Impact of a nutrition Education Intervention on nutritional status and nutrition-related knowledge, attitudes, beliefs and practices of Basotho women in urban and rural areas in Lesotho

By

Mamotsamai Ranneileng

BA.ED (National University of Lesotho)

MA in Health Promotion (University of Ireland – Galway) (UCG)

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Promoter: Prof. CM Walsh (PhD)

Co-Promoter: Prof. A Dannhauser (PhD)

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Faculty of Health Sciences

University of the Free State

Dedication

To my late mother

And I pay tribute to my late father, and dear brothers, may your souls rest in peace

To my sons, Tsepo and Tsepang,

You are always there...

To my grandson Lintle Oliphant Ranneileng

I want you to grow up to be counted amongst the greatest!

(tell the others after you)

DECLARATION

"I hereby declare that this thesis for the qualification of PhD in nutrition at the University of the Free State is my independent effort and had not previously been submitted for a degree at another University or Faculty. I furthermore waive copyright of the thesis in favour of the University of the Free State."

Mamotsamai Ranneileng

Date

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List of abbreviations

ADB	African Development Bank
AIDS	Acquired Immune Deficiency Syndrome
AHA	Assuring Health for All in South Africa
BMI	Body Mass Index
BOS	Bureau of Statistics
CCA	Common Country Assessment
DMA	Disaster Management Authority
FAO	Food and Agricultural Organization of the United Nations
FFQ	Food Frequency Questionnaire
FGP	Food Guide Pyramid
FNCO	Food and Nutrition Coordinating Committee
GOL	Government of Lesotho
HIV	Human Immuno Deficiency Syndrome
KABP	Knowledge, Attitudes, Beliefs and Practices
LHDS	Lesotho Health and Demographic Survey
LSPP	Lands Surveys and Physical Planning
MAFS	Ministry of Agriculture and Food Security
MOHSW	Ministry of Health and Social Welfare
MRC	Medical Research Council
NAPFS	National Action Plan for Food Security
NASP	National AIDS Strategic Plan
NUL	National University of Lesotho

SAFBDG	South African Food Based Dietary Guidelines
STIs	Sexually Transmitted Infections
TSF	Triceps skin fold
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children Fund
UFS	University of the Free State
WC	Waist Circumference
WLSA	Women and Law in Southern Africa - Lesotho

Chapter One: Introduction and Motivation for the study

1.1 Introduction

The importance of good nutrition to health has been well documented. Whether people eat well is a daunting question for nutrition and health promotion specialists alike. Even more challenging is the task of getting people to eat well. Reasons why people do not eat well can be ascribed to a number of factors. Global trends in morbidity and mortality indicate an exponential growth (Lesotho Demographic and Health Survey (LDHS), 2004: 12; 2009: 3) motivating why there is room for improvement in people's nutrition-related knowledge, attitudes, beliefs, practices and lifestyles. The popular belief, and indeed to a large extent factual reality, that women are home-makers has motivated the importance of including women as the primary target group for nutrition interventions in Lesotho. Educating people in nutrition is one of the most important facets of nutrition interventions that can be implemented in communities (Walsh, 1995: 121; Mushaphi, 2012:151). The following section describes the country, Lesotho, the setting of the study, including its physical features, socio-demographic characteristics, as well as the nutrition-related challenges facing its women.

1.2 Lesotho: The country

The Kingdom of Lesotho is a small, mountainous country of about 30, 355 square kilometres (Bureau of Statistics (BOS), 2003: 1). It is completely surrounded by South Africa, making it highly dependent on its neighbour economically and to a large extent politically (World Bank, 2003: 8). Four ecological zones divide the country thus: the mountains, which take up 59%, the foot-hills 15%, the Senqu Valley 9% and the lowlands 17% (National AIDS Strategic Plan (NASP), 2003: 1). The country is further divided into ten administrative districts. The mountains distinguish the country from its neighbours, although they also make the terrain difficult, making access, communication and agricultural production a challenge (African Development Bank (ADB), 2003: 2). Coupled with these are the unpredictable and unfavourable weather conditions marked by drought, erratic rains and very cold winters (United Nations Development Programme /Common Country Assessment of Lesotho (UNDP/CCA/Lesotho), 2004: 4).

The population of Lesotho has declined from the 2004 estimate of 2,309, 709 (2004 Lesotho Population Data Sheet) to 1,880,661 (made up of 916,282 males and 964,379 females) (BOS, 2006: 2). This decline could be due to mortality from the Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) pandemic in the country(World Bank 2003: 21), as well as changes in fertility and migration (BOS, 2006: 6). The people of Lesotho are called Basotho, and 76% of them reside in the rural areas (BOS, 2006: 4) although migration to towns has increased in recent years (Ministry of Agriculture and Food Security (MAFS), 2005: vi). Table 1 shows the changing trends in percentages of urban and rural residence since 1976 in Lesotho:

Table 1.1: Population by urban and rural residence (BOS, 2006: 4)

Residence	**Percentage distribution of the *de jure** population by urban and rural residence**			
	1976	1986	1996	2006
Urban	10.5	11.8	16.9	23.8
Rural	89.5	88.2	83.1	76.2
Total	100	100	100	100

**De jure* Lesothopopulation: Lesotho citizens living in and out of the country at the time of the census as opposed to *de facto* population which means Lesotho citizens actually living in the country at the time of the census.

Rural residents depend on subsistence farming for their food, while urban residents depend on the market for food, small areas of land to cultivate, and a high intake of street food (MAFS, 2005: vi).

Lesotho is one of the poorest countries in the world as ranked by the UNDP Human Development Index Rank (UNDP 2003: 5; Wikipedia Online). Poverty in this country has reached epidemic proportions in recent years, being a consequence as well as a cause of chronic and increasingly irreversible food insecurity (MAFS, 2005: 2; UNDP/CCA/Lesotho, 2004: 63). MAFS (2005: 2) indicates that the number of people falling below the poverty line increased to above 60%in the 1990's and the situation remains almost similar to date. According to FAO (2013), 59% of Basotho fall below the poverty line while 40% live in extreme poverty.

Food and nutrition insecurity in Lesotho is indicated and aggravated by multiple factors. The Ministry of Agriculture/National Action Plan for Food Security (MAFS/NAPFS) (2006: 13) and UNDP/CCA/Lesotho (2004: 64) identify the following as causal factors: poor performance from the agricultural sector with declining livestock and crop production, land degradation, poor climatic conditions and population pressure. MAFS/NAPFS (2006: 13) further indicates HIV and AIDS as a major contributory factor to the food and nutrition insecurity in the country. The report points out that HIV and AIDS reduced life expectancy from 52 years in 1995 to 36 years in 2002; increased the number of orphans in the country, significantly raised absenteeism and mortality in the work place, thereby reducing productivity and efficiency, and deprived households of their most productive members. HIV and AIDS have also reduced family labour for farming (MAFS/NAPFS, 2006: 10).

The BOS 2002/03 and 1994/95 Household Budget Survey (2006: iv) indicate that during the stated period, 29.0% of the population lacked food and did not even have the minimum amount of income to sustain a basic standard of living. According to MAFS (2005: 2), the situation of poverty and lack of food in the country had reached unacceptable proportions with the mountainous areas and the Senqu valley being mostly affected (World Bank, 2003: 56). The increasing food prices and rural to urban migration were worsening the problem (MAFS 2005: 2). The prevailing food crisis in the country had caused the former Prime Minister Dr. Pakalitha Mosisili to declare a state of emergency with regard to famine in the country in 2002 (ADB, 2002-2004: 2) and in 2007 (Disaster Management Authority (DMA)/ Food and Nutrition Coordinating Office (FNCO) 2008: 1), appealing for international aid from donors. In 2012, the situation of food insecurity in the country had not improved, to the extent that the present

Prime Minister Dr. Thomas Motsoahae Thabane also declared a state of emergency of hunger, also calling for relief in this regard (Lesotho Television News, August 2012; January 2013). The high unemployment rate in the country, estimated at 40% due to, among other factors, Basotho mine workers retrenchment from South Africa, worsening the situation (ADB, 2002-2004: 18). Subsistence farming, the poorest sector in terms of performance and revenue, is the most common economic activity, especially in rural areas (BOS, 2006: iii).

It is these complex macro socio-economic challenges that impact on women's nutrition in Lesotho. Over and above these, there are challenges that women experience on a larger scale than males, and these are presented in the next section.

1.3 The situation of women in Lesotho

Women have been found to experience marginalization in all spheres of life, and this exposes them to several problems that eventually impact on their health. In particular, women as compared to men are mostly single parents; significant characteristic predictive of health outcomes (Whitehead, 1987: 34). Female-headed households are most likely poor (BOS, 2006: 71), and women are mostly malnourished because in times of shortage, they sacrifice for their families to have more food. Women in developing countries are mostly burdened with caring for children and sick family members (Mwangome *et al*., 2008: 169), are challenged by extreme poverty, hard domestic and farm work to produce food (Doyle, 1995: 31). They experience feelings of powerlessness and low self-worth which is indicated by the fact that decisions in the family are made for them by their husbands and mothers-in-law (Van Rensburg, 2010: 265; Mwangome *et al*., 2008: 169). As articulated further by Doyal (1995: 31), women in developing countries "have little money or no money to spend and survive through direct production of their own and their families' needs. Many are engaged in subsistence farming, growing and then processing food they cannot buy." Globally women are further disadvantaged across the board as is evident regarding occupational positions, income and educational opportunities which are often lower for women when compared to those of men (Robson & Rootman, 2004: 158). Despite this hard work by women, in developing countries in particular, men still get the largest share of meal portions, disadvantaging both women and children (Mwangome *et al*., 2008: 169). In addition, because of hard domestic chores, women have less time to prepare healthy meals and consequently they experience higher levels of stress than men (Mwangome *et al*., 2008: 171).

Basotho women subscribe to the foregoing. Traditionally, girls and young women look after the home, care for their siblings and prepare and cook food (in preparation for looking after their husbands in future). This often starts at a very young age, to the extent that girls even stop going to school for this reason (UNESCO, 2003: 122). This is reflected in the fact that although women have a higher literacy rate than males (95% and 75% respectively) (LDHS, 2004: 27), more males achieve higher secondary education than their female counterparts (BOS, 2006: iii), meaning that most girls leave school at the primary level or before they finish secondary school either to get married or to look after the home. This practice is still more prevalent in rural than urban areas. LDHS (2004: 13) further indicates that due to the reasons stated above, Basotho women who live in the mountainous areas are less educationally advantaged than women in the lowlands.

Women bear the brunt of the poverty situation in Lesotho (World Bank, 2003: 56). This is evidenced by the fact that women are mostly represented in subsistence farming, which is the poorest sector in Lesotho (GOL/UNICEF, 1994: 216). Women are also mostly represented in 72% of the informal economic activities such as sale of fruits and vegetables imported from South Africa and home grown, sale of beer (local brew – *joala*), sale of animal products (offal, feet, heads) and other small-scale enterprises (MAFS, 2005: 10). Moreover, more women than men were employed in garment factories in 2003 (World Bank, 2003: 63), and 10% as domestic workers (LDHS, 2004: 34) with a monthly pay below the minimum wage (GOL/UNDP 2004: 131). The minimum wage has been recently reviewed in 2012 to a monthly pay of R908 for textile workers and R385 for domestic workers (GOL, Minimum Wage Act 2012: 1266, 1271).

Women in Lesotho are also disproportionately represented in HIV and AIDS infection. According to the LDHS (2009: 202), 27% of women aged 15-49 years were infected with HIV in 2004 as compared to 18% of males in the same age group. Although the rural residents population, particularly women, are more disadvantaged than their urban-based counterparts in respect of poverty, unemployment, level of education and discriminatory practices against women (ADB/ADF 2003: 9), young women of urban residence are more likely to be infected with HIV than rural women (LHDS, 2004: 242). In addition, 43.2% of women working in textile factories were infected with HIV in 2007 (MOHSW, 2007/8: 53). HIV and AIDS is a predisposing factor to unemployment and poverty, as well as malnutrition (Fenton & Silverman, 2008: 996; 1008). Furthermore, although legislation has been reviewed to make life easier for women (Women and Law in Southern Africa Research Trust – Lesotho (WLSA), 2010), women in Lesotho are still subjected to domestic violence, discriminatory inheritance practices, as well as early unstable marriages and divorce (Federation of Women Lawyers (FIDA), 2012 (Radio talk show).

1.3.1 Basotho women's nutrition-related knowledge, attitudes, beliefs and practices

Women in Lesotho may have been exposed to some information about nutrition mostly through radio. Knowledge of healthy diets alone, however, is unlikely to affect behaviour since people must also be motivated to change through a process of empowerment (Contento, 2007: 15; Kelleher & O'Donovan, 1995: 42).

Women's beliefs and attitudes towards food and nutrition may influence whether or not they act on the information that they have received, and whether they possess the ability and knowledge to process this information. These are reflected in what Doyal (1995: 50) calls "gender inequalities in nutrition and health care". Doyal (1995: 50) points out that, women have less access to nutrition and health care than men, despite the fact that they are usually responsible for the purchase, production and preparation of food. Women often give the food to their husbands and deprive themselves and their children of nutritious food. FNCO/UNICEF (1985: 10) found similar experiences in Lesotho. This is also a reflection of a lack of knowledge of the fact that women are more vulnerable to malnutrition than men, due in part to the hard domestic and agricultural work which women do, that depletes them of nutrients, in addition to menstruation, pregnancy and lactation (Doyal, 1995: 50).

As early as 1991, lack of knowledge by the mother has been highlighted as reflected in child feeding practices that indicate that availability of food did not ensure proper feeding of the child in the mainly rural Districts of Qacha's Nek and Quthing (GOL/UNICEF, 1991: 158). Other examples of lack of knowledge related to the health of children include the practice of giving enemas to children as a result of certain cultural beliefs (GOL/UNICEF, 1994: 216). FNCO/UNICEF (1985: 1) found that even children from wealthy families showed signs of malnutrition because mothers gave them food that they believed showed status instead of good nutrition. Sebotsa *et al.* (2003: 36) also found that people in Lesotho were no longer eating the nutritious 'indigenous food-plants' which they considered a low status food, but preferred eating exotic cultivated vegetables with a lower nutritional value as they believed them to be of better status. This is all due to a lack of knowledge of nutrition. Basotho women in particular lack knowledge of food groups, of nutrition during the life cycle and its application in the family (FNCO/UNICEF, 1985: 8).

Cultural beliefs and taboos also contribute to the malnutrition situation among Basotho women. This is reflected in the practice that is still common in rural areas which forbids young girls from eating eggs, offal and food that has come into the family as gifts (FNCO/UNICEF, 1985: 9), thus depriving them of necessary nutrients from relatively cheap protein sources. This also manifests itself in feeding practices of children by their mothers. These include in-exclusive breastfeeding practices in which Basotho women, especially in rural areas, introduce liquid and solid foods (usually grains) to babies younger than a month (Ministry of Health and Social Welfare: The Preliminary Report on Lesotho National Nutrition Survey, 2007:73; LDHS, 2004: 154).

It should be noted that women in urban and rural areas may have different attributes in terms of nutritional knowledge, attitudes, beliefs and practices. According to Martorell and Stein

(2001: 669), urbanization is often associated with improved education and status of women which may lead to dietary changes including greater energy intakes and higher rates of obesity. These then cause an array of nutrition- related problems such as diet-related chronic diseases that increase morbidity and mortality.

1.3.2 Nutritional status and health of women in urban and rural areas in Lesotho

As a consequence of a lack of nutrition-related knowledge and poor nutrition-related practices described above, the LDHS (2009: 150) found that the mean Body Mass Index (BMI) for women in the age group 15-49 years was 25 kg/m^2 and that 42% of women had a BMI of 25 kg/m^2 and higher. This trend increased with age as 68% of women in the age group 45-49 years had a BMI $\geq$25 kg/m^2 compared to 22% of the 15-19 years age group (LHDS, 2004: 176). In addition to the problem of overweight and obesity, underweight is also common. The percentage of women with a BMI of <18.5 kg/m^2 in the age group 15-19 years was 10.1%, and in the age group 45-49 years it was 4.0% (LDHS, 2004: 176).

Dodd (2008: 272) indicates that a BMI $\geq$25 kg/m^2 is a major risk factor for heart disease, diabetes, breast cancer and other cancers. Consequently in view of the BMI data, according to statistics from the Ministry of Health Annual Joint Review Report of 2007, out of a sample of 14, 228 women, 2% died of heart failure, 3% died of diabetes mellitus and 5% died of stroke (MOHSW, 2008: 46). According to the Ministry of Health, these diseases were also among the main causes of hospital admissions of women in the same year (it should be noted that many Basotho still die at home and therefore are not on hospital records, while quite a few use health facilities in South Africa). On the other hand, chronic underweight is a risk factor for infertility (Dodd, 2008: 272), and for becoming prone to infection and disease (Whitney & Rolfes, 2005: 20). Diarrhoea (5%) and gastroenteritis (3%) were among the main causes of death and hospital admissions among Basotho women in 2007 (MOHSW, 2008: 44, 46). Diarrhoea and gastroenteritis are associated with under-nutrition, lack of hygiene and poor food preparation methods (FNCO/UNICEF, 1985: 9).

Anaemia, a common problem in Lesotho, is the advanced stage of iron deficiency characterised by limited haemoglobin production (Yip, 2001: 319). Since the first time that high levels of anaemia were reported in Lesotho in 1992, further research has confirmed that it is still common (GOL/UNICEF, 1994: 207). The LDHS (2004: 170) reported that 38% of urban women as compared to 24% of women in rural areas had anaemia. The difference could be due to the iron pots that the rural based women predominantly use in their cooking. Anaemia has been found to be one of the main causes of death among women (MOHSW, 2008). Micronutrient malnutrition is among the factors that predispose individuals to iron deficiency, a feature that is pronounced in Basotho women. This is characterised by the consumption of a diet deficient in nutrients such as proteins, folate and vitamin B12, B6, and C which are necessary for prevention of iron deficiency (Anderson, 2000: 131; Webb, 2003: 314). Other risk factors for iron deficiency anaemia include being in the reproductive years due to periodic menstrual losses (Yip, 2001: 319), food preparation in which food is cooked in large amounts of water which is then thrown away, and eating a mainly plant-based diet which basically provides non-heme iron, a less bio-available type of iron compared to heme-iron from meat, fish and poultry (Leroy & Frangillo, 2007: 2311; Webb, 2003: 313).

Other micronutrient deficiencies prevalent in Lesotho include iodine deficiency which is prevalent in the mountain areas (Sebotsa *et al.*, 2003). This could be due to the country being landlocked as well as the soil erosion situation described above. It could also be due to the fact that cabbage, one of the *Bassica* species containing goitrogens (Smolin & Grosvenor, 2000: 375) (nicknamed "jelemut") is one of the most consumed cultivated vegetable in Lesotho (when cabbage is eaten raw it can cause goitre by interfering with the utilizations of iodine in the body). Despite the availability of peaches, pumpkins, carrots, apricots and other vegetables, vitamin A deficiencies in children are still common (GOL/UNICEF: 1991: 25).

According to the MOHSW Annual Joint Review report (2007: 8), Basotho women also suffer from cervical and breast cancers, the former being the most commonly occurring cancer in Lesotho (MOHSW, 2007: 8). According to this report, in 2006, 62 women with cancer of the cervix were referred to South African institutions as Lesotho does not have the capacity to treat cancer. Sexually transmitted infections (STI's), and HIV and AIDS are highly implicated in the causal route to cervical cancer. In addition, smoking, alcohol use, diet, sedentary lifestyles and obesity have been identified as risk factors for breast and cervical cancers (MOHSW, 2007: 8).

Nutritional status is a reflection of nutritional practices and lifestyle behaviour of individuals. These are in turn a function of the level of knowledge individuals have, their attitudes, beliefs, and practices as well as lifestyles. Education is one of the ways in which individuals' knowledge, attitudes, beliefs and practices, as well as lifestyles can be improved. In this case nutrition education can be used to increase women's level of nutrition-related knowledge and to improve their nutrition-related attitudes, beliefs, practices and lifestyles, thereby potentially improving their nutritional status.

1.4 Problem Statement

Enabling food and nutrition security is without doubt the first and foremost strategy to ensure access to safe, acceptable and adequate sources of food (Dodd, 2008: 272). However, the answer to good nutrition is not as straight-forward as that. A complex set of issues come into play to influence people's eating patterns and behaviour. These factors include among others; a lack of knowledge of how to eat and what to eat; social, socio-economic and cultural factors as well as psychological factors that determine people's food selection (Webb, 2003: 38). Basotho women's nutrition is particularly influenced by these factors. They are exposed to extreme poverty (LDHS, 2004: 27; World Bank, 2003: 56; GOL/UNDP, 2004: 131; BOS, 2006:71; FAO Online), they are disproportionately represented in HIV and AIDS infection rates (MOHSW 2007/8: 73; LDHS, 2004: 162) and they lack knowledge relating to nutrition, as well as have negative attitudes, beliefs and practices regarding nutrition (MOHSW 2007/8: 73; FNCO/UNICEF, 1985: 9; LDHS, 2004: 162). As a result, Basotho women's nutritional status is challenged. Although several nutrition-related initiatives have been undertaken in Lesotho (including radio talks and women's groups), most of these are fragmented and focused on single topics which have only provided an overview of the general role that nutrition plays in health, and none have provided nutrition guidelines that are relevant to the unique situation of women in Lesotho.

