no added fat or oil
Low fat	3 grams or less of fat
Less fat	25% or less fat than the comparison food
Saturated fat free	Less than 0.5 grams of saturated fat and 0.5 grams of trans-fatty acids
Light (fat)	50% or less of the fat than in the comparison food

Let's compare the plantains below

Looking at the different methods used to cook the plantains below should tell us that the energy and fat content of food can either be high or low depending on the cooking method used.

Per 100g	Fried	Roasted	Boiled
Energy	223 kcal	174 kcal	119 kcal
Fat	1.5 g	0.2 g	0.1 g

4. Food Portion Control

Eat a reasonable amount of food at frequent intervals throughout the day. This helps keep blood sugar stable and also ensure that no extra is stored as fat.

To control your portion size

- Eat three-quarters of the food on your plate.
- Eat a reasonable amount of food at regular intervals throughout the day.
- Focus on your food, chew thoroughly and eat slowly.
- Opt for low density foods with higher water content. Example, you can have a bowl of fruit salad or a bowl of light soup with chicken breast for the same number of calories found in a small packet of crisp.

You can however increase the portion sizes of these foods

- All fruits (but not fruit juices)
- Green and coloured vegetables example; cabbage, broccoli, peas, carrots.

Look at the portion sizes and calories of the foods below

- ***Fried rice-***

A cup of fried rice is about 350kcal

- ***Waakye***

A cup of waakye is about 280kcal

- ***Pizza***

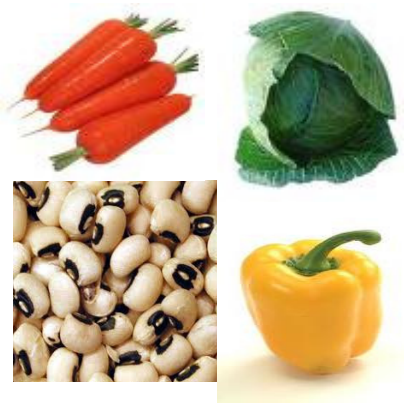
A slice of pizza is about 230-400kcal

- ***Banku***

One half of one Ga kenkey has about 380kcal

Consider the calories in this Take away food (fried potato chips)

- The portion size of this food is considered small with a weight of 500g and cost only £1.00



However, the energy and fat content is 1200 kcal and 62g respectively. (Food Portion Sizes, 1994, MAFF)

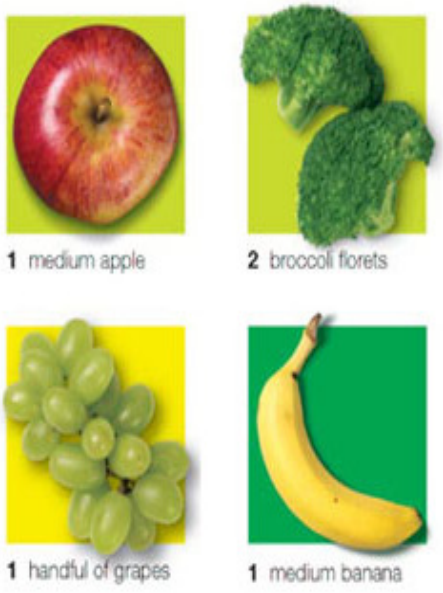
- The average portion size of chips from chip shops is 210g.

Energy content – 504 kcal

Fat content – 26 g

Why 5 - a – day

- They're packed with vitamins and minerals
- They can help you to maintain a healthy weight
- They're an excellent source of fibre and antioxidants
- They help reduce the risk of heart disease, stroke and some cancers
- They taste delicious and there's so much variety to choose from



What counts as 1 of your 5 - a - day?

- Fresh, frozen, chilled, canned, 100% juice and smoothies all count, as do dried fruit and vegetables
- Fruit and vegetables can be included in dishes
- Dietary supplements like vitamins and minerals *do not* count towards 5 A DAY.
- Potatoes and other related vegetables such as yams and cassava *do not* count.