Efforts have been made worldwide to improve nutrition policies and to educate the public on the importance of good nutrition (Smolin & Grosvenor, 2000: 33, Lee & Nieman, 2007: 35). These have evolved over time and have culminated into the United States Department of Agriculture (USDA) Food Guide Pyramid (FGP) (Bayerl, 2000: 313; Smolin & Grosvenor, 2008: 42; Escott-Stump & Earl, 2008: 342). The FGP has since evolved into 'my pyramid' (Escott-Stump & Earl, 2008: 345). Since 1917, several publications have been produced in the United States and Canada, including the Recommended Daily Allowances (RDA), which were revised into the Dietary Reference Intakes (DRI) (Smolin & Grosvenor, 2000: 33). Dietary guidelines, both disease specific and for the general public, have also been developed (Bayerl, 2000: 313-314). According to Lee and Nieman (2007: 35), the first guidelines were developed in Britain in 1833, while the first formal guidelines originated in Finland and Sweden in 1968. In America, dietary guidance started in 1977 (Escott-Stump & Earl, 2008: 342) and while the dietary guidelines were meant to show people what foods to eat, the FGP was developed to show people how much to eat from each food group (Smolin & Grosvenor, 2000: 39). The FGP has been hailed as a universal nutrition education tool (Mathai, 2004: 311; Katz, 2000: 292; Smolin & Grosvenor 2000: 42). For ease of reference because of its simplicity, the FGP model will be used in this study.

Although the USDA FGP has been used widely in South Africa, this country has also developed the Food Based Dietary Guidelines for South Africans (SAFBDG) (Vorster *et al.*, 2001). This is in line with what Dodd (2008: 279) and Lee and Nieman (2007: 34) propose; namely that the basic general guidance provided by the FGP should be complemented by nutrition advice that reaches a personal level, such as the SAFBDG.

As alluded to in section 1.1, Lesotho is highly dependent on South Africa for many facets of life (World Bank, 2003: 8), and these include food and information. The USDAFGP and the SAFBDG are used as the major nutrition education tools in South Africa and although these could also encourage dietary adequacy, balance and variety in Lesotho, no nutrition education guidelines that are specific to Lesotho exist.

From the foregoing background, which puts into perspective broader environmental factors as well as person-related issues regarding nutrition in Lesotho, it is evident that the following challenges remain unsolved: women in Lesotho experience many nutritional challenges and are survivors of a complex nutritional environment which exposes them to negative socio-demographic factors predisposing them to malnutrition; Basotho women's nutritional status is challenged in terms of food intake, health and weight status as a result of their food practices; and women in Lesotho still have limited nutrition-related knowledge and have negative attitudes, beliefs, practices and lifestyles related to nutrition. As a result, they may not consider changing their nutritional practices and lifestyles, because they may not be aware that there is anything wrong with them.

Nutrition education in Lesotho has never really been established beyond the simplistic concept of the three food groups (FNCO/UNICEF, 1985) that is still widely applied. Although FNCO/UNICEF (1985: 1) points out that it is almost fifty years to date since nutrition education was established in Lesotho, very few studies determining the impact of nutrition education interventions have been undertaken in Lesotho.This study explored the usefulness of a systematically designed and implemented nutrition education intervention among women in Lesotho as a basis for developing nutrition education guidelines, which are currently lacking in the country. Although nutrition education informed by health promotion principles has been widely researched and applied in nutrition education and counselling in other parts of the world, similar studies have not been done in Lesotho. Therefore, the study aimed to evaluate the impact of a nutrition education intervention informed by the theories of health behaviour. The study used constructs from the Health Belief Model, Self-Efficacy, Locus of Control, Theory of Reasoned Action and Theory of Planned Behaviour, Stages of Change Model and Social Support to inform, design, implement and evaluate a nutrition education intervention in

Lesotho. Nutrition education and theories of health behaviour are discussed in more detail in Chapter Two.

1.5 Aim of the study

The aim of the study was to evaluate the impact of a nutrition education intervention developed and implemented by the researcher on nutritional status and nutrition-related knowledge, attitudes, beliefs and practices of women in urban and rural areas in Lesotho.

1.5.1 Objectives/sub-aims

In order to achieve the aim, the following objectives were set:

- To describe the socio-demographic profile of participants;
- To evaluate whether learning occurred, by determining the following before and 6 months after implementation in both control and experimental groups:
  - (i) Nutritional status of participants:
    - (a) Anthropometric status (height and weight, waist circumference and triceps skin fold thickness);
    - (b) Health status and nutrition information;
    - (c) Usual food intake;
  - (ii) Nutrition-related knowledge, attitudes, beliefs and practices (KABP) including food habits; and
  - (iii) Lifestyle factors (physical activity, alcohol intake and smoking).

Chapter Two: Literature Overview

Chapter Two reviews literature relating to the objectives of the study according to the following: nutrition education interventions, definitions and purposes. Literature pertaining to theories of health behaviour and how they explain individual health behaviour is also reviewed. The chapter also reviews literature related to socio-demographic indicators, nutritional status, food intake, nutrition-related knowledge, attitudes, beliefs and practices, as well as nutrition-related lifestyles.

2.1 Introduction: Eating practices of the Basotho

According to Maslow's Hierarchy of needs, the need for food is a survival motive (Louw and Edwards, 2000: 812). This means that food sustains life and people will do anything to obtain food. Hunger is the drive motivating the need to eat in order to reach a state of homeostasis. In Lesotho, the days of cannibalism confirm this perspective. In the olden days in Lesotho as a result of tribal wars (*lifaqane*) and wild animals (*libatana le linyamatsane*), people lived a nomadic life, continuously moving from one place to another in search of food, while others turned to cannibalism because of starvation (Motsamai, 1980: 5). Food was also used as a component of important rituals, featured in the richness of Basotho language and was used as a symbol of respect to the ancestors through feasts (*mekete ea Balimo*) (Sekese, 1991; Makara & Mokhathi 1993: 81, 85).

People everywhere will use food as a means to an end, for example, using a hunger strike to draw attention to a plea or course of action (De Certeau & Giard, 2008: 73), offering sex in exchange for food (Flynn, 2008: 562), women using food to boost religious and cultural power (Counihan & Van Esterik, 2008: 4), and using food to perpetuate male dominance over women

(Clark, 2008: 415). Eating started as a quest for survival, but now ithasit has become a quest for health.

The Basotho are a homogenous society that share similar customs and traditions, including diet. The diet which was described by Segoete (1989: 7-10) in his novel entitled *"Mekhoa le meetlo ea Basotho* (Customs and traditions of Basotho)" includes grains, milk, pumpkins, legumes, seeds, indigenous food plants (vegetables and fruit) and some meat. Different dishes were made out of sorghum, which was the main staple food, and a few from yellow maize. Segoete (1981: 7) believed that although there was little variety in the Basotho diet, it was adequate and nutritious. However, this way of eating is a thing of the past sincethesince the Basotho diet of today has changed from the traditional Basotho diet of many years ago to a more westernised way of eating.

The introduction of commercial and domestically produced foods, though they ensured sustainability and eradicated cannibalism, caused disruptions in the Basotho diet. Such changes have also been reported in South Africa where, according to Stein and Temple (2008: 202), traditional African diets have undergone a transition as a result of modernization of food products. Although not much difference exists between urban and rural African diets which consist of large amounts of starch and differing amounts of vegetable and protein, urban diets are often more varied (Stein & Temple, 2008: 203; Macintyre *et al*., 1997: 203).

With the advent of HIV and AIDS, efforts have been made to revive the Basotho traditional eating habits in support of healthy eating as encouraged by the Ministry of Health and other stakeholders through radio and television shows. This has created some awareness among communities about the importance of eating well to promote health and prevent disease.

2.2 Nutrition education interventions

In this section, literature related to nutrition and nutrition education as an intervention is reviewed. The section includes a review of the definition of nutrition education, its value and purposes (including improving knowledge and changing behaviour) and health education strategies that can be adopted in nutrition education interventions.

2.2.1 Nutrition education

Nutrition education is an important component of health education, since diet is one of the behavioural factors that affects health (McGinnis & Forge, 1993 in Glanz *et al*., 2002: 4), although it is distinct from other health behaviours in that people have no choice since they have to eat (Contento, 2007: 29; Katz, 2001: 299). Educating people to change their lifestyle, including diet behaviour, could prevent premature death and mortality (Glanz *et al*., 2002: 5). It is therefore mandatory to provide nutrition education to individuals and communities in order to assist them to eat a balanced diet and to achieve optimal general health and well-being (Contento, 2007: 15). The benefits of nutrition education in modifying health can therefore not be overemphasized (Katz, 2001: 291).

The absolute necessity for good nutrition to ensure better health has been well documented (Youngkin & Davis, 2004: 76; Sizer & Whitney 2000: 2; Brylinsky, 2004: 446; Contento 2007: 310). The importance of good nutrition has been demonstrated by the sustained interest in getting people to eat well. There are several ways in which this can be implemented, among which nutrition education has been singled out (Walsh 1995: 64; Contento, 2007: 15; Katz, 2000: 291).

2.2.2 Definitions

Nutrition education is defined in many ways in accordance with its many purposes (Contento, 2007: 9; Nnakwe, 2009: 295). For purposes of this discussion three definitions are used as a premise. These definitions were selected on the basis of their complementary ability.

According to Stein and Temple (2008: 202), nutrition education is defined as "communication activities aimed at achieving a voluntary change in nutrition-related behaviour to improve the nutritional status of the population". It is evident from this definition that in order to achieve their aim, nutrition education programmes should have a purpose (Charney *et al*., 2008: 467) and be 'innovative' (Staats *et al*., 1996: 31). Several meanings arise from this definition. First, nutrition education entails communication. Secondly, it aims to achieve a change in nutrition-related behaviour (Contento, 2007: 12, 13). Thirdly, the ultimate goal of nutrition education is to improve the nutritional status of people (Stein and Temple, 2008: 202).

Nutrition education is also defined as "an intervention…any combination of learning experiences" (Boyle & Holben, 2010: 10; Stein & Temple, 2008: 202) and educational strategies designed to facilitate voluntary adoption of food choices and other food and nutrition–related behaviours conducive to health and well-being" (Contento 2007: 15). This definition can be viewed in line with the health education definition as proposed by Cottrell (2001: 8) as: "any combination of planned learning experiences based on sound theories that provide individuals, groups, and communities the opportunity to acquire information and skills needed to make quality health decisions."

The above definitions clearly regard nutrition education as an intervention facilitating the acquisition of nutrition information and skills, with a view to increasing nutrition-related knowledge. Secondly, they point out that nutrition education uses strategies, is facilitative and is guided by theories of health behaviour. Lastly, nutrition education targets voluntary nutrition-related behaviour change as well as a change in other health behaviours conducive to health and well-being.

The three definitions described above have commonalities and complement each other. Points arising from these definitions are discussed below.

According to Boyle and Holben (2010: 10), nutrition intervention is a health promotion activity that focuses on changing undesirable nutrition behaviour of a target population. An intervention is a treatment that can be composed of a single (micro) or a combination (macro) of two or more activities. The aim of interventions therefore is to "promote health and prevent disease" (Boyle & Holben, 2010: 10). In order to achieve this goal, nutrition education interventions must reflect in their design and implementation, the following aims: a change in nutritional intake, an increase in nutrition-related knowledge and promotion of behaviour conducive to health (Charney *et al.*, 2008: 467). Many nutrition education interventions have been designed and implemented with success, as acknowledged by various authors (Townsend *et al*., 2006; Contento, 2007; Shea and Basch, 1990; Staats *et al*., 1996).

Nutrition education is described as communication by different nutrition and health education experts as is evident in Stein and Temple's definition above. This view is supported by Nnakwe (2009:295) and Contento (2007: 387). The main purpose of communication is to send and receive messages. In the case of nutrition education, communication goes beyond this simplistic model; it is much more complex and involves interaction through interpersonal discussions (Contento 2007: 387), taking into consideration the nutrition educator's personal and professional profile as well as the psychosocial characteristics of the target audience (Contento, 2007: 389). Interactive discussions promote learning experiences, and therefore communication is education as pointed out by Contento's and Cottrell's definitions. This means that for people to adopt desirable nutrition behaviour, they need to be educated about nutrition. Nutrition education is therefore "a formal process of instruction/training of clients in nutrition skills to voluntarily modify their diet and manage that change to improve their health" (Charney *et al.*, 2008: 467).

Nutrition education's first objective is to increase people's nutrition-related knowledge (Lin *et al.*, 2011: 316). Although it has been widely acknowledged that knowledge alone is not enough to motivate health behaviour change (Lin *et al.*, 2011: 316; Chudley & DiClemente, 1994: 37), it is indeed a necessary first step. This means that nutrition education must do much more than just provide knowledge; it must aim at promoting a change in nutrition-related behaviour.

2.2.3 Purpose of nutrition education

Before developing nutrition and health education strategies, there is a need to understand the determinants of health and nutrition behaviour, a process which must be guided by theory (Contento, 2011: 61). A guide to effective health and nutrition education is understanding why people behave the way they do (Glanz *et al.*, 2002: 23; Chudley & DiClemente, 1994: 41;

Sarafino, 1994: 178), why they eat as they do (Contento, 2007: 29), and the way psychosocial uses of food interact to influence food choices (Webb, 2003: 27). Therefore, before designing strategies to educate people to eat in healthy ways, there is a need to understand what motivates them to select the food they eat, and to eat the food in the ways that they do. The first step to designing relevant nutrition education strategies is, therefore, an understanding of the factors that determine individuals' eating behaviour.

A number of factors interact to determine individuals' eating behaviour and Contento (2007: 29) classifies them into three categories. These categories are placed within the bio-psychosocial model of health as proposed by Sarafino (1994: 15) in which the psychological factors interact with the biological, bio-behavioural and the physical and social environmental factors to influence the individual's food choices and nutrition-related behaviour and practices. Contento (2007: 64) calls this approach the social-ecological model. These, according to Contento (2007: 30) are:

(i) The biological and psychological determinants of food, including taste preferences, hunger and satiety and "negative and positive associations with food";

(ii) Broader environmental factors such as socio-economic and cultural environments affecting food availability and consumption; and

(iii) Psycho-social factors including "perceptions and beliefs, attitudes, knowledge, personal meanings and values, social/cultures and norms, family and social networks."

To be complete, nutrition education and health education must be designed to take into consideration these bio-psychosocial interactions in food choices and nutrition behaviour. More so because according to Contento (2007: 40), the influence of food factors as well as environmental factors on food choices and nutritional behaviour function to a large extent on the basis of how an individual interprets and personalizes them. In this context therefore, an individual's knowledge, beliefs, attitudes and practices play a significant role in determining nutritional behaviour. The last category in Contento's classification, person-related factors, is the focus of this discussion. In this field, Contento (2007: 57); Bauer & Sokolik (2000); Elder *et al*. (1999: 275) and Katz (2000: 302) suggest the following strategies:

- To increase knowledge of the link between diet and health;
- To reach a balance between motivation and difficulty in changing dietary practices;
- To increase perceived susceptibility and perceived seriousness;
- To reduce/ change the perception of barriers;
- To increase the perception of benefits;
- To re-establish self-esteem and self-efficacy (skills, perception, confidence);
- To cultivate an internal locus of control;
- To increase social support through support groups;
- To address social pressure for and against behaviour change;
- To target the stage of change the client or community is at appropriately; and
- To empower the individual or group to lobby for political action to change their social circumstances.

The ultimate aim of strategic nutrition education is therefore to produce an individual or group with improved health and nutritional status. The individual or group is expected to move through short-term, intermediate and long term nutrition behaviour changes. Short-term changes include specific nutrition behaviour changes such as having access to, and consuming a variety of vegetables and fruit, reducing saturated fats in the diet, having a more positive attitude towards the new behaviour, and having more improved beliefs and skills in food preparation and presentation. Intermediate outcomes are the start of the maintenance of these new nutrition behaviours which then become a part of the individual's and societal norms. Long-term changes represent the stage when the individual and society can be said to have achieved nutritional competency in food intake which leads to overall desired health and well-being and optimal nutritional status (Contento, 2007: 73).

2.2.4 Behaviour change

Behaviour change, particularly nutrition-related behaviour, takes a lot of effort and time to achieve (Staats *et al*., 1996: 31; Hoeger & Hoeger, 2011: 34). This is evidenced by studies worldwide, for example, a review of longitudinal (10 years) studies in the Five Major Community-Based Cardiovascular Disease Prevention Programmes (North Karelia, Finland, Pawtucket, Minnesota and others), revealed minimal lifestyle changes even after this length of time of comprehensive interventions (Shea & Basch, 1990). Behaviour change is made even more difficult to achieve by intervention programmes that are of short duration and less creative (Staats *et al*., 1996: 31). In their study of risk factors for ischaemic heart disease in higher socio-economic middle-aged Afrikaans-speaking men in Bloemfontein, Staats *et al*. (1996: 31) concluded that the insignificant dietary changes in that group could have been due to dose response to intervention programmes that are once off and lack follow-up. They also concluded that one of the barriers to changing could have been central to the cultural assumptions regarding eating habits of the Afrikaner population. These conclusions make a case for nutrition education intervention that is a component of an integrated programme that addresses broader social, cultural and physical environments such as "unhealthful advertising of processed and fast foods, and other larger political contexts" which disable individuals from changing or adopting healthier lifestyles (Cohen *et al.*, 2007:13).

Another barrier to behaviour change is what Hoeger and Hoeger (2011: 34) call "human pessimism", which they describe as "the tendency of humans to perceive more negatives than positives in taking action" particularly with regard to nutrition and physical activity. In addition, Downie *et al*. (1995: 103) assert that individuals whose attitudes towards health are more incorporated with other attitudes are more resistant and are harder to change. For example, attitudes that are dictated by one's culture are more entrenched and form a mind-set towards life in general, including health. These could be perceived as the greatest challenges in nutrition education.

The first question is then, what is contained in nutrition education messages to enable them to achieve behaviour change? Nutrition education for behaviour change must increase knowledge of what makes a balanced diet (Lin *et al*., 2011: 316) and it must be creative (Staats *et al*., 1996: 31). This is the nutrition education that diffuses the confusing mixed messages that appear in the media, and is persuasive to adults because it has a credible source, and is framed on scientific evidence (Dodd, 2012: 432). Nutrition education directed at adults recognizes the physiological, developmental and social factors that have continuously impacted on their lives over the years placing them in a vulnerable position for a range of diseases (Dodd, 2008: 271). According to Escott-Stump and Earl (2008: 338), this is the nutrition education that persuades people to eat an adequate and balanced diet and to eat according to the dietary guidelines (Harnack *et al*., 1998: 131). Education about a balanced and adequate diet takes into consideration the bio-psychosocial circumstances of the individual, including among others, age, sex, life stage, taste and food habits, socio-economic conditions affecting availability and other factors such as variety, storage and cooking facilities, and has an ultimate focus towards creating in individuals perceptions and feelings of well-being and of a quality of life (Escott-Stump and Earl, 2008: 338). It assists individuals to change nutrition-related behaviours that are risk factors to health, including eating large portions (Hoeger & Hoeger, 2011: 38, 39; Dodd, 2008: 277), usually consisting of carbohydrate and fat (Oosthuizen *et al.,* 2011: 75), which is a recipe for weight gain (Lin *et al*., 2011: 316). In their study of the impact of a nutrition programme on the dietary intake patterns of primary school children in the Northern province, Oosthuizen *et al.* (2011) found that coupled with a lack of knowledge, cost and unavailability of food stuffs caused children to eat less vegetables and fruit and eat more processed and take away foods such as polony and fat cakes (vetkoek) (Oosthuizen *et al.,* 2011: 80). Processed and take away foods usually contain more salt, more sugar and more fat. People who consume these foods usually do not eat whole grains, vegetables and fruit as these do not normally form part of such diets (Dodd, 2012: 436).

In addition to eating according to the guidelines, individuals can be encouraged to increase consumption of functional foods which have nutritional as well as medicinal properties, such as whole grains, yoghurt, fruits and vegetables, lower fat food, fortified or supplemented products, certain spices, flax seeds, fish oils, nuts, soy and legumes. These foods have fewer calories, act as anti-oxidants, build a healthy gastrointestinal tract, and detoxify the liver (Dodd, 2008: 280).

Nutrition education should therefore promote nutrition behaviour that is conducive to health (Stein & Temple, 2008: 323) such as those that promote physical activity to prevent obesity and related morbidity and mortality (Stein & Temple, 2008: 323; Dodd, 2012: 434) and that prevent or reduce the impact of the 'metabolic syndrome' (Dodd, 2008: 271). In an evaluation of a United States Department of Agriculture (USDA) nutrition education programme for low-income youth, Townsend *et al*. (2006: 37) found that, compared to control groups, experimental groups reported significant improvements in knowledge and exhibited some positive changes in short term nutrition behaviour after a nutrition education intervention.

In view of the above, nutrition education that aims at successfully achieving behaviour change has the following characteristics: first, it uses strategies, and it is itself a strategy to advance the course of nutrition and health promotion (Dodd, 2008: 271; Harnack *et al*., 1998: 131). These strategies are combined and in this way the interplay of the many factors that influence health and nutrition behaviour is acknowledged. Secondly, it is 'systematically designed' and 'facilitative' (Contento 2007: 15). Thirdly, it is framed on theories/models of health behaviour. Fourthly, it advocates for changes in the broader environmental factors and socio-economic disadvantages that prevent individuals from changing their lifestyles (Stein & Temple, 2008: 323). Lastly, the ultimate goal of nutrition education is to improve the nutritional status of communities (Stein & Temple, 2008: 323), to increase perceptions and feelings of physical, mental and spiritual well-being; thus improving quality of life (Dodd, 2008: 272, 273).

2.2.4.1 Nutrition education is systematic

In order to promote behaviour conducive to health, nutrition education should be systematically designed. Systematically designed nutrition education uses methods, theories and principles that have structure and relevance. This type of nutrition education departs from what Contento (2007: 15) calls 'informal education'. The latter type of education commonly uses communication strategies that are ineffective (Stein & Temple, 2008: 323) and are delivered through channels such as radio, magazines, newspapers, television and popular diet books (Contento 2007: 15). It is usually 'top down', uses 'victim blaming' out-dated messages and nutrition education approaches that do not recognize the broader environmental factors that might inhibit individuals from adopting healthy lifestyles (Stein & Temple, 2008: 324, Ewles & Simnett, 2003: 48, 13). On the other hand, systematic nutrition education is facilitative; focused towards specific behaviours, with simple and straightforward messages (Viswanath & Bond, 2007: 22); and aims at developing personal skills, the ultimate goal being, to facilitate voluntary nutritional behaviour change (Contento, 2007: 5).

2.2.4.2 Nutrition education is facilitative

Systematically designed nutrition education is facilitative. This means that it uses methods and approaches that are themselves empowering. In addition to increasing nutritional knowledge and skills and raising awareness, it motivates an individual to think about and want to change and to value good health and quality of life (Contento, 2007: 15). The knowledge and awareness created enables individuals to make informed choices, and the facilitative process recognizes that individuals are free to make their own choices and therefore promotes independence and nutrition behaviour change by the individual’s own will. In this way nutrition education follows the ethical foundations of health promotion (Ewles & Simnett, 2003: 112) which emphasize non-coercion and respect for human rights (Stein & Temple, 2008: 324). Facilitative nutrition education builds ‘social capital’ towards improvement of health. Social capital means that communities forge mutual trust and provide each other with social support despite their social class disparities. This means that people in the community come together and share information and ideas and provide each other with tangible support (Ewles & Simnett, 2003: 12). In this way the differences in the levels of income and other health indicators almost disappear as people and ideas mingle. Viswanath and Bond (2007: 22) view social capital as “social integration” through which social support, social ties and social norms are strengthened, a process through which health and nutrition communication is facilitated, such as in peer education. However, Laboute (2004: 256) favours the concept of ‘social inclusion/exclusion’ instead of ‘social capital’ as he argues that the latter is patronizing as it advocates for the capitalist system which created social stratification in the first place to turn around and pretend to close the gap between the rich and the poor at the same time. Laboute (2004: 256) argues that ‘social inclusion’ would mean improving the situation of the poor, not only theoretically as ‘social capital’ seems to suggest, but materially as well. Therefore, the two concepts seem mutually complementary as ‘social capital’ also builds capacity of communities and equip them with skills to advocate for changes in the social circumstances that impede them to change and adopt healthier lifestyles.

2.2.4.3 Nutrition education is empowering

Systematic nutrition education empowers an individual by developing their personal skills. Developing personal skills means enabling people, by informing, educating and communicating with them, thus laying the foundation for change (Ewles & Simnett, 2003: 23). The information provided must be relevant and must improve knowledge and practical skills (Ewles & Simnett 2003: 248). It also means enabling people through assertiveness training, self-esteem building and other practical and life skills to enable critical thinking skills for effective decision making and skills to interpret, process and personalize the information (Ewles & Simnett 2003: 186). Development of these skills is conducive to healthy behaviour change (Kelleher & O’Donovan, 1995: 40). This process aims at empowering people to take control over their physical, social and psychological environments (Marks *et al*., 2006: 400) and of their health and their social interactions in general. The participatory nature of this training creates an atmosphere in which an individual explores and becomes more aware of their own unhealthy beliefs, attitudes and life style by taking exercises in, for example, self-awareness, values clarification, self-efficacy, self-esteem and assertiveness, which allows development of decision-making skills, formation of positive intentions and ability to act on one’s decisions (Kelleher & O’Donovan, 1995: 83-84; Marks *et al*., 2006: 400-1). Developing personal skills of individuals would have a multiplier effect whereby they would in turn participate meaningfully in the communities in which they live, influencing policy within local structures, lobbying for changes in their social circumstances, and having a bottom up approach to national structures and policies (Ewles & Simnett, 2003: 295). Health education that does not develop personal skills is considered ‘victim blaming’ (Kelleher & O’Donovan, 1995: 42), as it is just aimed at providing information about the risk factors and does not develop individuals’ skills to deal with that information. Provision of knowledge must be combined with development of personal skills for it to be effective (Contento, 2007: 12; Kelleher & O’Donovan, 1995: 42-43; Elder *et al.,* 1999: 275).

2.2.4.4 Nutrition education is interactive and participatory

Systematically designed nutrition education can be achieved through interactive and participatory delivery methods, the most widely used being group work method (Contento, 2007: 398; Jones & Byrne, 1993: 5). Although nutrition education is said to be a formal process, this does not necessarily mean that the delivery mode is always formal. According to Ewles and Simnett (1998: 20), "health education is broader than the traditional concept of formal classroom teaching". It encompasses a range of different objectives amongst which is increasing knowledge, changing attitudes, beliefs and practices as well as improving skills in a number of health issues including those that are related to nutrition and it is delivered through methods such as group work.

Group work is interpersonal, face to face communication such as workshops that go beyond provision of information (Contento, 2007: 387). It acknowledges that the audience brings with them their own set of beliefs, attitudes, previous experiences and knowledge; therefore, it provides acquisition of complex new concepts and principles leading to motivation to change behaviour (Pretty & Priester, 1994: 151).

Groups used by health promoters can be newly formed, or can already be in existence, and points for discussion can be on-going or once-off depending on the purpose of the group discussion (Ewles & Simnett, 2003: 252). Group dynamics in health education theory and practice acknowledge and employ the principles of adult education in their structure and purpose, particularly experiential learning as described by Ewles and Simnett (1998: 159). Experiential learning according to Ewles and Simnett (1998: 159; 2003: 277) "encourages 'active learning' through undertaking exercises and other activities designed, for example, to increase self-awareness or aid decision making". Group work increases knowledge and skills, and provides a comfortable learning environment, particularly when it includes personal and relevant activities such as self-assessment (Contento, 2007: 389). Therefore group work takes advantage of personal experiences as a basis for learning, allows independence of opinion among participants and lets them be their own directors, a fundamental principle of adult learning (Lieb, 1991: Online; Speck, 1991: Online).

Group work is facilitated by a group leader who is distinct from a traditional teacher in many respects. A group leader instead facilitates group work and guides learning. In contrast to a 'traditional teacher' a group work facilitator "uses direct, concrete and relevant experiences and does not judge the participants during learning but rather treats them with respect" (Ewles & Simnett, 1993: 119). Adult learners are 'intrinsically motivated' to learn, while traditional learners are 'extrinsically motivated' (Ewles & Simnett, 1993: 120). Traditional teaching on the other hand treats learners as passive recipients of the learning material and the teacher is seen as a 'distributor of knowledge'. Little creativity is encouraged from learners who learn 'through remembering facts and practical skills' (Ewles & Simnett, 1993: 120).

Contento (2007: 389) and Ewles and Simnett (2003: 255) describe an effective group facilitator as the one who considers the audience's pre-determined experiences, beliefs and attitudes as well as their expectations as described above by taking into consideration their cultural background. A group facilitator should also take note of life situations and should consider the different learning styles of participants by making the message affective, straight-forward and clear to enable message processing.

Ewles and Simnett (2003: 255) further describes the facilitator's role as a skilled and confident specialist who shows warmth and empathy to the group members as well as allowing them to express their feelings while also encouraging and counselling them. This is the kind of facilitator who is able to handle challenges involved in conducting this kind of group work, for example, dealing with dominant or reticent group members.

Nutrition education which employs the principles of adult learning can play a role in advocating for policy changes and in assisting people to make informed choices when it comes to selection and preparation of food. This would help to prevent disease, promote their health, and improve their nutritional status (Lee & Nieman, 1993: 4).

2.2.5 Theories and models of health behaviour

Different approaches have been used in nutrition education, and have received a lot of attention and approval. The social marketing, community based approach and social mobilization, are some of these communication strategies which Stein and Temple (2008: 325) argue that they inform clear information, education and communication steps. However, using theories of health behaviour is argued to be one of the most important benchmarks in addressing the challenges of understanding and improving health behaviour (Glanz *et al.*, 2002: 17). They are evidence based and have been empirically tested to provide a framework for nutrition education interventions among other nutrition programmes (Boyle & Holben, 2010: 506). Theory complements knowledge and provides a framework for research and health promotion and education practice (Glanz *et al*., 2002: 17). Nutrition education that is guided by theories of health behaviour moves away from unethical, victim blaming approaches (Lytle, 2005: 91). Nutrition education interventions framed on evidence based theory are appropriate as they are designed to address the setting, resources, goals, constraints and level of understanding and the psychological level of the individual or group (Contento, 2007: 56). They stand the best chance of success (Glanz *et al*., 2002: 17) as they are designed to be more cost effective in terms of time, money and personnel; explicitly stated theory helps in building in specific components and to observe which ones work and which ones do not; it also helps in developing appropriate teaching activities and evaluation instruments (Contento, 2007: 56).

Nutrition education informed by theories of health behaviour corrects misinformation and identifies benefits and barriers to change (Escott-Stump and Earl: 2008: 480). It promotes personalization of messages such that individuals perceive their own vulnerability to undesirable nutrition behaviour and consequent health threats (Katz, 2000: 302-303; Webb 2003: 24). It is based on dietary guidance which uses tools such as, among others, FGP, dietary guidelines and disease-specific dietary counselling on chronic illnesses (Dodd, 2012: 432). Theory-based nutrition education provides a better understanding of the target populations

(Contento, 2007: 56). It re-establishes self-esteem and self-efficacy, cultivates an internal locus of control and develops individuals' motivation to want to change (Katz, 2000: 302).

In a nutshell, nutrition education must design strategies following these steps: (i) must be based on and guided by theory; (ii) must use theory to identify the nutrition education needs of the individuals and communities targeted, specifically the determinants of behaviour of concern from the available literature and from the target audience; (iii) must prioritize and specify those identified needs; (iv) must use theory to design nutrition education programmes to delineate the stages/phases at which the individual or community is in the behaviour change process; (v) must design strategies that focus on those specific individual and community determinants of dietary behaviour and the dietary behaviour identified in the needs assessment according to the stage/phase in the behaviour change process.

Many behaviour change theories have been developed, studied, and used in research and practice, some more extensively than others. Contento (2007: 60) classifies these theories/models into two broad categories; the knowledge-attitude-behaviour model, and social psychological theories of health behaviour and behavioural change. The first model proposes that provision of nutrition information would lead to a change in attitudes, leading to a change in behaviour. This assumption is challenged with a view that knowledge alone is not enough to promote change, and that knowledge can work only under certain circumstances (Contento 2007: 60). The latter model proposes that nutrition education that acknowledges bio-psychosocial interactions on the part of the individual stands a better chance of success. The models which fall into the last category are: the Health Belief Model (HBM) developed by Becker (1974) (Sarafino, 1994: 180; Glanz *et al*., 2002: 45); the Theory of Reasoned Action developed by Fishbein and Ajzen (1975) (Glanz *et al*., 2002: 42); the Stages of Change (Trans-theoretical Model) developed by Prochaska and DiClemente (1992) (Katz, 2000: 301); the Social Cognitive Theory including Self-efficacy developed by Bandura (Glanz *et al*., 2000: 31); Locus of Control developed by Abusabha (Katz, 2000: 301); and Social Support and Social Networks (Glanz *et al*, 2000: 31). These theories have also been popularly used in health education and promotion interventions (Bauer and Skulk, 2000: 3; Elder *et al*, 1999: 275; Glanz *et al*., 2002: 41).

The inherent weaknesses in these theories when used singly are compensated for when they are used together as they overlap and share key concepts. For example, Elder *et al.* (1999: 275) point out that the theories share the following factors: "intentions to behave, environmental constraints impeding behaviour change, skills, outcome expectancies, norms for the behaviour, self-standards, affect, and self-confidence with respect to behaviour." They caution however, that each individual client must be treated according to their needs using relevant theories.

2.2.5.1 Health Belief Model (HBM)

The HBM (developed, used and refined by Becker; 1974, Becker *et al*., 1977; Becker and Rosenstock, 1966; Sarafino 1994; Janz *et al*., 2002; and Glanz *et al*., 2002) (Sarafino, 1994: 180-181) proposes that an individual's likelihood of changing their health behaviour is governed by their beliefs in the health outcome of their actions, and according to Sarafino (1994: 180-181), they make two assessments. The first relates to the threat of the health problem, for example, an individual is likely to take action if they believe that the health problem is significant and perceive the seriousness of the health threat. These perceived serious consequences could mean death, disability and pain (Janz *et al*., 2002: 45); and they perceive themselves personally susceptible, or at risk of contracting the health problem if they do not change their present behaviour, also called perceived susceptibility. The likelihood of perceiving threat and vulnerability and personalizing them is further motivated by socio-demographic factors such as 'age, sex, race, ethnic background' (Sarafino, 1994: 181) and educational attainment (Janz *et al.,* 2002: 50); socio-psychological variables including personality 'traits, social class, social pressure; and structural variables such as knowledge about or prior contact with the health problem' (Sarafino, 1994: 181). The second assessment evaluates the benefits and barriers of taking preventive action for example, after the first assessment has motivated the individual to take action (Janz *et al.,* 2002: 50), an individual will act desirably (iii) if they believe that engaging in a particular behaviour change will achieve a particular behavioural goal, or reduce the health risks and make them healthier – perceived benefits – and if they believe that the perceived benefits outweigh the barriers to taking preventive action; and (iv) if they believe that the change is feasible, that there are less barriers or costs to change – perceived barriers – such as financial considerations, perceived danger, unpleasantness, difficulty, inconvenience, time, accessibility, availability, familiarity, and understanding (Janz *et al.*, 2002: 49-50; Katz, 2001: 302; Sarafino, 1994: 181-2; Webb, 2003: 24).

These evaluations will combine to drive the individual to take preventive action, but they may need 'cues to action or triggers' to remind individuals to take action (Sarafino, 1994: 180; Janz *et al*., 2002: 50). Such triggers could be a public health announcement, a poster, a phone call, or bodily symptoms.

The health belief model has been used worldwide to explain, predict and inform nutrition intervention programmes. The following are some of the studies in which the health belief model was used. It has been used to explain uptake of nutrition interventions in low income groups in the UK (Kennedy *et al.,* 1998); to identify barriers to fruit and vegetable consumption in a multi-ethnic worksite population in Massachusetts (Cohen *et al*., 1998: 381); to inform a nutrition education programme for urban, low-income older adults in Philadelphia (Klinedinst, 2005: 93-104); to predict dietary behaviour of Chinese Americans (Liou & Contento, 2001); to inform a worksite nutrition education programme for University staff to promote healthy dietary behaviour that reduces risks of cardiovascular disease and cancer (Abood *et al*., 2003: Online); as a framework for educating young girls about the importance of diet in preventing osteoporosis in Iran (Hazavehei *et al*., 2007: Online); and, to educate diabetic patients about diet management as part of diabetes therapy (Sharifirad *et al*., 2010: Online).

*2.2.5.*2 Self-efficacy

Self-efficacy, derived from Bandura's Self-Efficacy theory (1977a; 1977b, 1986) (Prochaska *et al* (2002: 50) has been used as both a theory and a construct in other theories. It has been added to the HBM with the realization that the latter does not completely explain other intricate behaviour such as nutrition behaviour (Contento, 2007: 82; Prochaska *et al*., 2002: 51). Self-efficacy theory (construct) proposes that in order for individuals to change a specific behaviour which might be difficult or need a lot of effort to accomplish, they must believe in their capacity to initiate and perform the change (Sarafino, 1994: 185), and must have confidence that they can overcome the barriers to performing the behaviour (Baranowski *et al.*, 2002: 173). Self-efficacy may be affected by prior failed attempts at a particular behaviour and this might affect an individual's self-esteem which in turn may affect self-efficacy (Katz, 2001: 301). It may also be affected by the effort required to perform the behaviour (Baranowski *et al*., 2002: 173). Self-efficacy is recognized as an important determinant in the transition from one stage to another in the stages of change model (Katz, 2000: 301) and in the perception of barriers as described in the HBM (Prochaska *et al*., 2002: 51).

Self-efficacy has been used in fruit consumption studies in the Netherlands (Brug *et al.,* 2006: 73 -78). It was also used as a framework in the problem-solving approach in nutrition education and counselling to get people to change their unhealthy eating behaviour (Houts *et al*., 2006: 254-258). Liou and Contento (2001) used self-efficacy to predict the dietary behaviour of Chinese Americans. Chen *et al*. (2010) used self-efficacy theory and locus of control to explain the relationship between background characteristics, nutrition self-efficacy and locus of control and nutritional status in older Taiwanese adults.

2.2.5.3 Locus of control

Locus of control (developed by Stickland, 1978; Wallston & Wallston, 1982) (Sarafino, 1994: 185) is the personal control that people feel towards health. It is either internal or external (Katz, 2001: 301). An internal locus of control means that a person believes that they can influence their own health while external locus of control means that an individual believes that their health is in the hands of others, such as powerful others or chance (Sarafino, 1994: 113). According to Sarafino, individuals with a strong internal locus of control are believed to be more likely to practice behaviour that prevents illness and promotes their health such as eating a prudent diet and seeking more information about health than those with an external locus of control. Locus of control, like other theories of health behaviour, cannot completely predict the practice of health behaviour, and it has been found to work better with people who value their health highly (Sarafino, 1994: 185). Katz (2001: 303) asserts that for an individual to change their dietary and other health behaviour, they need, above all, motivation to want to change and the most effective method of raising motivation to change is “re-establishing self-esteem and self-efficacy… and…cultivating an internal locus of control”.

Locus of control was used to explain the Western Cape’s elderly coloured population’s perceptions about the relationship of good nutrition and longevity (Charlton & Ferreira 1997). It was also used to explain the cultural differences in health promoting behaviour between Jewish and Arab Israelis (Cohen & Azaiza, 2007: Online); and it was used to explain internal resilience and its relationship with physical education among adolescents in Botswana (Shehu & Mokgwathi, 2008).

2.2.5.4 Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB)

The theory of reasoned action developed by Ajzen and Fishbein (1980); Fishbein (1980, 1982), proposes that “people decide their intention in advance of most voluntary behaviour, and intentions are the best predictors of what people will do” (Sarafino,1994: 182). According to Sarafino (1994: 182), two attitudes become important in determining intentions: “(i) attitudes regarding the behaviour, and (ii) attitudes about a subjective norm”. Attitudes about behaviour are in turn governed by two evaluations: beliefs about what the outcome of the behaviour would be, and beliefs about the rewards that would accrue from performing the behaviour. Attitudes about subjective norms are also in turn governed by other’s opinions about the behaviour and motivation to comply with those opinions. Thus the “TRA focuses on cognitive factors (beliefs and values) that determine motivation (behavioural intention)…particularly behaviour under volitional control” (Montano & Kasprzyk, 2002: 93).

The theory of planned behaviour adds to the theory of reasoned action the construct of perceived behavioural control, which means that after forming an intention or motivation to perform a behaviour, an individual is likely to perform the behaviour if they believe in their own power or personal control over the behaviour, perceiving power and control over the barriers and other determinants of behaviour, and perceiving more facilitating factors (Montano & Kasprzyk, 2002: 93). According to Montano and Kasprzyk (2002: 93), these two theories are particularly useful in identifying the underlying determinants of behaviour, providing guidelines for designing, implementing and evaluating behaviour change interventions. These two theories can also be used with other theories in behaviour change interventions, thus complementing and improving these interventions.

Brug *et al.* (2006: 73-78) used the TPB together with self-efficacy to understand fruit consumption within families in the Netherlands. Liou and Contento (2001) also used the TRA to predict dietary behaviour and acculturation of Chinese Americans. Eto *et al*. (2011) used the TPB to understand frequency of adolescent participation in family meals in California, New York and Texas in the United States.

2.2.5.5 Social support and social networks

Social support is one of the functions of social networks articulated by Burg & Seeman (1994) (Heaney & Israel, 2002: 186). Social support means “intentional, consciously provided help from the sender to the receiver, which can be interpreted negatively or positively by the receiver” (Heaney & Israel, 2002: 186). In addition, Sarafino (1994: 102) defines social support as a psychosocial modifier of stress and as “the perceived comfort, caring, esteem or help a person receives from other people or groups”. According to Sarafino (1994: 103), this support can come from individuals (family and friends), co-workers, or community organizations. Sarafino (1994: 103) classifies social support into five categories which are: emotional support, tangible or instrumental support, informational support, esteem support and network support. Heaney and Israel (2002: 186) add appraisal support to the categories. Emotional support refers to the provision of empathy, love, trust, caring and concern toward the person. Tangible or instrumental support refers to provision of the necessary assistance in times of stress, including lending them money and helping with chores when needed. Informational support means giving advice, directions, suggestions or feedback. Network support refers to the “feeling of membership in a group of people who share interests and social activities” (Sarafino, 1994: 103). Appraisal support means giving informational support to aid self-evaluation (Heaney & Israel, 2002: 187). The concept of social support has been hailed in the prevention of other unhealthy health behaviour such as youth drug use (DiClemente, 1994: 42) and can play an important role in nutrition education in creating awareness of the need for social support in dietary behaviour change.

Social support exists to some degree in societies. In developing countries where women do hard chores including care of babies; grandmothers and older children sometimes assist in minding the baby while the mother performs the other hard chores, but none comes from the husbands (Mwangome *et al*., 2010: 171).