A portion of fruit is

- Small-sized fruit: 2 or more. Ex: 2 plums, 2 satsumas, 3 apricots, 2 kiwi fruit, 7 strawberries, 14 cherries, 6 lychees
- Medium sized fruits: Eg 1 apple, banana, pear, orange, nectarine, or 1 sharon fruit

- ½ grapefruit, 1 slice of papaya, 1 slice of melon (2-inch slice), 1 large slice of pineapple, 2 slices of mango (2-inch slices)
- 1 tbsp of raisins, currants, sultanas, 1 tablespoon of mixed fruit, 2 figs, 3 prunes, 1 handful of banana chips
- A glass (150ml) of 100% juice (fruit or vegetable juice or smoothie) counts as 1 portion, but you can only count juice as 1 portion per day, however much you drink

A portion of vegetable is

- Green: 2 broccoli spears, 8 cauliflower florets, 4 heaped tablespoons of kale, spring greens or green beans
- Cooked: 3 heaped tablespoons of cooked vegetables such as carrots, peas or sweetcorn
- Salad: 3 sticks of celery, 2 inch piece of cucumber, 1 medium tomato, 7 cherry tomatoes
- 3 heaped tablespoons of tinned or frozen carrots, peas or sweetcorn 3 heaped of pulses and beans

Some helpful ways to increase your fruit and vegetable portions

- Try adding up your fruit and vegetable portions during the day.
- For example you can;
    - ❖ Add sliced banana to your cereal or dried fruits to your porridge.
    - ❖ Add a bowl of salad to your lunch of rice and vegetable stew or sandwich.
    - ❖ Take a glass of juice or smoothie with your sandwich
    - ❖ Add a portion of frozen vegetables to your jollof rice.
    - ❖ Remember plantains count as vegetables but potatoes do not count as fruit or vegetables.

Alcohol

- Alcohol has no nutrients but high in calories and therefore contributes to weight gain
- Alcoholic drinks also contain sugar
- Can be harmful to health if taken in excess

To reduce alcohol intake

- Set a drinking goal and choose a limit of how much you will drink or not drink at all.
- Sip when drinking and drink slowly.
- Try not to keep alcohol at home or at the workplace.
- Maintain a healthy diet and do not skip meals.
- Take up activities or hobbies that will take up your time.
- Stay away from people or places that make you drink.

5. Salt, Sugar and food labelling Salt

- Excess salt in the body can increase the raise your blood pressure and increase your risk of getting heart disease or stroke.
- Daily salt intake of no more than 6g is recommended for adults. This is about a teaspoonful of salt.

Sources of salt in the diet

- Very small amounts of salt are an important part of our diet.
- Only 5% of salt occurs naturally in food and about 10-15% is added in cooking or at the table.

Foods that are high in salt include

- ❖ Koobi (salted fish)
- ❖ Processed foods
- ❖ Salty snacks
- ❖ Fast foods
- ❖ Momoni

Salt/Sodium Labelling

Phrase	**What it means**
Sodium free or salt	No more than 5mg sodium per 100g or 100ml
No added salt	No salt or sodium added to the food
Reduced sodium	Contains at least 25% less sodium than the standard version

Low salt	No more than 40mg sodium per 100g or 100ml
Low salt/low sodium	Food is naturally low in sodium/salt

Reducing salt intake

- Reduce reliance on processed foods since most are high in salt.
- Eat more fresh foods or foods that are close to their natural state, such as fresh fruits, meats and poultry that are not already seasoned and unaltered grains and cereals vegetables.
- At the table, do not add salt to the food you about to eat.
- Use herbs, spices, fresh garlic, ginger and lemon juice rather than salt to flavor food.
- Substitute fruits, unsalted nuts, and other low-sodium snacks for high-salt items, such as plantain chips or potato chips.
- Reduce your intake of bacon, sausage, corned beef and ham.
- Reduce intake of salted fish like koobi.

Confusingly, sodium or salt may be listed in either grams or milligrams. To convert from sodium to salt; 1g (1,000mg) sodium=2.5g salt.