2.2.5.6 Stages of change model

The stages of change model mainly focuses on readiness to change (Sarafino, 1994: 185) and is distinct from other theories in that it represents a 'temporal phenomenon' (Prochaska *et al*., 2002: 100). The theory proposes that an individual changes behaviour moving through several stages, namely, pre-contemplation, contemplation, preparation, action, and maintenance. The pre-contemplation stage refers to the phase in which an individual is not seriously thinking about changing at least in the nearest future (Sarafino, 1994: 185), usually six months (Prochaska *et al*., 2002: 100). According to Prochaska *et al*. (2002: 100) individuals at this stage lack knowledge, are experiencing frustration because of prior failed attempts, and are therefore unmotivated and 'hard to reach'. The contemplation stage refers to the phase in which an individual is seriously thinking about change because of increased awareness of their unhealthy behaviours, but have not yet made the decision to change (Sarafino, 1994: 186). Individuals can get stuck in this stage for six months or more, becoming 'chronic contemplators' or 'behavioural procrastinators' because of their perception of more cons than pros for changing behaviour (Prochaska *et al*., 2002: 100). In the preparation stage, individuals have formed an intention and are making action plans to change in the next month, such as seeking out more information and joining support and educational groups (Prochaska *et al*., 2002: 100; Sarafino 1994: 185-6). The action stage is the phase where individuals have made specific observable changes in their lifestyles that take some time, usually six months (Prochaska *et al*., 2002: 102; Sarafino 1994: 186). In the maintenance stage individuals strive to sustain the lifestyle changes they have achieved and become more resistant to relapse. At this stage, individuals can continue with their newly acquired lifestyles indefinitely but for follow-up purposes researchers put it at a period lasting from six months to five years (Prochaska *et al*., 2002: 102; Sarafino 1994: 186). After six months and five years individuals have been found to be much more stable and cases of relapse have been found to be very few (Prochaska *et al*., 2002: 102). The termination stage, described as 'idealistic' as it is too strict a criterion, is the stage where individuals are experiencing a complete change and can no longer fear temptation no matter their psychological state, and they have total self-efficacy (Prochaska *et al*., 2002: 102).

Built in within each stage are borrowed constructs from other theories (hence the other name, trans-theoretical model), which interact to influence progression from one stage to the next (Sarafino, 1994: 185; Katz, 2001: 301). These factors may include level of knowledge, motivation and health beliefs. Health educational strategies must therefore aim at a stage which a person or community is at to motivate progression to the next stage and towards maintenance of the positive health behaviour and to prevent relapse or regression.

The stages of change model has been used in fruit and vegetable promotion campaigns and has been found helpful in defining at which stages people are most susceptible to change (Van Duyn *et al*., 1998: 371-379).

It can be deduced from the foregoing that nutrition education is a force to be reckoned with. Several points become clear. First, nutrition education empowers the individual or group it is intended for, thus enabling them to reach their highest potential, and move through Maslow's Hierarchy of Needs (Dodd, 2008: 272). The process that effective nutrition education follows is in itself empowering. Secondly, nutrition education increases knowledge and personal skills as well as promoting behaviour change, an action that improves health. Improving health means improving people's quality of life. Thirdly, nutrition education advocates for improvements in people's socio-economic status, thus taking an enabling role for people to have more control over, and to improve their lives.

Nutrition education is challenged by several factors. First, the environment of today in which people live, play and socialize predisposes them to over-eating, with the corresponding unhealthy meal patterns (Hoeger & Hoeger, 2011: 38, 39) on the one hand, and unavailability and unfavourable socio-economic conditions on the other (Steyn & Temple, 2008: 328). Secondly, people's cultural beliefs and attitudes dictate their core value system which does not place a high value on health and therefore they perceive more barriers to change, perceive less benefits, as well as lack motivation to change and these make behaviour change very difficult (Hoeger & Hoeger 2011: 40). Thirdly, nutrition education is challenged by top down, unsystematically designed nutrition education approaches that are victim-blaming as they do not recognize the broader environmental factors that might impede individuals from adopting healthy lifestyles (Steyn & Temple, 2008: 328). Fourthly, there is inadequate political commitment, without which inequalities in health and inequitable distribution of resources will continue to grow. Lack of political commitment also leads to inadequate nutrition education funding from donors (Steyn &Temple, 2008: 328).

These challenges call on nutrition education that utilizes approaches that use messages specific to the behaviour or community practices concerned. It is facilitative, and it is founded on the ecological model of health, therefore it continuously educates policy makers to recognize the importance of nutrition education, to make desirable nutrition changes in policy and legislation, and to facilitate availability and accessibility of food for everyone. Nutrition education empowers individuals and communities through personal skills development and advocacy skills to foster changes in nutrition policies that affect them. It educates the individual and groups to enhance awareness, increase knowledge, change their attitudes, enhance personalization of messages, develop critical thinking skills to evaluate those messages and establish the motivation needed for behaviour change. Lastly, nutrition education creates and strengthens social capital within communities thus building a nutritionally competent society.

2.3 Socio-demographic and socio-economic conditions

Socio-economic conditions are important determinants of health. This section reviews literature on the relationship between these characteristics and health.

Socio-economic conditions and its relationship with health has been the subject of discussion of public health experts for some time (Ewles & Simnett, 2003: 12). Socio-economic status has been dubbed the major determinant of health and nutrition behaviour no matter which factor is looked at (Harnack *et al*., 1998: 131). It is itself defined by social class as well as being used interchangeably with it (Visnawath & Bond 2007: 21). Socio-economic status is indicated by economic conditions, occupation, housing, geographic location and gender among other factors (Ewles & Simnett 2003:12). Their inverse relationship with health is manifested in what Ewles and Simnett (2003:12) call inequalities in health after The Black Report in 1980 (a famous research report that was produced by Sir Douglas Black in Britain, which documented and increased awareness of widening social class disparities and inequalities in health) (Ewles & Simnett, 2003: 13). Inequalities in health exist from birth (Kelleher & O'Donovan, 1995: 96) and continue to grow (Ewles & Simnett, 2003: 12).

Socio-economic conditions are broad and can touch on many facets of life. Income is one of the defining factors for economic conditions. Income, as has been alluded to above, is one of the factors that define socio-economic status. Viswanath and Bond (2007: 21) states that high income influences dissemination and access to health information by enabling, for example, individuals in this group to pay for communication services, and to take recommended protective action such as buying vegetables and fruit. On the other hand, low income is reported to have a negative influence on health as people in this category are reported to perceive more barriers related to unfavourable family beliefs and norms, have low self-efficacy and lack personal motivation for adopting healthy eating behaviour (Kennedy *et al.,* 1998: 94). Also people in the lower social classes live in poverty. A study of a farming community in Fouriesburg in South Africa found that women usually employed severe food coping strategies including eating a diet composed mainly of large quantities of staple foods made of maize meal, irregularly accompanied by very cheap quality protein foods with consequent obesity in the majority of the women (Kruger *et al*., 2008: 6, 10). They usually have inadequate housing which is usually overcrowded and social amenities (such as toilets). They occupy unskilled manual jobs and are most likely unemployed. This affects availability and accessibility of food (Lytle, 2005: 92).

2.3.1 Age

Age has been found to be one of the most important determinants of health and nutrition knowledge, beliefs, and attitudes (Hanarck *et al.*, 1998: 137). Many studies conducted in the United States have produced evidence that nutrition-related knowledge, attitudes, beliefs and practices are affected by age (Hanarck *et al.*, 1998: 137). In these studies, the younger and the older age groups 18-24 years and 75^{+} years were associated with low nutrition knowledge as compared to the adult age groups 25-44 years, and 45-64 years respectively. The adult age group 45-64 years was found to have more nutrition knowledge than all other age groups (Hanarck *et al.*, 1998: 137). However, Lin *et al.* (2011: 315) produced conflicting evidence which showed that among the Chinese, age groups 19-30 years, as well as 31-44 years exhibited better nutrition knowledge than the middle adult age group 45-64 years. The differences could be attributed to different population studies that could have been carried out among different social classes or nationalities or to inclusion of formal nutrition education in schools as Kearney *et al.* (1998: 145) found to be a factor in their study of Irish adults' nutrition attitudes and beliefs. Lin *et al.* (2011: 314) however found that the knowledge that the younger age group displayed did not help in changing their negative attitude towards nutrition, while the opposite was true for the age group 31-44 years. This means that nutrition educators must take age into consideration when designing nutrition education interventions.

2.3.2 Education

Education is referred to as literacy to include all levels of education (Robson & Rootman, 2004: 155). Literacy is rated as the most important determinant of health compared to income and other socio-demographic characteristics and has actually been found to have a causal relationship with income and occupation (Robson & Rootman, 2004: 155). Low level of education usually presupposes low income (Viswanath & Bond 2007: 21). People in this category usually have poor access to health information, which they have few skills to interpret and personalize. They also usually have unequal access to other health services (Viswanath & Bond, 2007: 21). People with low education are also among the most hard to reach groups with nutrition information (Kennedy *et al*., 1998: 94). This could perhaps explain why Robson and Rootman (2004: 163) state that low level of education is highly associated with heart disease. People with low education are also reported to live in low income housing and have more stressful jobs over which they have no control, and they are more entrenched in their cultural beliefs (Robson & Rootman, 2004: 161). People with high level of education on the other hand are most likely to access health information, and to act on it because they have money, time and other resources needed to make the required lifestyle changes (Ewles & Simnett, 2003: 48). The poor and less educated are therefore not well-placed for changing their lifestyles or lobbying for change (Ewles & Simnett, 2003: 48).

2.3.3 Occupation

Occupation can confer risk of morbidity and mortality if it involves hazards at work or if jobs are stressful; and the lower occupational and otherwise poorer classes usually bear the brunt of almost all of these illnesses and deaths (Viswanath & Bond, 2007: 21). Consistent evidence in support of this was found by a longitudinal study which examined mortality rates for men aged 15-64 by occupational class in Ireland, and Nolan and Whelan's study of rates of chronic illness amongst Irish people from different occupational classes (Kelleher & O'Donovan, 1995: 99). Occupation can on the other hand contribute to good nutrition through enabling exchange of social norms around healthy eating and communication about such (Viswanath & Bond 2007: 21).

2.3.4 Housing

Poor housing is also an indicator for health, and studies have produced evidence that housing affects health (Bryant, 2004: 217). Poor housing can determine health by its structure or state, which makes it prone to unhealthy substances and chemicals that are used as utilities, or naturally inhabit because of the state of the house. Features such as pests and insects, dust, dampness and overcrowding among others, are common in these households (Bryant, 2004:

221). The effect on health that these have cannot be overemphasized, for example, studies have produced evidence that poor housing conditions cause psychological stress, which in turn causes cardiovascular disease and related psychosomatic illnesses (Bryant 2004: 225, 226).

2.3.5 Geographic location

Geographic location has been found to affect health and nutrition in many ways. First, rates of poverty have been found to differ among urban and rural dwellers in which rural residents have been found to experience higher rates of poverty than urban residents (Kelleher & O'Donovan 1995: 24). The situation of poverty anywhere impacts on individuals' health in several ways including hindering access to health and health information, or ability to act on this information. For example, individuals affected by poverty lack the means to access the recommended foods or to afford a healthy lifestyle or healthy eating in general (Viswanath & Bond 2007: 23). In fact, according to Visnawath and Bond (2007: 16), inequalities in health between urban and rural areas continue to widen. Location has also been found to have an impact on people's beliefs (Kelleher& O'Donovan, 1995: 24) as well as attitudes and practices (Edelman & Mandle, 2006: 33). A study by McCluskey (1989) of Irish people's beliefs found that people from urban and rural locations significantly differed in the way in which they defined health (Kelleher & O'Donovan, 1995: 24). Charlton and Ferreira (1997: 13) argue that a range of varied beliefs exists among the rural as compared to the urban populations, and Lin *et al*. (2011: 309) found that rural Taiwanese adults had less nutrition knowledge and a more negative attitude towards the relationship between nutrition and health.

In summary, generally people in the lower socio-economic class are more likely to adopt unhealthy behaviour lifestyles such as smoking, poor diet (Kelleher & O'Donovan, 1995: 24) and lack of exercise (Viswanath & Bond 2007: 21; Kruger *et al*., 2008: 6). Socio-economic status was found to have an impact on nutrition education and other health promotion messages (Staats *et al*., 1996: 31). For example, people in the lower socio-economic strata were found to perceive more barriers, had a more negative attitude towards a healthy diet (Harnack *et al*., 1998: 135) and had more negative perceptions and beliefs towards healthy diet (Dapi *et al*., 2007: 320; Lytle, 2005: 92).

2.4 Nutritional status

Nutritional status is defined by Hammond (2012: 129) as: "the degree to which physiologic nutrient needs are met for an individual." In other words, it is the condition of the body in terms of adequacy of diets/usual intakes and the physical composition of the body. Physiology of the body is the state of the body and its functions which need food substances to sustain this state and to perform its functions optimally. This means eating foods in adequate amounts and adequate variety that will provide the required nutrients. This whole equation amounts to the state of health (Smolin & Grovesnor, 2008: 61) whose condition is determined by whether or not the individual's nutrient intake meets the nutrient requirements with the consequent optimal nutritional status (Hammond 2000: 353). Hammond (2012: 129) argues that several factors dictate individual requirements. These include physiological and psychological stress (illness/healthy state), as well as developmental stage. When balance is reached, optimal nutritional status is reached and this contributes to "growth and development, maintains general health, supports activities of daily living, and assists in protection from disease and illness" (Hammond 2000: 353). According to Hammond, a lot of factors interact to influence this balance. The individual must have food, which is the basis of this equation but is in turn affected by the complex food environment which is characterized by food insecurity and other psycho-social contexts which inhibit individuals from adopting nutrition and other life style behaviours conducive to health. Inability to access food leads to poor health/nutritional status as individuals are unable to eat recommended diets for disease prevention and health promotion (McIntyre, 2004: 190). Food insecure individuals are impeded from preventing and managing chronic illnesses such as heart disease, diabetes, high blood pressure and food allergies (McIntyre, 2004: 190).

Nutritional assessment is carried out to evaluate nutritional status of individuals or groups. This would indicate nutritional deficiencies or excesses as well as other nutritional needs that might be present. Nutritional assessment guides nutritional care plans and other programmes designed to address those identified needs for individuals, groups or communities (Smolin & Grosvenor, 2000: 55). Methods of nutritional assessment include: medical, social, medication, nutritional histories; physical examination; anthropometric data; laboratory data (Hammond, 2000: 360) and past and present dietary intake (Lee & Nieman, 2003: 73; Smolin & Grosvernor, 2000: 55). For purposes of this study, dietary intake data were used together with anthropometry to assess the nutritional status of the sample. According to Lee and Nieman (2003: 73-74), using diet intake data in conjunction with anthropometry among others, is a good way of measuring nutritional status.

2.4.1 Anthropometric measures of nutritional status

As previously mentioned, anthropometric data form part of nutritional assessment (Hammond, 2008: 383). It Involves measurement of the physical make up of an individual including height and weight (Lee & Nieman, 2007: 3), skin fold thickness and waist circumference (Hammond, 2008: 399). These measurements must be accurately taken by well-trained individuals in order to reflect the true nutritional status of the individual. These measurements are then related to standard values obtained from measurements of large numbers of subjects (Lee & Nieman, 2007: 3). For the purpose of this review, body mass index (BMI), waist circumference and triceps skin fold will be discussed.

2.4.1.1 Body Mass Index (BMI)

BMI is one of the tools used to measure nutritional status (Hammond, 2008: 400). It is obtained through weight and height measurements. The formula used to calculate BMI is the Quetelet's index (W/H^2), being current weight divided by height in m^2 and expressed as kg/m^2 (Hammond, 2008: 400; Gibson, 2005: 274).

In order to calculate BMI, weight and height measurements have to be taken as accurately as possible (Hammond, 2008: 399). BMI combines weight and height to determine whether an individual's weight is appropriate for height (Hammond 2008: 400). Used individually, weight and height are not very useful (Hammond, 2008: 400) and therefore BMI is calculated.

BMI is categorized according to Table 2.1, being cut-off points as outlined by Lee and Nieman (2007: 7); Hammond (2008: 401); and Thomas and Bishop (2007: 63) as follows:

Table 2.1: BMI reference values

Category	BMI kg/m^2
Underweight	<18.5
Normal	18.5-24.9
Overweight	25.0 – 29.9
Obesity, class I	30.0 – 34.9
Obesity, class II	35.0 – 39.9
Extreme obesity, Class III	≥40

According to this classification, a BMI above 25kg/m^2 is considered overweight. Although controversial, recent studies have produced evidence that a BMI of 25 and 27 is not a risk factor for "all cause and cardiovascular mortality" and that the range of 18.5 and 24.9 is too strict a criterion for older adults (Hammond, 2008: 401). De Koning *et al.* (2010: 1323, 1327) also stated that although BMI provides information on general obesity, it has limitations in that it does not differentiate between individuals with high muscle mass, excess fat or abdominal obesity. BMI therefore on its own cannot be used to determine type 2 diabetes disease risk; it has to be used in combination with other anthropometric measures such as waist circumference. When used together in this way, De Koning *et al.* (2010: 1323, 1327) argue that although an increased BMI was positively associated with type 2 diabetes after removing the confounding factors such as age, sex, smoking and ethnicity, it was found to still predict type 2 diabetes and glucose status when used together with waist circumference and waist hip ratio (De Koning *et al.,* 2010: 1323). BMI also needs to be used in consideration of age, sex and race (Hammond, 2012: 401).

BMI has also been found to interact with and affect several factors. For example, higher BMI in South African women was predictive of underreporting food intakes (Mchiza *et al*., 2010: 88). In their study of a nutrition programme for women and infants (WIC) in Virginia, USA, Serrano *et al.* (2006: 199) found that women with desirable BMI and good job titles discussed health issues related to weight with ease. A study of first year students in the University of Malawi reported that the first year challenges and experiences at university caused increases in BMI (Takomana & Kalimbira, 2012: 138).

BMI has been found to be negatively related to breakfast eating and breakfast composition (Timlin & Pereira, 2007: 272). People who ate breakfast composed of grains rather than protein were found to have desirable BMI's, and this kind of breakfast was found to possess an ability to control appetite and consequently CVD related disease (Timlin & Perreira 2007: 275).

2.4.1.2 Waist circumference

Waist circumference refers to the measurement obtained from the narrowest point between the rib cage and the umbilicus as viewed from the front using a non-stretchable tape measure (Hammond, 2008: 402).

Waist circumference measurements are often used to obtain fat around the abdomen (Hammond, 2008: 402). Fat deposits around this area are considered a risk factor for obesity and the 'metabolic syndrome', and abdominal and visceral fat on its own has been found to indicate disease (Hammond, 2008: 402). This condition is strongly associated with insulin resistance, type 2 diabetes and high blood lipids levels and therefore 'cardio metabolic risk' (De Koning *et al.,* 2010: 1323, 1328). Furthermore, De Koning *et al.* (2010: 1328) state that because of lower muscle mass, women's increased waist circumference as compared to men's, signified a relatively increased visceral fat. DE Koning *et al.* (2010: 1328) further argue that android obesity in women was indicative of a change in hormonal state signalling post-menopause and 'polycystic ovarian syndrome' among other things.

Waist circumference is categorized as indicated in Table 2.2 which outlines cut-off points according to Thomas and Bishop (2007: 63); and Lee and Nieman (20007: 189) as follows:

Table 2.2: Waist circumference reference values

	Ideal	Increased Risk	Substantial Risk
Men	<94cm	>94cm	>102cm
Women	<80cm	>80cm	>88cm

2.4.1.3 Triceps skin fold thickness

According to Lee and Nieman (2007: 197), there is some debate about using triceps alone, but these measurements can be used in combination with some other methods to estimate body fat percentage, both subcutaneous and visceral (Gibson, 2005: 279). It is the most commonly measured site because it is accessible and it can be compared easily with reference data taken from a large sample (Lee & Nieman, 2007: 187). According to Leaned Nieman (2007: 194) “the triceps skin fold site is on the posterior aspect of the right arm, over the triceps muscle, midway between the lateral projection of the acromion process of the scapula and the inferior margin of the olecranon process of the ulna”. DE Koning *et al. (*2010: 1323, 1328) indicate that accuracy of triceps skin fold measurements in Africans can be affected by the larger muscle mass which they have been found to possess in comparison with the other groups for the same BMI. De Koning *et al.* (2010: 1323, 1328) argue that these differences in ethnic body fat distribution could explain why other groups are more predisposed to ‘cardio metabolic’ risk than others.

Triceps skin fold measurements are classified according to reference data from the National Health and Nutrition Examination Survey (NHANES) I and II (Lee & Nieman 2007: 197) according to Table 2.3:

Table 2.3: Triceps reference values

Percentile reference values	classification
$\leq 15^{th}$ percentile	Low
$15 – 85^{th}$ percentile	Normal
$\geq 85^{th}$ percentile	High

2.4.2 Determining food intake

Food intake can be determined using a wide variety of instruments. For the purpose of this study, the food frequency questionnaire (FFQ) is discussed as a method of determining food intake. The information that is obtained can be compared to various standards, such as the FGP and SAFBDG.

2.4.2.1 Food Frequency Questionnaire

The FFQ is one of the methods that can be used to determine dietary intake data (Hammond, 2008: 395). A FFQ is retrospective in nature and may focus on food groups rather than on specific foods. If this is the case, it cannot be used to assess nutrient intake (Hammond, 2008: 397).

FFQs are susceptible to reporting bias. For example, in a recent study of accuracy of reporting food energy intake among South African women, Mchiza *et al.* (2010: 89) identified characteristics of women who were most likely to underreport their food energy intake. Factors such as ethnicity, BMI, socio-economic status, social class, body image and guilt were found to be most predictive of under-reporting, only varying in degree according to different ethnic groups. As compared to women of 'mixed ancestry' and white women, black women were almost always the ones who most frequently underreported, were mostly obese and of low socio-economic status (based on educational level and household density) (Mchiza *et al*., 2010: 88).

2.4.2.2 Food Guide Pyramid

The FGP is one of the tools used to assess the adequacy of the diet and as a nutrition education tool. It interprets dietary guidance and puts it into eating patterns, showing appropriate and adequate number and size of portions from each five food groups per day, week or month (Escott-Stump & Earl, 2008: 342). It is a good guide to planning an optimal diet (Mathai, 2004: 311), and can promote health and prevent disease (Earl, 2004: 375). A FGP can be designed in ways that reflect the nutrient needs for the target group for whom it is designed and can be used as a guide for what is referred to as the "Defensive Nutrition Paradigm" (Mathai, 2004: 311). This is the type of nutrition that "… ensures maintenance of a healthy body weight and adiposity level and helps prevent metabolic syndrome…" (Mathai, 2004: 311).

The FGP uses the five major food group method that is used as the criterion for a daily balanced diet (Earl, 2004: 375) and is simple and easy to understand (Lee & Nieman, 2007: 49, 51). The five major food groups consist of the following: the breads, cereals and other grain products group which appears at the bottom of the pyramid and denotes the largest portion of the meal; the vegetables group, the fruits group, the meat, poultry, fish, legumes, eggs and nuts group as well as the milk, yoghurt and cheese group. The FGP also includes at the top end, oils, solid fats and added sugars, the size showing the smallest portion size in the daily meal that these foods are recommended to contribute (Rolfes *et al*., 2006: 44, Lee & Nieman, 2007: 41). The FGP indicates the number of servings and by its very design gives an indication of the relationship in size of the servings from each food group, and provides visual examples of what types of foods make each group (Earl, 2004: 363). The FGP is also designed to suit a person's age, sex, size and physical activity, as well as to provide examples of serving sizes (Lee & Nieman, 2007: 54). A detailed description of the FGP, the serving size suggestions and the nutrients provided by each food group depicted is described in Whitney and Rolfes (2005: 44-45).

Although the FGP differs from country to country, it is appropriate because it is based on scientifically proven dietary information (Escott-Stump & Earl, 2008: 342). The following are some examples of FGPs: Eating Well with Canada's Food Guide in Canada (uses four food groups) (Escott-Stump & Earl, 2008: 342), and assumes a different shape, My Pyramid in the USA (Escott-Stump & Earl, 2008: 345) and the Mediterranean Diet Pyramid (Escott-Stump & Earl, 2008: 349). All three place different emphasis on certain foods, for example, Canada puts vegetables first, while Americans put grains first, with a little difference in the recommended number of servings. The Mediterranean Diet Pyramid on the other hand places emphasis on especially monounsaturated and polyunsaturated fatty acids, e.g., omega 3 fatty acids (Escott-Stump & Earl, 2008: 350).

2.4.2.3 The South African Food Based Dietary Guidelines

Dietary guidance, called dietary guidelines, exists in several countries, and according to Lee and Nieman (2007: 35) they have been since time immemorial, expressed as cultural practices, taboos and religion. In America, dietary guidance, both general and disease specific, was first published in 1980 (Dodd & Bayerl, 2012: 277). In South Africa, the Food Based Dietary Guidelines have been developed to assist people to eat an adequate disease-preventing and health-promoting diet based on food and not on nutrients as the latter has been found ineffective (Gibney & Vorster, 2001: 2). In addition, the SAFBDG have been hailed as "comprehensive, appropriate and applicable, and as promoting equity in diet" (Gibney & Vorster, 2001: 2). This quality in the guidelines is highlighted by the use of friendly and straightforward language rather than technical language, thus making sure that it reaches the public for which it is intended.

2.4.3 Nutrition-related knowledge, beliefs, attitudes, practices and lifestyles

This section discusses available literature on nutrition-related knowledge, beliefs, attitudes and practices as it relates to objectives of the study.

2.4.3.1 Knowledge

Having knowledge means having information and having a clear understanding of it (Ewles& Simnett, 2003: 88). That nutrition knowledge is important in creating awareness of the relationship between good nutrition and health is a well-established fact (Sharma *et al*., 2008: 364; Lin *et al*., 2011: 309). It has also been established that people with a low level of education are predisposed to limited access to health and nutrition information, thus denying them a chance to make an informed choice (Charlton & Ferreira, 1997: 13). Harnack *et al*. (1998: 135) indicate that compared to individuals with a postgraduate education, individuals at lower levels of education were more likely to perceive more barriers towards a healthy diet. Kearney *et al.* (1998: 145) also state that level of education provided the best explanation for nutrition attitudes and beliefs. The same has been found to apply in other health behaviours such as smoking as well as reproductive health (LDHS, 2009: 56). It is important therefore for nutrition education to increase knowledge as a foundation in the behavioural change process (Lin *et al*., 2011: 316). Walsh (1995: 294) found that nutrition knowledge influenced positive nutrition practices among the coloured communities in the Free State in South Africa. Nutrition behaviour change however, needs much more than knowledge to motivate, rather, changes in the broader social, cultural and economic factors are needed to instigate meaningful behaviour change (Mwangome *et al.,* 2010: 168; Walsh, 1995: 309). An in-depth discussion on the knowledge, attitudes, beliefs and practices of Basotho women in relation to nutrition and health has been given in Chapter One.

2.4.3.2 Attitudes

According to Downie *et al*. (1995: 102), an attitude is a "function of beliefs and values that a person has regarding a health situation". Attitudes determine behaviour and in some cases *vice versa* (Downie *et al*., 1995: 98). Attitudes, like beliefs, are 'complex psychological concepts' that touch on people's feelings (Ewles &Simnett, 2003: 88). They are very important mediators of communication in that they can act as barriers if negative or as enablers if positive (Edelman & Mandle, 2006: 92).

Downie *et al*. (1995: 102) define an attitude in two ways. First, they state that an attitude is 'a relatively stable tendency to respond consistently to particular people, objects, or situations.' This definition can be understood to mean that an attitude is an inclination or orientation toward or away from people, objects or situations to which people respond readily, willingly and in a predetermined manner. This means that people will react with some consistency to health situations in the way in which their attitudes predict or determine. Downie *et al.* (1995: 102) also define an attitude as a 'learned predisposition to think, feel and act in a particular way'. Learning in this case is not necessarily conscious, but attitudes are acquired from experience with primary influences such as family and friends, and from secondary sources such as peer groups and schools. People therefore form perceptions according to how they have learned to think and feel, and these will predict their actions. As a result, they form stereotypes and biases towards people, objects or situations (Edelman & Mandle, 2006: 92). The notion of an attitude as a learned pre-disposition dates as far back as Aristotle, who coined the term "habitus" in reference to an attitude as refined over time by contemporary philosophers like Marcel Mauss. Mauss defined habitus as " the totality of learned habits, bodily skills, styles, tastes, and other discursive knowledge that might be said to "go without saying", in which case, according to Mauss, "it operates beneath the level of rational ideology" (Mauss, Online).

The fact that attitudes are learned means that they can be changed. However, Downie *et al.* (1995: 98) argue that attitudes are difficult to change and that those that are 'isolated' rather than 'integrated' with other behaviours are the most difficult to change which could mean that it is those attitudes that are acquired from experience that are much more stable and harder to change (Pretty & Priester, 1994: 153). This is the most important barrier to health behaviour change, and health promotion experts propose that repeated health education and nutrition education messages that provide accurate information using appropriate strategies can gradually change attitudes (Lin *et al*., 2011: 316). They further argue that attitudes provide a better explanation for nutrition behaviour than knowledge while Contento (2001: 328) argues that attitudes are better predictors of nutrition behaviour than the "subjective norm or the influence of important others."

2.4.3.3 Beliefs

People's beliefs are one of the major determinants of health (Contento, 2011: 75). A person's belief means his/her 'own direct or indirect intellectual evaluation of the object, based on facts collected or acquired', and 'it may be incomplete or biased' (Downie *et al*., 1995: 101), and this makes it difficult to change. People's concept of health is varied and is shaped by factors such as their own experiences, knowledge, values and expectations among other factors, as well as their cultural and social circumstances (Ewles & Simnett, 2003: 5). These are referred to as 'personal attributes' (Glanz *et al*., 2002: 11), as 'person-related factors' (Contento 2007: 30) and as 'health behaviour' (Glanz *et al.*, 2002: 11). In either form, their modification is important to improved nutritional status. It is the purpose of nutrition education to change these personal attributes into those that will ensure good nutrition hence reference to them as 'modifiable determinants' (Contento, 2007: 53). For example, although some inconsistencies were observed in a study of the older people in Sparta, Greece, some food habits were found to be consistent with the reported food beliefs while some were not. In Sweden, food beliefs were found to relate to health messages which had been promoted in the country for over 20 years (Charlton & Ferreira, 1997: 9, 12). Charlton and Ferreira (1997: 13) found that due to a lack of knowledge regarding nutrition and health, the elderly Cape Peninsula Colourds could not relate their long lives (longevity) to their good nutrition and lifestyles as they explained their health in terms of their cultural beliefs.

People's beliefs can be manifested in the way in which they define health. People from different geographic locations, age groups and social class define health in terms of what it means for them. For example, health has been viewed as the capacity to cope and function as expected; and as a spiritual and moral issue (Kelleher & O'Donovan, 1995: 10, Ewles & Simnett, 2003: 5) as in the case of African Americans who view health in terms of church and spirituality (Edelman & Mandle, 2006: 33). Health is also seen as the absence of disease (Ewles & Simnett, 2003: 5, Kelleher & O'Donovan, 1995: 24) and as a balance. The Native Americans perform traditional rituals and healing ceremonies to restore balance when illness strikes (Edelman & Mandle, 2006: 36). Ancient Greeks viewed health as an equilibrium (Kelleher & O'Donvan 1995: 9; Ewles & Simnett, 2003: 5), while some African societies view it as a function of witchcraft. African societies believe that sickness and death are caused by witchcraft, or upset ancestors, as in the Azande of Sudan (Herselman, 2003: 6), and the Basotho, who, according to the MOHSW (2004), seek medical help as a last resort after consulting traditional healers. In Gambia, Mwangome *et al.* (2008: 170) found that witchcraft was still perceived to be the cause of illness in malnourished children and traditional healing was performed. However, a shift away from traditional believes is identified by Dolman *et al.* (2007: 952) in their study of 'beliefs of South Africans regarding food and cardiovascular health' in which they found that the adult population from all gender, ethnic and socio-economic status in the Metropolitan areas, rather than holding on to their traditional beliefs, believed that eating certain types of food was good for cardiovascular health. This means that people will respond to health and illness in the way that they understand and believe it works. These apply to nutrition-related behaviours in the way that these person-related factors, or personal attributes as the case may be, determine nutrition related behaviours due to how an individual interprets and personalizes the broader environmental influences to health (Contento, 2007: 40). It is important therefore to understand traditional beliefs and practices of a particular target audience (Charlton & Ferreira, 1997: 9) as they are key determinants of what people do (Contento, 2007: 53). This would enable a clearer understanding of their food habits and health behaviour as well as aid in the design of health promotion and disease prevention activities for that group (Charlton & Ferreira, 1997: 9). Beliefs and practices of Basotho women in relation to nutrition are discussed in Chapter One.

2.4.3.4 Practices

Practices are skills and actions or behaviours related to health (Ewles & Simnett, 2003, 88). Practices are intertwined with knowledge, attitudes and beliefs. Practices of Basotho women related to nutrition and health have been discussed in Chapter One.

Knowledge, attitudes, beliefs and practices are further explained in the context of theories of health behaviour which have been developed to provide an in-depth understanding of why people do and do not perform certain health behaviours. Knowledge of the determinants of health and nutrition behaviour alone will not help in designing appropriate nutrition strategies. Instead, theory is needed to guide and provide a framework for such strategies due to the fact that changing health behaviour, and in particular nutrition-related behaviour, is a complex process. This is consistent with Cottrell's (2001: 8) definition of health education alluded to above which suggests that health education strategies must be based on sound theory.

2.4.4 Lifestyle factors that impact on nutritional status

This section reviews the literature on life styles as they impact on health and nutritional status.

2.4.4.1 Physical activity

Physical activity is identified in 'Healthy People 2010' as one of the leading health indicators (Edelman & Mandle, 2006: 233). Despite the many ways in which physical activity can be defined or done, it involves body movement which can be moderate or vigorous. It is one of the types of behaviour that is very difficult to get people to do as people continue to be sedentary despite efforts to achieve recommendations of "Healthy People 2010" (Edelman & Mandle, 2006: 262).

Physical activity confers a number of benefits. Among others, it prevents coronary heart disease through different mechanisms such as increasing HDL cholesterol and decreasing LDL cholesterol levels, improving glucose intolerance and insulin sensitivity, and reducing obesity (Edelman & Mandle, 2006: 266). Physical activity is helpful in reducing the risk of osteoporosis through increasing bone density in younger women, maintaining bone mass and decreasing the risk of fractures in older women (Edelman & Mandle, 2006: 270). Physical activity also reduces the ageing process, improves all types of arthritis, improves the condition of low back pain, improves the immune system if done in appropriate amounts, improves feelings of physical and mental wellbeing, decreases symptoms of depression, anxiety and anger, and increases feelings of self-esteem (Hoeger & Hoeger, 2011: 383; Edelman & Mandle, 2006: 272).

Several factors in the environment negatively influence physical activity behaviour. According to Bandura's Social Cognitive Theory, people's behaviour is greatly influenced by observational learning/modelling from their environment from which individuals unconsciously or consciously observe and learn healthy or unhealthy behaviours such as physical activity and dietary patterns (Contento, 2007: 120). The negative influence thrives in what Hoeger and Hoeger (2011: 34) call a 'toxic environment' which affects physical activity in many varied ways. First, is the closest environment in which we are naturally entangled and over which we have no control. These are friends, peers, homes, schools and workplaces and the physical environment (Contento 2007: 121). In addition to learning, environmental factors such as sedentary jobs, convenient eating facilities, cars, television, internet, cell phones and remote controls, discourage and impede physical activity (Hoeger & Hoeger, 2011: 35). It is evident from the above that good nutrition goes hand in hand with physical activity.

2.4.4.2 Smoking/Snuff-taking

It has been proven beyond reasonable doubt that cigarette smoking is a risk factor for heart disease, cancer and stroke, which in the developed world, are the leading causes of premature death. Smoking has been found to cause more cancer deaths in the work place than any other cause (Hoeger & Hoeger, 2011: 360). That cigarette smoking not only damages the smokers' health, but also that of other people through passive smoking is a well-established fact. During the early 90's, there was an observed rise in smoking rates among women in both the developed and the developing world, with the resultant increase in the proportion of women killed by lung cancer (DOH, 1995, in Ranneileng, 1996: 3).

Reasons for smoking are many and varied, including biological, psychological and social factors (Sarafino, 209). Some of the biological factors include genetic factors; variations in women's menstrual cycle which affect their mood swings; weight gain caused by smoking cessation; and oral contraceptive use and menopause problems (Sarafino, 1994: 212). Social factors include ethnicity, gender differences, peer pressure, individual motivation factors, and socio-economic factors. Psychological factors include personality, negative affects such as neurotic and depressive disorders, feelings of anxiety and anger, a coping mechanism and a relaxation technique, addictive behaviours and habit (Sarafino, 1994: 215).

Although the sample was too small for any meaningful conclusions to be made, Ranneileng (1996: 135) found that gender, age, socio-economic status and knowledge, attitudes and beliefs of the target audience had an impact on the way in which individuals perceived their own self-efficacy and barriers to stopping smoking, severity of the health threats from smoking, personal control and personalization of messages.

2.4.4.3 Alcohol intake

Alcohol is one of the beverages identified as functional in terms of its beneficial effects on health (Dodd, 2008: 282), particularly cardiovascular diseases (Hoeger & Hoeger, 2011: 360). The mechanism through which alcohol in general lowers the risk of CVD is not clearly understood, but the polyphenols in red wine may be associated with this protective effect (Dodd, 2008: 282). Moderate intake of alcohol which is rated at one (1) measurement for women and two (2) measures or units of alcohol for men per day is recommended for these protective effects to be realized. These should be in consideration of appropriateness to take alcohol regarding medical issues, life stage and age (Dodd, 2008: 282). However, even the smallest amount of alcohol taken has been found to be a risk factor for some cancers in women, particularly cancer of breast, oesophagus, larynx, rectum and liver (Hoeger & Hoeger, 2011: 360). Heavy alcohol usage has been found to create deficiencies of some nutrients including folate and vitamin C (Dodd, 2008: 479). Heavy alcohol usage has also been associated with many social issues, including crime and violence (Sarafino, 1994: 226).

Chapter three: Methodology

3.1 Introduction

In this chapter, the methods that were applied in the study are outlined. These include description of the research design, sampling methods, measurement, questionnaire validity and reliability, pilot study, statistical analysis, procedures of the study, ethical aspects and development of the nutrition education intervention.

3.2 Research design

An intervention study in which a randomized pretest-posttest control group design was adopted.

3.3 Sampling

3.3.1 Population

Women in Lesotho make up 964, 379 (51.3%) of the total population of 1,888,661 (BOS, 2006: 2). Table 3.1 depicts total *De Jure* (Lesotho citizens residing both in and out of the country) population by residential status and gender in Lesotho.

Table 3.1: Total *De Jure* population by residential status and gender in Lesotho

Residence	Males	Females	Total	Percentage
Urban	207,848	240,122	447,970	23.8
Rural	708,433	724,258	1,432,691	76.2
Total	916,281	964,380	1,880,661	100

3.3.2 Sample selection

As described in Chapter One, although homogenous in almost all aspects, the population of Lesotho is spread over a broad area which differs in characteristics such as physical features and climatic conditions which impact on accessibility and other social factors. Accessible areas are those that can be reached by car. Two out of ten districts, Maseru and Berea were included in the study because they are fairly accessible in both their urban and rural areas. Maseru district is the capital and the only city in Lesotho. It is representative of the country in that it includes the most urban and most advanced, as well as the most rural areas of the country. The Berea district is also fairly representative in that it includes an urban town (Teyateyaneng, commonly known as TY), as well as a broad rural area. The choice of these districts was also made due to considerations of cost and logistics. Table 3.2 represents population distribution according to gender in the two selected Districts.

Table 3.2: Population distribution according to gender in Maseru and Berea Districts

	Population in districts	Number of Males	Number of Females
Maseru	429,823	205,175	224,648
Berea	256,496	125,041	131,455
Total	686,319	330,216	356,103

An urban and rural area was defined according to the Lands Surveys and Physical Planning (LSPP) boundaries in Lesotho (BOS, 2006). Table 3.3 and 3.4 represent a total number of villages included in the study.

Table 3.3: Total number of villages included in the study in Maseru and Berea Districts

	Total number of Constituencies	Number of constituencies included in the study	Number of urban areas included in the study	Number of rural areas included in the study
Maseru	18	14	663	810
Berea	10	5	125	268
Total	**28**	**19**	**788**	**1078**

Table 3.4 Number of urban and rural villages and the number of sample villages

		Total number of villages	Total number of sampled villages
Berea	Urban	125	23
Berea	Rural	239	34
Maseru	Urban	679	127
Maseru	Rural	808	116

Nineteen constituencies (before constituencies were re-drawn in 2011) out of a total number of 80 constituencies in the whole country were randomly selected for the study. Randomization was done between towns and villages and not within towns to prevent spill-over or contamination. The intention was to include every second town in the experimental group, but due to limitations (as described in Chapter Five) this was not possible. All the women who met the inclusion criteria and signed informed consent forms (volunteered to participate) were included in the study. The aim was to include a total of 150 urban and 150 rural women but a total of 512 women were included, which was reduced to 452 due to incomplete questionnaires.

3.3.3 Sample size

Considerations of the effect of cost and logistics compromised true sample size calculations for this study and caused consideration for a convenient number (Gibson 2005: 6). Although a sample of 300 women, 150 from rural areas and 150 from urban areas, were initially planned to be included in the study (despite the limitations), a total of 512 women were reached. This was due to the fact that some meetings had up to 30 volunteers. Instead of the experimental group having 75 rural and 75 urban women and the control group having 75 rural and 75 urban women, there were 71 and 116 women from the urban area in the control and experimental groups, respectively, and 133 and 124 women from the rural area in the control and experimental groups, respectively. The original intake exceeded 150 for each group and this was allowed as contingency to overcome drop out.

3.3.4 Inclusion and exclusion criteria

3.3.4.1 Inclusion criteria

Women in the age group 19-60 years were eligible to participate in this study. Women constitute a “collective experience”, therefore they form a community (Easterling *et al.*, 2003: 3), and community participation is an important principle of health promotion. The choice of women in this age group was made with the knowledge that in Lesotho women are home makers and they decide what is to be eaten in the family whether they are working women or not. Considering this significant role of women in the household, nutrition education programmes aimed at women are more likely to succeed. Women, particularly in this age group, are the most productive and therefore determine the dietary intake of their families.

3.3.4.2 Exclusion criteria

The following categories of women were excluded from the study: domestic workers that lived in the homes of women participating in the study, pupils/students, acutely ill and disabled women, and pregnant and lactating women. These groups have their unique characteristics that need special considerations that were beyond the scope of this study.

3.4 Measurement

The variables, operational definitions and techniques that were applied in the study are described in the following sections.

3.4.1 Variables

The following variables were measured before and after the intervention, with the exception of socio-demographic profile which was measured only before the intervention to provide a description of living conditions.