Artificial flavor enhancers

- Limit use of artificial flavor enhancers like Maggi which contains monosodium glutamate! This contributes to your total sodium intake and can increase risk of high blood pressure.

Other helpful tips

- You should also increase your potassium intake whiles reducing your sodium intake to have an even greater effect
- Good sources of potassium are
  - ❖ Banana
  - ❖ Plantain
  - ❖ Avocados
  - ❖ Garden eggs
  - ❖ yam

Sugar labels

- No added sugar – may contain natural sugar
- Low sugar - <5g / 100g or 100ml
- Reduced sugar – 25% less than std

Read Sugar labels carefully!

- "No added sugar": Means that no sugar has been added BUT there may be natural sugar in the product
- "Low sugar": The label may say 'low sugar' BUT sugar comes in many forms e.g. syrup, glucose, glucose syrup, maltose & honey
- "Low in fat": Some low fat products are very high in sugar so always check the label….."Carbohydrates of which sugars"

Reducing sugar intake

- Drinking enough fluids (6-8 glasses) each day helps to reduce appetite.
- In drinking, water should be drank plainly if possible or either with ice or flavored with a low calorie squash or fruit juice.
- Tea and coffee can be drunk without sugar. Low fat milk can also be used as fluid to reduce appetites.
- Both alcohol and soft drinks intake can be reduced by developing alternatives to drinking.
- Water and unsweetened fruit juices can be used as alternatives to alcohol and soft drinks.

Fruit Juices

- Over 10% sugar
- >25 g sugar in standard glass of juice which is more than 5 teaspoons of sugar
- 1 glass (250ml) = 105 calories

To reduce sugar content, you can mix 50-50 juice and water

Coca cola

- 330 ml can has about 11% sugar
- Calories in one can is about 142
- >35 g sugar per can which is equal to 7 teaspoons full of sugar

Lemonade

- Same sugar content as cola (7 teaspoons full of sugar)
- Non-diet fizzy drinks can increase your calorie intake

6. Setting realistic weight-loss goals, keeping motivated and monitoring your weight

- Following a healthy diet plan is only half of the weight-loss equation.
- Make lifestyle changes gradually.
- Be realistic about your time frame.
- Your goals should include how much weight you want to lose.

Real life tips

- Be realistic about the time frame you will want to lose the weight.
- Track your progress by keep daily records of dietary intake exercise sessions and weekly measurements.

Be sensible and

Keep short term goals of what you want to achieve daily. Set short term goals and break the weight-loss programme into smaller, more achievable mini goals which can be monitored regularly. keep track of weight-loss and monitor progress regularly using weighing scales or your clothes

How do you maintain your motivation?

- Health reasons?
- Make a list of reasons for wanting to lose weight
- Record your progress and reward yourself for every mini goal you are able to achieve.
- Keep a journal/dairy and read over your journal when lacking motivation. This can be a good way to remind yourself of how much you have achieved.
- Avoid spending time with people who discourage you and spend more time with t hose who encourage you.
- Exercise as early as possible or as soon as you are able to in the day. This stops you from procrastinating.
- Watch cooking shows that promote healthy eating or fitness shows to keep you motivated. This can also be a good way of learning new things or changing some of your routines especially if they have become boring.
- Join a support group to keep you motivated. Likewise, find a weight-loss buddy.
- Weigh yourself regularly and reward yourself with new clothes if affordable.
- Pass on what you have learnt to family or friends. Picture yourself at the end of your journey

Maintaining your weight

Losing weight can be easy, however maintaining weight-loss can be tricky or even difficult. To do this,