(i) Socio-demographic profile of participants in rural and urban areas;

(ii) Nutritional status of participants, including:

   a. Anthropometric measurements (height, weight, waist circumference and triceps skin fold thickness);

   b. Health status and nutrition information; and

   c. Usual food intake;

(iii) Nutrition-related knowledge, attitudes, beliefs and practices (KABP); and
(iv) Lifestyle factors (physical activity, alcohol intake and smoking).

3.4.2 Operational definitions

3.4.2.1 Socio-demographic profile

For purposes of this study, socio-demographic profile refers to demographic characteristics including educational level and birth date of participants and their household members. It also refers to the participants' location, language spoken, marital status, employment status, type and status of dwelling in terms of size, available utilities as well as total income for the household.

3.4.2.2 Nutritional status

For purposes of this study nutritional status refers to anthropometric and health status; and usual food intake.

(i) Anthropometric status

For the purpose of this study, anthropometric status refers to Body Mass Index (BMI), waist circumference and triceps skin fold thickness.

(a) BMI

BMI refers to weight in kg divided by height in m^2, and is expressed as kg/m^2 (Hammond, 2008: 400; Gibson, 2005: 274). BMI was categorized according to cut-off points as suggested by Lee and Nieman (2007: 7); Hammond (2008: 401); Thomas and Bishop (2007: 63). Cut-off points are outlined in Table 3.5.

Table 3.5: BMI reference values

Category	**BMI kg/m^2**
Underweight	<18.5
Normal	18.5-24.9
Overweight	25.0 – 29.9
Obesity, class I	30.0 – 34.9
Obesity, class II	35.0 – 39.9
Extreme obesity, Class III	≥40

(b) Waist circumference

Waist circumference refers to the measurement obtained from the narrowest point between the rib cage and the umbilicus as viewed from the front (Hammond, 2008: 402). For waist circumference cut-off points, refer to Chapter Two, Table 2.2.

Waist circumference was categorized according to cut-off points suggested by Thomas and Bishop (2007: 63) and Lee and Niemen (2007: 189). Cut-off points are outlined in Table 3.6.

Table 3.6: Waist circumference reference values

	Ideal	**Increased Risk**	**Substantial Risk**
Men	<94cm	>94cm	>102cm
Women	<80cm	>80cm	>88cm

(c) Skin-fold thickness: Triceps

Triceps skin fold refers to the site "on the posterior aspect of the right arm, over the triceps muscle, midway between the lateral projection of the acromion process of the scapula and the inferior margin of the olecranon process of the ulna" (Lee & Nieman, 2007:).

Triceps measurements were classified according to reference values from NHANES I and II (Lee & Nieman 2007: 197). These are outlined in Table 3.7.

Table 3.7: Triceps reference values

Percentile reference values	**classification**
$\leq 15^{th}$ percentile	Low
$15 – 85^{th}$ percentile	Normal
$\geq 85^{th}$ percentile	High

(d) Health status and use of supplements

For the purpose of this study, health status referred to ailments frequently experienced during the previous six month period. These included both acute and chronic ailments. It also referred to the medications that were used at the time of the study as well as traditional medicine and nutritional supplements.

(ii) Usual food intake

Usual intake refers to the types of foods eaten and frequency of intake (every day, regularly, sometimes and never), and number of times they were eaten per day. Foods that were included were grouped according to the food groups included in the USDAFGP (referred to as Food Guide Pyramid (FGP) in this study). These included:

(a) the breads, cereals and other grain products group; vegetable group; fruit group; meat, poultry, fish, legumes, eggs and nuts group; milk, cheese, and yoghurt group; and fats, sweets and alcohol beverages;

(b) For healthy foods (e.g. vegetables), choosing the option every day and regularly was considered a healthy choice; while choosing the option sometimes and never was considered the unhealthy choice. For unhealthy foods (e.g., butter), choosing the option every day and regularly was considered an unhealthy choice, while choosing the option sometimes and never was considered the healthy choice;

(c) Agreement with the guidelines of the SAFBDG were also included (yes/ no).These included the following guidelines:

1. Enjoy a variety of food (Maunder *et al.*, 2001: 7);

2. Be active: refers to 30 minutes of moderate to vigorous physical activity three or more days of the week (Lambert *et al.*, 2001: 12). In this study it referred to physical activity such as gardening, cleaning the house, brisk walking, jogging, cycling, stretching, aerobics, netball and swimming three or more days of the week;

3. Make starchy food the basis of most meals: refers to eating unrefined or minimally processed as well as fortified cereals and grains everyday (Vorster & Nell, 2001: 24);

4. Eat plenty of fruit and vegetables every day: refers to eating not less than five servings of vegetable and fruit every day (Love & Sayed, 2001: 24);

5. Eat dry beans, peas, lentils and soy regularly: refers to eating dry beans or peas or lentils or soy every day (Venter & Eyssen, 2001: 37);

6. Meat, fish, chicken, milk and eggs can be eaten every day: refers to two servings of milk per day, about four eggs per week, two to three servings of fish per week, and two portions of meat per day (Scholtz *et al.*, 2001: 46);

7. Eat fats sparingly: refers to low fat options from non-animal fat and the use of unsaturated soft margarine and vegetable oils (Wolmarans & Oosthuizen, 2001: 54);

8. Eat salt sparingly: refers to preparing meals with reduced salt and not adding salt to food at the table (Charlton & Jooste, 2001: 63);

9. Drink lots of clean safe water: refers to drinking a total of 2 litres (approximately 8 glasses) of water and beverages per day. These include tap water, beverages such as tea and coffee and other drinks made using tap water (Bourne & Seager, 2001: 69);

10. If you drink alcohol, drink safely: refers to alcohol intake of 0-2 measures per day for women, with at least two alcohol free days per week. Binge alcohol intake refers to drinking 3 or more standard drinks on weekly basis (van Heerden & Parry, 2001: 73).

3.4.2.3 Nutrition-related knowledge, attitudes, beliefs and practices (KABP)

(i) Knowledge reflects general knowledge in various nutrition-related statements informed by general nutrition knowledge, FGP and FBDG, categorized as 'true or false or do not know'.

Participants' knowledge was categorized in terms of right and wrong responses.

(ii) Attitudes refer to specific attitude (feeling/opinion) statements (Ewles & Simnett, 1998: 132, Kelleher & O'Donovan, 1995: 81) regarding nutrition to which participants indicated whether they agreed with, disagreed with, or did not know.

For purposes of this study, participants' attitudes were assessed as their views and perceptions regarding certain specific ideas presented to them through attitude statements.

(iii) Beliefs refer to participants' own specific beliefs about nutrition and whether they agreed with, disagreed with or did not know what their beliefs were regarding specific statements. These were informed by models of health behaviour and were classified under the following models: HBM, self-efficacy, TRA/TPB, locus of control, and social support (Contento, 2007: 30, 53, 79, 80; Sarafino, 1994: 179; Glanz *et al*., 2002: 53, 79, 80).

(a) HBM: Belief statements were categorized according to whether participants believed in the severity of consequences that might arise from not eating a healthy diet; whether they believed in their own vulnerability to developing illnesses if they did not eat a healthy diet; whether they believed in the benefits of eating a healthy diet, and what they perceived as barriers to not eating a healthy diet.

(b) Self-efficacy: participants' responses to specific statements were categorized in terms of their confidence in their own capability to produce and eat a healthy diet.

(c) TRA/TPB: Participants' responses to specific statements were categorized in terms of whether they were governed by social norms and social pressure, and whether they believed in their own power to make decisions regarding food.

(d) Locus of control: Participants' responses to specific statements were categorized in terms of whether they had an internal or external locus of control regarding food.

(e) Social support: Participants' responses to specific statements were categorized according to their perceptions of the support they had from close family and friends.

The Stages of change model was used to determine the overall stages of readiness to change according to the participants' responses to the other models.

(iv) Practices refer to specific statements regarding participants' food choices and food preparation behaviours expressed as a 'yes or no' and whether participants usually ate breakfast, lunch and dinner every day, regularly, sometimes or never, as well as what was usually consumed per meal. Practices also referred to lifestyle factors such as physical activity, alcohol intake and smoking (Whitney & Rolfes, 2005: 473, Krummel, 2004: 874).

a) Food choices: In addition to what participants ate on a daily basis (as determined by a food intake questionnaire, food choices were determined by questions related to grocery shopping, including budgeting (what, how often), and keeping home gardens.

b) Food preparation: Food preparation methods were determined by whether or not participants washed hands with soap every time when touching food; washed cooking utensils every time after use; washed vegetables and fruit every time before cutting, cooking or before eating raw; boiled food instead of frying it; threw away water when cooking vegetables or re-used it (Whitney & Rolfes, 2005: 664-666); and not overcooking vegetables.

(c) Eating practices: Eating practices were determined by whether or not participants ate breakfast, lunch and dinner and what each meal consisted of.

3.4.2.4 Lifestyle factors

Lifestyle factors included whether or not participants exercised or did manual work including any of the following: gardening, cleaning the house, brisk walking, jogging, cycling, stretching, aerobics, cycling, netball and swimming. Physical activity was assessed by whether or not the participants engaged in physical activity.

Alcohol intake included whether participants drank alcohol, how much they drank and how often. Alcohol intake of more than two standard drinks per day or binge drinking on some days was considered excessive.

Smoking included smoking of cigarettes and taking snuff. Smoking at all, assessed by whether participants smoked or not, the number of cigarettes smoked and the number of times snuff was taken was considered unhealthy.

3.4.3 Techniques

Techniques included questionnaires and anthropometric measurements.

3.4.3.1 Socio-demographic questionnaire

A semi-structured, socio-demographic questionnaire adapted from the one developed for the Assuring Health for All (AHA) FS study by the University of the Free State was adapted for use in this study to determine socio-demographic circumstances of participants (Appendix A). The questionnaire was completed by the researcher and trained assistants in an interview with each participant.

3.4.3.2 Anthropometric techniques

Standard methods to determine weight and height, waist circumference, triceps skin fold thicknesses as suggested by Gibson (2005: 6); and Earl and Borra (2000: 368) were used by one trained researcher to measure anthropometric variables and noted on a standardized form (Appendix B). A description of these techniques is given in the following section.

(i) Weight

Electronic scales were used to measure weight. Guidelines provided by Lee and Nieman (2003: 167) and Gibson (2005: 252) were followed.

Scales were placed on a hard, non-carpeted level surface. The weights were taken in the mornings before food, and after urinating. Each participant wore minimal clothing; stood in the centre of the scale, unaided, head up, looking straight ahead. Measurements were taken to the nearest 0.1kg.

(ii) Height

A non-stretchable tape measure fastened to a wall was used to measure height according to the guidelines provided by Gibson (2005: 247).

A non-stretchable tape measure was tied in a vertical position to a wall with a flat surface, based on a hard and level floor with no cornice.

Each participant wore minimal clothing; stood erect with feet together; head in the Frankfort plane, touching the tape (this was aided by an upward lift through the mastoid processes when necessary); knees straight; heels, buttocks and shoulder touching the wall as much as possible; hands on the sides, palms facing the thighs; shoulders relaxed; took a deep breath, stood tall. The measurement was taken at the end of the deep breath. The measurements were taken to the nearest 0.1mm. All measurements were taken in the morning.

(iii) Waist circumference

An elastic measuring tape was used to measure waist circumference. Measurements were taken at the narrowest point between the rib cage and the umbilicus. In cases where the point was not visible, this area was measured at the midpoint between the lower rib and the iliac crest. For obese individuals, measurements were taken at the umbilicus level. Guidelines provided by Gibson (2005: 281) were followed. Each participant was asked not to eat breakfast before measurement; they were asked to wear minimal clothing to enable correct positioning of the tape; they stood erect, arms relaxed at the sides, feet together; weight evenly balanced on both legs; the measurer stood in front of the participant, and then placed an elastic measuring tape at the marked site; the measurement was taken after a normal expiration; and reading was taken to the nearest millimetre.

(iv) Skin-fold thickness: Triceps

The triceps skin-fold thickness was measured by means of skin fold callipers. These measurements were taken as established by Gibson (2005: 275) as follows: Participants were asked to bend the arm 90^0 at the elbow to enable identification of the site to be measured. A non-stretchable tape measure was used to locate a midpoint of the back of the upper right arm. A mid-point was marked directly in line with the acromion process and the tip of the elbow with a fine pencil or felt pen. The arm was then let to hang and relax, and the skin-fold (the skin together with the subcutaneous fat) was raised, grasping it with the thumb and the index finger of the left hand vertical and parallel with the marked site; placed the calliper 1cm away from where the fold was grasped, exactly at the mid-point; held the calliper at 90^0 to the surface of skin-fold; held the skin-fold throughout the reading and recording; and read and recorded the measurement about 4 seconds after placement of the calliper on the skin-fold.

3.4.3.3 Health status and use of herbal remedies and supplements

Health status was assessed by a predetermined list of common ailments (included in Appendix B) from which participants indicated those that they had experienced in the past six months; and by listing names of medications and supplements that they were currently using. Use of herbal remedies was also noted.

3.4.3.4 Food Intake *Q*uestionnaire/Food *F*requency Questionnaire

A semi-structured food intake questionnaire/short FFQ designed by the researcher to determine usual food intake, types of foods and number of servings of those foods eaten per day was used to determine food intake (Contento, 2007: 183, 365) (Appendix C). Questions were informed by the FGP and FBDG. The food intake/ short food frequency questionnaire was completed by the researcher and trained assistants in an interview with each participant.

3.4.3.5 Nutrition-related knowledge, attitudes, beliefs and practices (KABP) and lifestyles questionnaire

Nutrition-related knowledge, attitudes, beliefs and practices were assessed using a semi-structured questionnaire (Appendix D) informed by selected theories of health behaviour as described in chapter One.

This questionnaire was designed using the questioning mode of the selected health behaviour models, for example, the HBM, self-efficacy, locus of control, stages of change, TRA/TPB and social support. The questionnaire was completed by the researcher and assistants in an interview with each participant.

3.5 Validity and reliability of questionnaires

Validity

Validity refers to the degree of accuracy with which an instrument measures what it is supposed to measure (Contento, 2007: 371; Leedy & Ormrod, 2005: 29; Uys, 2003: 123) given the context in which it is applied (Brink, 2000: 167).

All questionnaires were compiled according to information obtained from in-depth literature review and all questions were directly related to the aims and objectives of the study.

Reliability/ Reproducibility

Reliability/Reproducibility refers to "The consistency with which a measuring instrument produces the same result when the entity being measured has not changed" (Leedy & Ormrod, 2005: 29). It is also characterized by "obtaining the same results when used repeatedly in similar situations" (Gibson [workshop report], 2006: 1).

Reliability was determined by means of administering the four sets of questionnaires to a randomly selected 10% of the target population twice, one month apart. Where 20% of responses differed, these questions were considered unreliable and the results were not reported.

3.5.1 Anthropometric status

Validity

Validated methods of measuring anthropometric status were used as suggested by Lee and Nieman (1993/2003) and Gibson (2005).The researcher performed all the measurements in order to ensure accuracy, care and consistency and to make sure that the set standards were conformed to. Reliable, validated standards to interpret results were applied (see analysis) (Webb, 2003: 88).

Reliability

Standardized anthropometric methods were used as established in the literature to ensure accuracy and precision of measurements, thus ensuring reproducibility. Measurements were carried out by the trained researcher to ensure accuracy and consistency.

3.5.2 Health information and use of nutritional supplements and herbal remedies

The list of common illnesses included an open ended self-generated list (included in Appendix B) to enable participants to describe freely their own ailments as felt and known by themselves. Open-ended questions are themselves valid as they allow participants to say things in their own way and express what they really believe (Robson, 1994: 233, in Ranneileng, 1996: 63).

3.5.3 Food Intake Questionnaire/Food Frequency Questionnaire (FFQ)

Validity

FFQ are a valid method to measure usual food intakes. The questions were based on the recommendations of the FGP and FBDG, being themselves valid methods of assessing food intake to ensure content validity. The FFQ included a list of (staple) locally based foods (which in itself is a valid method) (Gibson, 2005: 105) which were also listed in the Food Composition Table for Lesotho (Food Composition Table for Lesotho, 2006).

Validity of the FFQ is subject to among others the following threats: respondent burden, interviewer/respondent biases, respondent memory lapses, uncertainty regarding true variation in daily nutrient intakes, characteristics of the study group (age, income, season, chronic illness, dieting, health related activities, behaviour, psychological effects, types of food or beverages consumed), between and within subject variation as well as omission of supplements (Gibson 2005: 105).

To improve validity of the FFQ the following strategies were used:

- Data were collected through a series of meetings, which later became workshops. This in itself acted as an incentive for people to participate. It also minimized interviewer burden in terms of travel and number of days needed to work. It also minimized respondent burden.

- Interviews were conducted in a manner that enhanced data accuracy and completeness. To ensure this, the researcher provided adequate training for research assistants, and together these provided privacy when necessary, used questioning skills that were non-directional, appropriate pace and probes and an objective approach. This not only ensured accurate and reliable collection of data, but it also ensured accurate documentation and review of information (Gibson [workshop report], 2006: 2)

Reliability

Although reproducibility of the FFQ is generally considered high (Gibson, 2005: 135), the following were considered to ensure reliable collection of data:

- The Usual Food Intake/FFQ was designed according to recommendations in the literature, and researcher and trained assistants completed the questionnaires to avoid inter-rater inconsistency (Gibson, 2005: 135) and to ensure collection of reliable data;

- The questionnaire was pre-tested among 10 (ten) randomly selected respondents, with similar characteristics to the envisaged sample (Mouton, 2006: 103) and modifications were made thereof; and

- The FFQ questionnaire was then administered again to 10% randomly selected participants after the study one month later to ascertain reliability (Leedy & Ormrod, 2005: 29; Contento, 2007: 372) and the difference margin of responses of more than 20% was considered unreliable and the responses were not reported.

However, no preparations were made to cater for reporting of seasonal variability as suggested by Gibson (2006: 1). As a result, seasonal variability may have contributed to unreliability of some responses, particularly in the fruits and vegetables sections.

3.5.4 Nutrition-related Knowledge, Attitudes, Beliefs, Practices and Lifestyles Questionnaire

Validity

A semi-structured questionnaire was developed in accordance with the standard methods as suggested by health psychology and health promotion experts and followed the suggested guidelines of each theory of health behaviour (Sarafino, 1994: 180; Contento, 2006: 59; Bauer & Sokolik, 2000: 3; Katz, 2001: 300) and lifestyle factors as described in the literature (Krummel, 2000: 571, 569, 578; Wing *et al*., 2001: 651; Martorell & Stein, 2001: 667).

Semi-structured questionnaires follow specificity and sequence while still using prompts and probes. They also allow flexibility as open-ended questions are used. This method of data collection is valid in itself as it truly assesses the respondents' experiences through their own perspectives (Robson, 1994: 233).

Reliability

The developed semi-structured questionnaire was pre-tested among 10 (ten) randomly selected respondents, with similar characteristics to the envisaged sample (Mouton, 2006: 103). Modifications were then made accordingly. The questionnaire was administered to 10% of randomly selected participants after the baseline information was collected, with at least one month in between to ascertain reliability. Data collected were compared to the main study and a difference margin of 20% meant unreliable data and those responses were discarded from the study. Where unreliable questions were found they have been reported in the results section.

3.6 Pilot study

A pilot study was carried out to verify the feasibility, appropriateness and acceptability of methods (Leedy & Ormrod, 2005: 110, Hodges & Videto, 2005: 143; Katzenellenbogen & Joubert, 2007: 50). Particularly, the pilot study was carried out to ensure cultural acceptability of the research methods, the length of time it would take to complete the questionnaires and the length of time required to take the anthropometric measurements of participants. Four villages, two in Maseru and two in Berea were included in the pilot study. One village in each town was used as a control and one as an experimental group. The experimental group provided an opportunity to test delivery of the nutrition education intervention. Twenty six women were included in the pilot study. These enabled the instruments to be refined to the point where no more changes were needed.

After the pilot study, it was evident that the study was feasible, appropriate and acceptable. The pilot study also showed that appointments needed to be made shortly before the day of data collection to prevent any interruptions that might arise. In addition, the pilot determined that both weekdays and weekend days would be required for data collection to ensure availability of respondents. It also became evident that the information document (Appendix E) as well as clear verbal explanation was absolutely necessary to dispel expectations of benefits that were not going to be provided. For example, participants expected medical examinations such as high blood pressure tests, diabetic tests, and HIV and AIDS tests. They also expected to be given food and free medication.

Several changes were made to the questionnaires as a result of the pilot study.

Changes made to the socio-demographic questionnaire included: addition of the option, "Modern marriage (church, magistrate)" to the question about marriage; and addition of the option "no toilet" to the question about type of toilet.

Changes made to the nutrition-related knowledge, attitudes, beliefs and attitudes questionnaire included:

> Addition of an additional option to Question 7 (7.1.9) "I have a garden"; addition of an additional option to Question 7 (7.2.10), "I cook vegetables until they are well-done."
>
> It was not necessary to make any other changes to the other questionnaires.

Changes were also made on inclusion age criteria which had to be extended to 19-60 years following an observation that women of 60 years were often still productive, and were often the ones caring for families.

3.7 Procedures of the study

Step 1 :

- Proposal was presented to the Evaluation Committee of the Faculty of Health Sciences at the University of the Free State for approval;
- Permission was obtained from the Ethics Committee of the Faculty of Health Sciences of the University of Free State (Appendix F);
- Permission to conduct the study was obtained from the Ministry of Health and Social Welfare in Lesotho;
- Pilot studies were conducted with 26 participants;
- Research assistants were recruited (from the National University of Lesotho [NUL] Nutrition Department) and trained by the researcher. The researcher was present during all the field work and was in charge of all the logistics and presented in all the

nutrition education workshops. Research assistants were useful in conducting the interviews alongside the researcher. Research assistants were trained to understand the aims and objectives of the study and the interview procedure with each questionnaire. Although the researcher conducted all the anthropometric measurements, research assistants helped in recording the readings. Assistants also assisted in photocopying and compiling of the workshop materials;

- After random selection of villages to be included in the study the researcher arranged information sessions with the community leaders/community counsellors to sensitize them to the intended project, and obtain consent. The community leaders were asked to call *pitsos* (*pitsos* are themostthe most effective way of disseminating information to the communities in both urban and rural areas in Lesotho) where information related to the project (as explained on the information document, Appendix E) was explained to the community members, and women were invited to participate in the workshops;

- The sample frame drawn according to the Lands Surveys and Physical Planning boundaries in Lesotho (BOS, 2006) was followed with considerations of accessibility, and villages were randomly assigned to control and experimental groups;

- Venues for data collection (in the selected villages) were established; and

- Volunteers (women) from the selected areas were invited to participate in the study, describing purpose, venue, date, time and length of time for data collection.

Step 2 (a):

- Volunteers participating in the study assembled at the agreed venues on the set dates and times arranged for pre-test measurements and interviews;

- They signed consent forms (Appendix G);

- Volunteers were measured and interviewed each day starting with anthropometric measurements, then the researcher and assistants completed the following questionnaires in an interview with participants: a socio-demographic questionnaire, followed by a health and nutrition information questionnaire, then a food intake/ short food frequency questionnaire, and a knowledge, attitudes, beliefs, practices and lifestyles questionnaire;

- Participating volunteers were informed of further arrangements for the post-test measurements and interviews;

- During the second round of measurements, to improve response rate, anthropometric measurements and interviews were taken at the volunteers' homes for those who had not assembled at the agreed venue; and
- Each participant in the experimental group was invited for nutrition education on agreed dates and venue (a total of 15 intervention sessions were arranged with about 15 to 30 women attending each session).

Step 2 (b): The Experimental Group (2 days each)

- The nutrition education intervention was presented to participating volunteers;
- The nutrition education intervention was presented on the same day of the interviews, after a short break, and continued the next day;
- The nutrition education intervention was delivered by the researcher to the experimental groups immediately following the interviews for the duration of two days. After completion of the interviews, women were served a light meal of sandwiches with tea/drink and a fruit, after which a nutrition education session commenced for the rest of the day and continued the next day. Before each education session, the women selected group leaders to enable follow-up;
- Group leaders were selected to follow up on other group members after the nutrition education to encourage them to implement what they had learned; and
- Participating volunteers were informed of further arrangements for the post-test measurements and interviews.

Step 3:

- Reliability of questionnaires was checked on a randomly selected 10% of the participants one month after the baseline;
- After a period of 6 months, step 2 (a) was repeated for the post-test evaluation; and
- The nutrition intervention was presented to the control group after post-test interviews and measurements had been completed.

3.8 Ethical aspects

Approval from the Ethics Committee of the Faculty of Health Sciences of the University of the Free State (Appendix F) and from the Ministry of Health and Social Welfare in Lesotho were obtained before commencement of the field work.

The nature of all the procedures followed and employed in the study were disclosed (Gibson, 2005: 19) in an information document conveyed to both the Ethics Committee and the participants. Volunteers were informed about how they were going to be involved in the study and what would be expected of them. Information about the aim of the study was explained. The information document also included information about the types of measurements to be done. Participants were informed that the study bore no potential risks to them, but did offer the benefit of the assessments and intervention programme. All discussions took place in the participants' language of choice (Sesotho or English).

Informed consent was obtained from the participants in their language of choice who were also informed that participation was voluntary and that they could withdraw from the study at any time if they so wished (Gibson, 2005: 9; Salkind, 2006: 58; Leedy & Ormrod, 2005: 101).

Participants were informed that their individual identity would not be disclosed and that there was no monetary or material gain for participating in this study. In cases where the researcher felt that participants needed medical assistance, participants were referred. On the days of data collection and nutrition intervention, snacks were provided.

3.9 Development of the nutrition education intervention

The nutrition education intervention in this study was systematically designed as suggested by Contento (2007: 15). It followed steps in its design that ensured that first and foremost it provided an education that laid the foundation for change by providing relevant information and facts (Ewles & Simnett, 2003: 248) related to nutrition. It was informed by selected theories of health behaviour and nutrition education tools such as the FGP and SAFBDG that provided it with structure and purpose (Contento, 2011).

The intervention was facilitative in that it used group work and other participatory methods (Ewles & Simnett, 2003) which ensured interaction among participants and the facilitator. It used simple and straight-forward messages focused towards specific areas of knowledge (Viswanath & Bond, 2007: 22).

Participatory methods such as questioning, brainstorming, and group work were used to facilitate learning. Blank flip charts were used, and the facilitator together with the participants built notes throughout the training. These notes were left with the group leaders for reference by the participants. The nutrition education intervention which was developed in advance was followed in order to give structure and reference to the learning process. The following section outlines the nutrition education intervention in its entirety.

3.9.1 Nutrition education intervention

This section outlines how the intervention was designed, the steps followed (according to the suggestions in Chapter Two) and the implementation process.

3.9.1.1 The step process

The following steps address the issues of methodology and principles of health promotion and adult learning that were adopted in this study (as motivated in Chapter Two).

Step 1: Needs assessment and analysis

Step 2: Identify relevant psychosocial determinants of the core nutrition-related behaviours using theory as framework

Step 3: Set educational goals of the intervention

Step 4: Set aims and objectives based on theory as framework

Step 5: decide the best strategies and methods for achieving the aims and objectives

Step 6: Identify resources

Step 7: Plan evaluation methods

Step 8: Set action plan

Step 9: Action (implementation)

A detailed description of how the intervention was designed, principles that guided the design, content and methodology are described in the following sections:

3.9.1.2 A nutrition education intervention for women in selected urban and rural areas in Lesotho

Step 1: Collect, analyse and prioritize needs

Step 1.1: A needs assessment and analysis should involve identification of the following:

- Nutrition challenges and possible causes of those challenges;
- The main nutrition-related behaviours /practices that the intervention intends to address; and
- Target audience to be addressed by the intervention.

Step 1.1.1: From literature analysis, the following nutrition-related concerns were identified:

- Lack of knowledge of the food groups and the contribution made by these foods as well as some specific foods to good health and wellbeing; and
- Helpful and unhelpful attitudes, beliefs, practices and lifestyles related to nutrition and health.

Step1.1.2: What are the core nutrition-related behaviours/or practices addressed by this intervention

- Promote a change from eating according to the three legged pot (three food groups) to eating according to the FGP and SAFBDG and the health benefits of eating in this way (described in detail in Step 3.2);

- Special emphasis on specific foods such as β-carotene rich fruit and vegetable, vitamin C rich fruit and vegetable, water, alcohol, saturated fatty acids (SFA's) monounsaturated fatty acids (MUFA's) and polyunsaturated fatty acids (PUFA's), caffeinated tea and coffee with meals and indigenous food plants; and
- Promote a change in nutrition-related knowledge, attitudes, beliefs, practices and lifestyle.

Step 1.1.3: Target audience

Women in the age group 19-60 years

Step 2: Theory based potential psychosocial determinants of nutrition-related behaviours identified as knowledge, beliefs, attitudes and practices that may impact on nutrition-related behaviours

Step 2.1: Knowledge

To be based on programme content (described in Step 3.2)

Step 2.2: Attitudes and beliefs as indicated by the following:

- Self-awareness (through self-assessment of vulnerability and threat of a nutrition-related health problem);
- Sensory affective (taste);
- Self-efficacy;
- Barriers/cons/costs;
- Outcome expectancies/benefits/rewards/pros;
- Personal control/internal –external locus of control;
- Social norms and cultures (influences from peers, family, community);
- Motivation (intrinsic motivation influenced by extrinsic motivation from the intervention);
- Intention to act; and
- Coping skills.

Step 3: Educational objectives

Objectives of the nutrition-education intervention should address only the psycho-social and not the broader environmental determinants of nutrition-related behaviour and should include:

- Educational goals; and
- Programme content.

Step 3.1: Educational goals

- To increase awareness/knowledge of participants of the importance of eating according to the FGP and FBDG, as well as eating some selected foods;
- To create awareness and increase knowledge of the importance of healthy lifestyles to health;
- To create motivation for change from current eating practices to the desired ones;
- To improve self-esteem, self-locus of control, and self-efficacy for forming an intention to change by building theoretical skills for producing, buying, preparing and serving food according to FGP, FBDG and including the other selected foods; and
- To improve individual self-efficacy for building healthy lifestyles.

Step 3.2: Programme content

Step 3.2.1 The FGP adapted from Whitney and Rolfes (2005) was used (Contributions from participants about what they usually consumed are also included).

Food Group: breads, cereals and other grain products

Servings per day: 6-11 (I serving = 1 slice of bread, papa, half a cup rice, pasta etc.)

Composition (in descending order of nutrient density):

- Whole grains (e.g., wheat, oats, barley, millet, rye), enriched breads, rolls, cereals, rice, pastas, air popped corns, enriched and less refined papa, sorghum-soft porridge and samp;

- Participants also ate stiff corn porridge (*papa ea mabele*) (believed by participants to relieve diabetes), and a mixture of bran and wheat;
- Other traditional grain foods participants consumed consisted of cooked corn, cooked maize mixed or unmixed with beans, roasted maize, corn-on-cob (*likhobe, maqoachane, lits'ifa tsa poone ea lehoetla*), wheat cooked – mixed or unmixed with beans (*likhobe tsa koro*), maize cooked and roasted (*sebera*), remnants from making traditional beer (*Joala*) such as (*moroko, setoto*) and other traditional dishes such as (*senyaka-mahloana, maqoachane*) (these are unrefined and minimally refined grain products);
  - Participants also ate fat cakes (*makoenya*), sandwich and pizza;
  - Pancakes, muffins, cornbread, crackers, cookies, biscuits, French toast, pre-sweetened cereals; and
  - Croissants, fried rice, doughnuts, pastries, cakes and pies.

Nutrients: source of energy, important minerals, and fibre.

Food Group: Vegetable

Servings per day: 3-5 (I serving = half a cup)

Composition: (in descending order of nutrient density)

- Bean sprouts, broccoli, Brussels sprouts, carrots, cauliflower, corn, cucumbers, eggplant, green beans, green peas, leafy greens (spinach, pumpkin leaves (lihaba [lepu when mixed with baby marrows]), turnip, some indigenous food plants), legumes, lettuce, mushrooms, onions, sweet potatoes, tomatoes, winter squash, indigenous food plants (including, *tenane, moetse-oa-pere, mankiling, bobatsi, leharasoane, lintlhokojane, semetsing, papasane, leshoabe, qhela, hatlane, fukuthoane and moetse-oa-pere*), cabbage, *lithotse tsa mokopu* (pumpkin seeds), baby marrows, mixed vegetables, perm, Chinese cabbage and beetroot;
- *Moroho*, green leafy vegetables (usually cooked cabbage, spinach, wild growing vegetables, pumpkin leaves etc.); and

- Potato salad or mashed.

Nutrients: important source of vitamins and minerals and fibre, low in fat and cholesterol.

Food Group: Fruits

Servings per day: 2-4 (1 serving = 1 medium fruit, half a cup of juice or stewed fruit).

Composition (in descending order of nutrient density):

- Apples, apricots, bananas, blueberries, grapefruit, guava, kiwi, oranges, papaya, peaches, pears, pineapples, plums, strawberries, watermelon, unsweetened juices; *garanade*, quince, *torofeiee* (pickle pear), *moroboi, liponaponana, limomonane, lints'onts'o, monokotso'ai* (wild and domesticated straw-berries and other wild berries), litchi, *nartjies*;
- Canned or frozen fruit (in syrup), sweetened juices, dried fruit (e.g., *mangangajane*) and commercial dried fruits, coconut, avocados, olives; and
- Fruit drinks, punches, that contain little juice and lots of added sugar.

Nutrients: important source of vitamins and minerals, fibre, low in sodium (salt), fat and cholesterol.

Food Group: Meat, poultry, fish, legumes, eggs and nuts group

Servings per day: 2-3 (1 serving = 1 medium portion, half a cup beans etc., special considerations such as eggs were observed [refer to FBDG in section 3.2.2])

Composition (in descending order of nutrient density):

- Poultry (light meat, no skin), fish, shellfish, legumes, egg whites;
- Lean meat (fat-trimmed beef, lamb, pork), poultry (dark meat, no skin), ham, refried beans, whole eggs, tofu, peanut butter, nuts;
- Hot dogs, luncheon meats, ground beef, sausage, bacon, fried fish or poultry, duck; and

- Other meats participants ate such as donkey meat, horse meat, rabbit, rat and cat meat, tinned beef, baked beans, chicken feet, feet (*litlhakoana*) and heads of cow, pig and sheep. Ostrich and turkey.

Nutrients: Meat, poultry, and fish: protein and other important vitamins and minerals;
Legumes: protein, fibre, important minerals, low in fat and cholesterol.

Food Group: Milk, cheese, and yoghurt

Servings per day: 2-3

Composition (in descending order of nutrient density):

- Fat-free and 1% low fat milk (and fat-free products such as buttermilk, cottage cheese, cheese, yoghurt), fortified soy milk;
- 2% reduced milk (and low fat products such as yoghurt, cheese, cottage cheese), chocolate milk, sherbet, ice milk;
- Whole milk and (whole milk products such as cheese, yoghurt), custard, milk shakes, pudding, ice cream; and
- Other milk and milk product types: sour milk, cake and *lehala* (soft porridge cooked with milk).

Nutrients: Calcium, protein, other important vitamins and minerals.

Food group: Fats, sweets, alcohol beverages

Servings: use sparingly

Composition:

- Foods high in fats such as margarine, salad dressing, oils, lard, mayonnaise, sour cream; cream cheese, butter, gravy, sauces, potato chips, chocolate;
- Other fats that participants consumed include pork and beef fat;

- Foods high in sugar such as cakes, pies, cookies, doughnuts, sweet rolls, candy, soft drinks, fruit drinks, jelly, syrup, gelatin, desserts, sugar and honey; and
- Alcohol beverages such as wine, beer, and liquor.

Nutrients: Excess energy (sugar, fat, and alcohol), contain very few other nutrients.

Step 3.2.2: SAFBDG (contributions from participants are also included):

Enjoy a variety of food (Maunder *et al.*, 2001: 7): Variety of food in this intervention means eating three different types of foods per day from each of the five food groups as determined by the FGP;

Be active: Encourage participants to engage in moderate to vigorous physical activity of 30 minutes three or more days of the week (Lambert *et al*, 2001: 12);

Physical activities including gardening, cleaning the house, brisk walking, jogging, cycling, stretching, aerobics, netball and swimming three or more days of the week. Activities added by participants included cleaning the surroundings, pushing the wheel burrow, climbing mountains to gather wood, hoeing the fields and running after animals;

Make starchy food the basis of most meals (Vorster & Nell, 2001: 24): Encourage participants to eat unrefined or minimally processed as well as fortified cereals and grains every day (refer to FGP: the grains group);

Eat plenty of fruit and vegetables every day (Love & Sayed, 2001: 24): Encourage participants to eat not less than five servings of vegetable and fruit every day, using the FGP as a guide for selection of the fruits and vegetables;

Eat dry beans, peas, lentils and soy regularly (Venter & Eyssen, 2001: 37): Encourage participants to eat dry beans or peas or lentils or soy every day for reasons explained in the FGP above;

Meat, fish, chicken, milk and eggs can be eaten every day (Scholtz *et al.*, 2001: 46): Encourage participants to eat two servings of milk per day, about four eggs per week and two to three servings of fish per week. Although two portions of meat per day are recommended, due to considerations of affordability, participants are encouraged to eat meat in moderation, as long as they meet the requirements for this group when counted together;

Eating these foods interchangeably on different days reduces the difficulty of relatively achieving this kind of eating. Awareness that one could have different types of food on the plate at any one meal made it affordable to include some kind of the meat group on the plate every day;

Eat fats sparingly (Wolmarans & Oosthuizen, 2001: 54): Educate participants about the necessity of reducing saturated fat in their diet by eating low fat products from non-animal fat including soft margarine and vegetable oils. Highlight the effects on health, particularly on cardiovascular disease of saturated fat, demonstrating the damage on the coronary artery walls leading to various coronary artery diseases;

Eat salt sparingly (Charlton & Jooste, 2001: 63): The recommendation is to prepare meals with reduced salt and not to add salt to food at the table. Educate participants about the negative effects of excessive salt on health. For example that excessive salt intake is a risk factor for high blood pressure (Couch & Krummel, 2008: 872) which in turn is a major risk factor for stroke, heart disease and atherosclerosis (Sarafino, 1994: 438);

Drink lots of clean safe water (Bourne & Seager, 2001: 69): Educate participants about the importance and necessity of drinking water as well as beverages made using tap water amounting to 2 litres or 8 glasses in all per day. These include tap water, beverages such as tea and coffee and other drinks made using tap water. Water makes up the bulk of the body weight, rehydrates the body and maintains various body functions (Charney, 2008: 148); and

If you drink alcohol, drink safely (Van Heerden & Parry, 2001: 73): Educate participants about the effects of heavy alcohol intake, including heart disease, some cancers and that alcohol abuse also damages the brain cells, impairs memory and perception and promotes irresponsible social behaviour in general (Hoeger & Hoeger, 2011: 360; Sarafino, 1994: 227). Advise participants to drink moderately if at all, (0-2 units per day for women, with at least two alcohol free days per week). Highlight the necessity to avoid binge alcohol drinking which involves drinking 3 or more standard drinks per week.

Step 4: Theory based aims and objectives of the intervention: should be based on each potential psychosocial determinant (which in this case were selected on the basis of the literature review)

Step 4.1: Potential psychosocial determinants (selected in step 2)

Educational objectives for each selected potential psychosocial determinants included:

Step 4.1.1: Knowledge: were determined by whether at the end of the nutrition education participants were able to:

- Identify the food groups that make up FGP and list the foods that could fall under FBDG;
- Show the number of servings required from each food group;
- Identify the most basic nutrients derived from each food group;
- Identify refined and unrefined grain products;
- Identify fruits and vegetables that are rich in vitamins and minerals (especially vitamin A and C);
- Identify sources of saturated fatty acids (SFAs);
- Identify sources of monounsaturated fatty acids (MUFAs);
- Identify foods and drinks containing sugar;
- Appreciate the importance of drinking 8 glasses of water per day;
- Appreciate the importance of eating a variety of foods;
- Indicate the dangers of high intake of salt;
- Describe at least three consequences of: sedentary lifestyles, heavy alcohol intake, smoking, caffeinated tea/coffee with meals; and
- Integrate indigenous vegetables and fruits into the fruit and vegetable groups; and Identify milk as a source of calcium.

Step 4.1.2 Beliefs, attitudes, practices and lifestyles:

Assist participants to be more self-aware and be able to assess whether they are vulnerable to disease threat:

Step 4.1.2.1: At the end of the educational programme, participants should be able to:

- Analyse their own nutrition and related behaviour through self-assessment;
- Describe their perception of personal vulnerability as compared to the recommendations; and
- Evaluate their perception of personal threat as compared to recommendations.

Step 4.1.3: Identify costs and benefits – to reduce perception of barriers and increase perception of benefits

Participants were able to:

- Identify specific barriers/cons/costs to eating a healthy diet (e.g., unavailability, lack of money, lack of land (gardens), time, cost, distance, lack of knowledge, lack of motivation); and
- Identify benefits (outcome expectancies) (e.g., short-term benefits such as positive feelings of wellness brought about by physical activity and eating recommended foods)
- Devise ways of dealing with the barriers (e.g. home gardens, plan meals, budget etc.)

Step 4.1.4: Personal control/internal-external locus of control/social norms and cultures

Participants were able to:

- Express their feelings of personal power/control over the barriers to taking recommended action (the feeling that they had acquired knowledge required to overcome the barriers and take control of their own health);

- Express whether they believe that their own health was in the hands of chance/fate/luck/witchcraft (external locus of control) or whether they believed that their own health was in their own hands (internal locus of control); and
- Express perceptions of social norms and cultures that promote or inhibit performance of recommended action, e.g., the role played by friends, husband, family, in influencing whether or not to take recommended action.

Step 4.1.5: Outcome expectancies/benefits/rewards/pros

Participants were able to:

- State short and long term benefits of a balanced diet; and
- Describe their planned coping strategies with the taste of food prepared in recommended ways, e.g., low fat meat, white meat, etc., (e.g., acquiring the taste with time, combining fruits/vegetables in a fruit salad, by comparing taste with benefits, using spices and lean sauces).

Step 4.1.6: Practices: Action

Demonstration of self-efficacy, setting goals, demonstrating intention to act

Participants were able to demonstrate ability to:

Describe their own beliefs in their own self-efficacy in achieving a balanced diet every day/week. For example:

- Compile a budget for food;
- Make decisions according to the FGP and SAFBDG and according to the options available to them, what they were going to buy and prepare for a day/week;
- Prepare simple salad dishes with as much variety of type and colour (yellow and green emphasized) as possible and refrigerate (where possible) for inclusion in as many meals;
- Plan ahead of time how balance was going to be achieved throughout the week;

- Put the FGP and FBDG up on the wall of kitchen for reference and planning through role play; and
- Prepare less saturated and more unsaturated fatty acids meals (lean meat, white meat, vegetable oils, fish etc.) through role play.