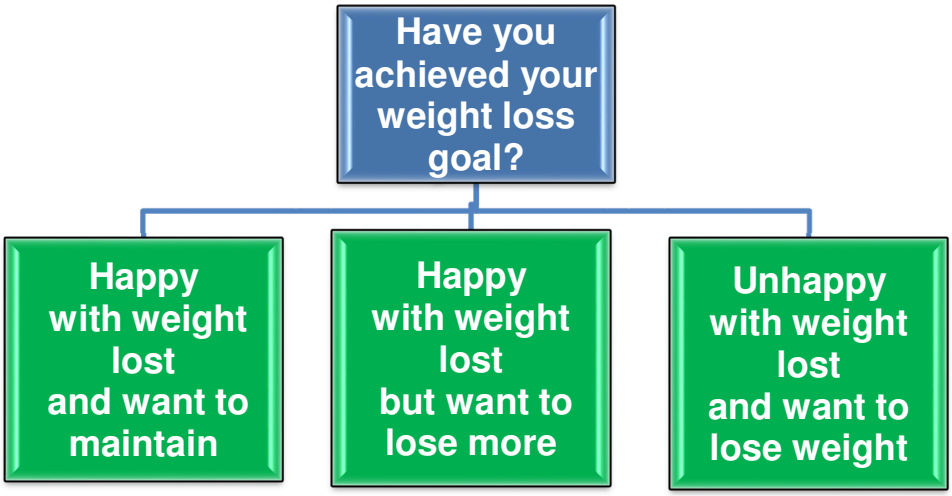
- Continue with regular exercise.
- Continue to keep track of your daily dietary intake and exercise.
- Weigh yourself regularly and if you find that you have put on weight, change your habits to control it
- Continue to maintain relationships with supportive people or your weight-loss buddy.
- After weight-loss, slowly increase your daily calorie intake whiles continuing to exercise and follow a healthy diet plan. Weigh yourself regularly to find out if you have stopped losing weight. If you have, then make this your new daily calorie intake.
- Continue to eat healthily and find ways to cope with problems without relying on food.
- Eat only when hungry and have regular, small and frequent meals throughout the day to keep hunger pangs at bay and your keep your blood sugar stable.

Additional tips

- Keep a food diary

- Know your weaknesses : e.g. If you like crisps, then keep them out of the house
- Plan your week and when there will be social events
- Remember that you may have ‘good’ days and ‘bad’ days. However, you must have more ‘good’ days than ‘bad’ days

After your weight-loss, what happens next? Look at the diagram below. Where do you find yourself?



If you have achieved your weight-loss goals, then CONGRATULATIONS. Keep up the good work.

You have all the skills you need

APPENDIX C: ETHICAL APPROVAL

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London Metropolitan University
166-220 Holloway Road
London N7 8DB

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Tel: + 44 (0)20 7133 4095
Fax: + 44 (0)20 7133 2417

Dear Joycelyn,

I am pleased to confirm that the RD2, which you submitted for the recent Faculty of Life Sciences Research Student Progress Group (RSPG) meeting, has been approved. Please see the attached feedback.

The RSPG will be reviewing your progress regularly.

Throughout the period of registration, it is expected that students will continue to develop their skills and knowledge and participate in the Researcher Development Programme. The University offers a range of training opportunities to support researchers in developing transferable professional, personal, research, and career skills and knowledge. Details of workshops and on-line course can be found here:http://www.londonmet.ac.uk/research/the-research-and-postgraduate-office/current-students/researcher-development-programme.cfm

Research student are also able to attend postgraduate taught modules. If you wish to attend a module, please discuss this with your supervisor and submit a registration form to the Research and Postgraduate Office. Forms can be downloaded here: http://www.londonmet.ac.uk/research/the-research-and-postgraduate-office/current-students/taught-modules.cfm

Please do contact me if you have any queries.

Best regards,
Doreen Henry.

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APPENDIX D: PUBLICATIONS AND PRESENTAIONS FROM THIS THESIS

- Adinkrah A & Bhakta D. (2010). High prevalence of overweight and obesity in migrant Ghanaians in London; using Black Churches as a setting for an obesity intervention programme. *Proceedings from the Nutrition Society*, 69 (OCE6), E506.

- Adinkrah J & Bhakta D. (2010). First generation Ghanaian migrants in the UK; dietary intake, anthropometric indices and nutrition education through the Black Churches. *Proceedings of the Nutrition Society*, 69 (OCE1), E37.

- Adinkrah J & Bhakta D. (2013). Nutrition intervention for first generation Ghanaian migrants in London. (Presented at the Nutrition Society Summer meeting, 2013).