Step 4.1.7: Motivation

- Participants express motivation to change their food habits, physical activity, and smoking/taking snuff.

Step 5: Decide strategies, methods and activities for achieving the aims and objectives for each selected personal psychosocial determinants (educational activities/learning experiences).

This part was informed by Contento (2007: 304-333); Elder *et al*. (1999: 275-278); Katz (2000: 303); Ewles and Simnett (1998: 135-138) and Wing *et al*. (2001: 650-652).

Step 5.1: Strategies: an intervention should use strategies. The following strategies were used during this intervention:

- Provide Basic facts about FGP, FBDG and selected nutrients and lifestyles: To increase knowledge of the link between diet and health in order to create motivation to change;
- Provide information to increase participants' self-awareness, perception of personal risk/threat/vulnerability and promote active contemplation to change;
- Cultivate an internal locus of control, personal control and belief in personal power over the barriers to change;
- Facilitate commitment to taking action – develop 'cognitive' and 'affective' skills to increase self-efficacy, build self-esteem, build perception of personal control and power, motivate progression from contemplation to preparation and action (readiness to change);
- Motivate intention, preparation and ability to act: develop 'cognitive' skills to set targets and evaluate progress, draw implementation plans; and

- Facilitate development of coping strategies - for maintenance of the new behaviour: to increase social support through support groups.

Step 5.2: Methods and activities:

- 'Facilitated' group discussions (self-awareness/self-assessment exercises, sharing experiences, small group discussions); the researcher was the main facilitator, research assistants assisted in monitoring of the group discussions; and
- Participatory small lectures (questioning, role playing, brain-storming, practicing skills).

Step 6: Identify resources

- Resources were identified (see acknowledgements page) and accessed to provide for this intervention the following:
- Transport;
- Flip charts, pictures (photocopies of FGP);
- Per diem for research assistants;
- Snacks for participants; and
- Photocopies (consent forms, information documents.

Step 7: Plan evaluation methods

Evaluation methods were be planned in advance. Evaluation of the effectiveness of this intervention was done through a pre-test, post-test study design. The impact of the intervention on anthropometric variables, health and nutrition information, food intake and nutrition-related knowledge, attitudes, beliefs, practices and lifestyles were determined.

Step 8: Set an action plan; the researcher did the following:

- Selected field workers (three field workers were selected);
- Trained field workers (three field workers were trained);
- Planned a training programme according to objectives (programme was drawn); and
- Other details were followed according to procedures of the study (Section 3.7).

Step 9: Implementation of the nutrition education intervention

After requirements for implementation, both within the study and outside (approval by relevant authorities) had been met, the intervention was implemented as follows:

Step 9.1: Provided basic facts about FGP, SAFBDG and selected foods and lifestyles:

To increase knowledge of the link between diet and health in order to create motivation to change:

The researcher gave an overview of the FGP, FBDG and other selected components to participants. Flip charts were used to build, analyse and discuss the FGP and FBDG.

The researcher provided educational facts on the importance of nutrition and physical activity to preventing disease, promoting and protecting health and generally improving the feeling of health and well-being. The contribution made by each one of the food groups and the other selected foods in the body and some deficiency/excess diseases caused by under or over taking of some foods were discussed. Education was provided through a participatory approach (hands-on experience) in which participants, through 'facilitated discussion' with the researcher, built the FGP on a flip chart and listed all of the SAFBDG and the selected foods and lifestyles. This process was intended to increase knowledge, dispel myths and misconceptions about food and its role in the body as well as increase motivation.

Step 9.2: Provide information to increase participants' self-awareness, perception of risk/threat/vulnerability and promote active contemplation to change

The researcher adopted a model of 'self-empowerment' as described by Ewles and Simnett (1998:135-138) and Wing *et al.* (2001: 650-652) which bases the process on two basic principles of 'experiential learning' which they call 'self-awareness' and 'changing behaviour'. This process identified at least five stages of helping people to make healthy choices. These are: self-awareness/self-assessment, self-monitoring, identifying costs, benefits and rewards, setting targets and evaluating progress, and devising coping strategies.

Step 9.2.1: Self-awareness/self-assessment

Through the process of self-awareness/self-assessment, strong points/assets that participants already possessed were identified, for example, what they were already eating according to the recommendations. Participants were assisted to analyse their own diet and related lifestyle behaviours through self-assessment. Using the flip chart, participants participated in completing the following table of what they ate and did the previous day:

Table 3.8: Food Diary (adapted with modifications from Jones and Byrne [1993: 18-19])

Meal	Type of food	Specific description	size of portion	Type of cooking	Comments
Breakfast					
Morning snack					
Lunch					
Afternoon snack					
Dinner					
Evening snack					
Alcohol					
Smoking/taking snuff					
Physical activity					
Water intake					

After completing this table, participants did the following:

- compared their eating with the recommendations of the FGP and SAFBDG;
- Drew their ideal food diary/ meal plan following what they learnt from the FGP and SAFBDG based on what they had and what was affordable;
- Described and evaluate their perception of personal vulnerability based on what they were usually eating as compared to the recommendations;
- Formed an intention to adopt eating according to recommendations of the FGP and SAFBDG by making a decision to use the food diary method as a daily reminder; and
- Through this process, participants identified gaps (e.g., don’t eat breakfast).

Step 9.2.2: Assessment of risk/threat/vulnerability

- Participants assessed their own personal risk/threat/vulnerability by comparing their current food habits with the recommendations; and
- A short group discussion was held where participants shared their own (family/relatives) experiences with chronic illnesses such as diabetes, cancer, heart disease etc., and if diet management was used to mediate the impact of the diseases. This process would continue to create contemplation and motivation to change nutrition-related behaviour.

Step 9.2.3: Barriers/cons/costs

(Methods used: brainstorming, group work)

Participants did the following:

- Brainstormed barriers to achieving a balanced diet (e.g., unavailability, lack of money, lack of land (gardens), time, cost, distance, lack of knowledge, lack of motivation);
- They discussed barriers to physical activity (e.g., time, lack of motivation, lack of knowledge, lack of facilities);
- Identified barriers to performing the other selected lifestyle behaviours (alcohol and smoking/ taking snuff); and
- Discussed ways of dealing with the barriers in small groups and gave feedback in plenary sessions (e.g. home gardens, for those who did not have big spaces to create the newly recommended plot types [pin holes]) to grow different types of vegetables, to plan meals according to what they had, make a time-table of what the family was going to eat throughout the week, drew a weekly and monthly budget for food, made a list of foods needed, made the whole exercise fun)!

This part intended to create awareness of barriers to performing healthy behaviours such as eating a balanced diet, not smoking, not drinking or drinking moderately in order to reduce perception of barriers.

Step 9.2.4: Pros/benefits/rewards/outcome expectancies

Participants:

- Expressed beliefs in self-efficacy brought about by successfully performing the recommended actions of e.g., planned grocery shopping, planned preparation of meals and snacks as recommended;
- Identified short and long-term benefits (e.g., improved appetite, good health, longevity, prevention and protection from diseases, desirable weight/posture, general feeling of wellbeing, improved nutritional and health status);
- Described short and long term benefits of physical activity, stop smoking, moderate and alcohol intake (e.g., feeling well, good skin, reduce weight, like oneself!); and
- Shared their own personal experiences in successfully performing the actions before.

This part intended to create awareness of benefits of eating a balanced diet and leading a healthy lifestye in order to increase perception of benefits of performing healthy behaviours.

Step 9.2.5: Cultivate an internal locus of control, personal control and beliefs in personal power over the barriers to change

Personal control/internal-external locus of control/social norms and cultures; participants did the following:

- Were guided through questions to express how they felt regarding personal control, internal or external locus of control;
- Formed small groups in which they analysed and argued beliefs related to food preferences (taste), attitudes they had towards food and the influence from important others, cultures and norms (such as their likes and dislikes, acquiring the desired taste overtime, influences from family members, friends) and discussed and suggested ways of overcoming these;

- Expressed their feelings of personal power/control over the barriers to eating according to recommendations (the feeling that they had acquired knowledge required to overcome the barriers and take control of their own health);
- Expressed their belief that their own health was not in the hands of chance/fate/luck/witchcraft (external locus of control), express their believe that their own health was in their own hands through eating according the recommendations (internal locus of control);
- Identified how to deal with social norms and cultures that promoted or inhibited eating according to recommendations, e.g., the role played by husband, relatives, in influencing whether or not to eat according to recommendations (for example, involving family members in decision-making about food, e.g., drawing a budget together, making the new changes beneficial to the whole family in terms of eating a balanced diet, understanding and discussing together why a high value should be placed on food); and
- Gave feedback in a plenary session.

Step 9.2.6: Facilitate commitment to taking action

This part was intended to develop cognitive and affective skills to increase self-efficacy, build perception of personal control and power and motivated progression from contemplation to preparation and action (readiness to change).

Self-monitoring was the main focus of this part of the session: Participants continued to use the food diary table and recorded the following: keeping detailed diaries of the behaviour to be changed, for example, participants asked themselves questions such as:

- What are the present eating practices that need to be changed?
- How frequently do they occur? For example how often do I eat these or not? (e.g., sugary drinks and snacks, sweets, Russian sausage, saturated meat fat, big portions of *papa,* binge alcohol intake, smoking/taking snuff, lack of physical activity);

- When it happens what else is going on in the environment (what pressures from friends – socializing, relatives – wanting to eat differently, community - what are the norms? What products? Availability? Number of people living in the house?);
- What else is happening internally (thoughts and feelings – stress, anger, depression) (do you ever ask yourself why you eat like that or why you do the things you do, e.g., smoke, drink alcohol or if you should do things differently)?
- What events lead up to the practice (e.g., eating unwanted/unplanned foods, not eating breakfast, drinking alcohol, smoking, not engaging in physical activity)?
- What are the most difficult ways of eating patterns/habits to change?
- What plans to put in place to counteract pressures/influences to perform unwanted behaviours?

Participants gave feedback to the group and discussed in a brainstorming session easy ways in which they could perform new behaviours. Participants who tried and succeeded before were allowed to share their experiences (e.g., salt reduction, saturated fat reduction – especially with big families where food needs to be diluted in order to be enough).

Participants made a commitment to perform this exercise to self-observe and self-evaluate beyond this workshop, e.g., ask: 'what am I going to do after this workshop?' (To be followed up by group leaders identified by the group members themselves).

Step 9.2.7: Motivate intention, preparation and ability to act: Provide 'cognitive' skills to set targets (e.g., each day, week, and month), and evaluate progress (food diaries), draw implementation plans (e.g., where to start)

This part intended to:

- Improve self-efficacy (confidence boosted by the acquired knowledge and skills); and to motivate progression from contemplation to preparation and eventually to action; as well as facilitate an empowerment process and movement towards perception of personal power and control (internal locus of control);

- Increase beliefs in self-efficacy, weigh pros and cons, make decisions, set goals of when and how they intend to take action, draw a budget, draw a shopping programme and list, describe beliefs in self-efficacy (e.g. 'I can'); and
- Guide participants to set small, achievable targets and through verbal and written instruction were guided to perform all or some of the following:

Step 9.2.7.1: Regarding food:

- Compile a budget for food (methods used: role playing, demonstration, drawing, describing, group work);
- Decide when this can be implemented;
- Make plans according to the FGP and FBDG and according to the options available to them what they are going to buy (write on flip charts, describe);
- Divide it into long-term (e.g., maize meal, rice, pasta, flour) and short-term food needs (e.g., perishables such as fruits and vegetables, milk, meat etc.);
- Start working up the FGP, balancing as much possible;
- Make plans of what is to be eaten each day;
- Increase the balance each day, making as much from the FGP as possible;
- Refrigerate some left over foods where possible to reduce preparation time;
- Prepare simple salad dishes with as much variety of type and colour (yellow and green emphasized) as possible and refrigerate for inclusion in as many meals (prepare imaginary salad dishes and compare notes in plenary)
- Plan ahead of time how balance is going to be achieved throughout the week (draw plans and share in plenary sessions);
- Put the FGP and FBDG up on the wall of kitchen for reference and planning;
- Make own food policies;
- Prepare less saturated and more unsaturated fatty acids (lean meat, white meat, vegetable oils, canola oil, olive oil, fish) (describe composition of lean meat, vegetable oils);

- Start each day, each week.

Step 9.2.7.2: Physical activity (exercise):

- Start with short, five minute walks, then increase intensity and length gradually;
- Physical activity can include gardening, cleaning the house, jogging, cycling, aerobics, etc.; and
- Join groups where possible, who are trying to make similar changes for support and fun!

Step 9.2.7.3: Alcohol and smoking:

- Reduce one per day/per week (make own decision, how much/many you want to reduce and whether by day/week).

Step 9.2.7.4: Caffeinated tea/coffee:

- Reduce the number of cups per day; and
- Drink after one hour of meals or drink caffeine free tea (Rooibos).

Step 9.2.8: Facilitate development of coping strategies (for maintenance of the new behaviour), to increase social support through support groups

Step 9.2.8.1: Coping with change is not easy; it needs a lot of psyching up to do. It needs social support from family and friends to help cope with the new behaviours:

- Encourage support groups;
- Make the changes enjoyable;
- Exchange healthy but tasty recipes;
- Preparing meals for a family can be fun, enjoy it, do not make it a difficult task, be creative about it;
- Plan it in advance;
- Keep busy, keep home gardens, rear chicken for eggs and meat, rear pigs etc.;

- Form support groups (stokvels) to boost each other in turns to set up these small projects; and
- Help each other deal with relapse.

Step 9.2.8.2: Coping skills for taste

- Participants described their planned coping strategies with the taste of food prepared in recommended ways, e.g., low fat meat, white meat, etc., (e.g., acquiring the taste with time, combining fruits/vegetables in a fruit salad, by comparing taste with benefits, using spices and lean sauces).

Step 9.2.8.3: Coping with relapses/setbacks

- To be taken as learning experiences; and
- Try again and again, do not despair

3.10 Statistical analysis

The initial assessment and post assessment were described by means of descriptive statistics, namely frequencies and percentages for categorical data and means and standard deviations or percentiles for continuous data, calculated per strata. The change from initial to post assessment were calculated per strata and compared by means of 95% confidence intervals. Reliability analysis was calculated as follows: the two questionnaires were compared and if an answer to a question differed by more than 20% the question was deemed unreliable and was excluded from the analysis.

Chapter Four: Results

4.1 Introduction

This chapter presents results of an intervention study that was carried out to evaluate the impact of a nutrition education intervention on nutritional status and nutrition-related knowledge, attitudes, beliefs and practices of women in urban and rural areas in Lesotho. Interviews were conducted one on one with women between the ages of 19 to 60 years in each household. This was with an understanding that these women were responsible for decision-making about what was eaten in their families.

Results pertaining to response rate, reliability, socio-demographic profiles, anthropometry, health status, usual food intake, nutrition-related knowledge, attitudes, beliefs and practices including eating habits and lifestyles of participants; as well as the motivation of participants to change in the control (C) and experimental (E) groups before and after intervention will be described. The change from pre-to-post intervention will also be described.

4.2 Response rate

Table 4.1 shows the response rate per questionnaire. The numbers differ due to the fact that some participants did not complete the interview for all four sets of questionnaires namely, socio-demographic questionnaire, anthropometry, FFQ and KABP. Initially it was planned to include 150 participants in the control and 150 in the experimental groups. In the baseline survey more than these were included (to compensate for drop outs) and this is the reason that the percentages for baseline are higher than 100%. Some were not available to complete the post-intervention questionnaires in both the control (C) and experimental (E) areas.

The socio-demographic questionnaire was administered only at baseline, and according to Table 4.1, a total of 453 (more than the planned 300; this was allowed to provide contingency for drop-out) participants were interviewed. In the same baseline phase, 451 participants completed anthropometric measurements and the health and information questionnaire (C = 137.3%; E = 163.3%). The FFQ was completed for a total of 450 participants (C = 137.3% E = 162.6%). A total of 444 participants completed the KABP questionnaire (C = 133.3%; E = 162.6%).

After intervention, a total of 259 participants (C =70.0%; E = 102.6%) completed the health and information questionnaire, and anthropometric measurements. The FFQ was completed by a total of 260 participants (C =70.6%; E = 102.6%) and the KABP was completed by a total of 260 participants (C =70.0%; E = 103.3%).

Two hundred and four (187) participants resided in an urban area, 71 of which were in the control group while 116 were in the experimental group. Two hundred and forty (240) participants resided in a rural area, with 133 and 124 participants being in the control and experimental groups respectively.

The number of participants differed for various variables due to missing values (in some questionnaires some questions were not answered).

Table 4.1: Response rate

Questionnaire	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	n	%	n	%	n	%	n	%
Socio	206	137.3	245	163.3				
Anthropometry and health	206	137.3	245	163.3	105	70.0	154	102.6
FFQ	206	137.3	244	162.6	106	70.6	154	102.6
KABP	200	133.3	244	162.6	105	70.0	155	103.3
Urban and Rural Residence								
Urban	71		116					
Rural	133		124					

4.3 Reliability

To ascertain reliability, the questionnaires were administered to 10% of randomly selected participants a second time one month after the study. Where more than 20% of answers differed between the initial reliability survey, the question was considered unreliable and the results not reported.

The second time around, more than 20% differences in responses from the initial survey were found for the following questions: the occurrence of vomiting and persistent headache, intake of white rice, sour porridge, lettuce, onion, turnip, apricot, banana, grapes, oranges, peaches, pear, strawberry, pork, number of tea/coffee cups, number of eggs per day, sugary snacks, stop drinking alcohol and stop smoking/taking snuff.

Some items that were found unreliable as listed above have been excluded from the results. It was noted that seasonal variability may have affected reliability of some responses, for example, it may have been difficult for people to indicate how many times a day they ate peaches as they are in and out of season. As a result, concessions were made to include results related to fruits and vegetable consumption in the results.

4.4 Socio-demographic profile

Socio-demographic profiles including educational level, location, language spoken, type and availability of services, employment status, type and status of dwelling and total income are described in Table 4.2.

In the control group, the median age of participants was 41 years (range 19-60 years); while in the experimental group it was 45 years. The minimum age was 20 years and 19 years in the control and experimental groups respectively, while the maximum age was 60 years in both groups. The youngest age (less than 25) and the oldest age (between 50 and 60) were the least represented, at about 10% of participants. Representation was almost evenly balanced among the other age groups.

The majority of participants had primary school education (C =54.4%; E = 47.9%). Higher secondary education (Form D-E) and tertiary education were the least represented.

There were fewer urban (C = 34.8%; E = 48.3%) than rural participants (C = 65.2%; E = 51.7%). The majority of participants did not speak English or any other language other than Sesotho (C = 69.4%; E = 63.0%). The predominant marriage was the traditional one where no courts or church were involved (C = 46.8%; E = 47.9%).

Most participants were house wives (C = 54.6%; E = 45.9%). Few participants were employed (C = 18.8%; E = 24.4%), self-employed (C = 11.6%; E = 12.6%), engaged in subsistence farming (C = 1.9%; E = 1.6%) or had a part-time/piece job (C = 6.8%; E = 3.7%).

The majority of participants had a house (C = 78.3%; E = 87.0%) although very few participants had a bathroom in the house (C =15.5%; E = 26.5%), and fewer still had their own water tap (C =27.8%; E = 28.5%), with the predominant access to water being a communal tap (C = 63.9%; E = 57.3%). The median room density was 0.3 and 0.4 (with a range of 1 to 11 people living in a household) in the control and experimental groups respectively. Almost everyone had a kitchen/place for cooking (C = 83.5%; E = 81.3%) on which some used open fire (cow dung, maize sticks, wood) as fuel (C = 29.3%; E = 23.0%), using a cast iron pot (C =57.8%; E = 48.6%) with the majority using it on a daily basis (C = 79.3%; E = 68.9%).

Few participants had electricity (C = 31.6%; E = 45.1%) and many participants still predominantly used pit latrine (C = 61.7%; E =56.7%) with water system and VIP types being the least used.

The majority of participants had one member of the family employed (C = 71. 4%; E = 63.1%) with 33.3% in the control group and 24.4% in the experimental group reporting a monthly family income of between R100 and R500.

Table 4.2: Socio-demographic profiles

Profile	Control group n = 206		Experimental group n = 246	
Age groups (years)	N	%	N	%
<25	20	9.7	16	6.5
25 and < 30	31	15.1	36	14.6
30 and < 35	19	9.2	29	11.8
35 and < 40	25	12.1	18	7.3
40 and < 45	26	12.6	20	8.1
45 and <50	33	16.0	43	17.5
50 and <55	31	15.1	46	18.7
55 and <60	21	10.2	38	15.5
>60	1	0.5	6	2.5
Education				
Primary School	112	54.4	118	47.9
Form A-C	51	24.8	56	22.8
Form D-E	25	12.1	34	13.8
Tertiary	18	8.7	38	15.5
Location				
Urban residence(n = 204)	71	34.8	116	48.3
Rural residence (n = 240)	133	65.2	124	51.7
Language spoken				
Sesotho only	143	69.4	155	63.0
Sesotho and English	63	30.6	89	36.2
Marital status				
Magistrate/church	37	18.1	53	21.5
Never married	22	10.7	17	6.9
Traditional marriage	96	46.8	118	47.9
Separated	7	3.4	5	2.0
Divorced	4	1.9	7	2.9
Widowed	30	14.6	43	17.5
Stay together	0	0	3	1.22
Employment status				
House wife	113	54.6	113	45.9
Unemployed	30	14.5	45	18.3
Self-employed	24	11.6	31	12.6
Subsistence farmer	4	1.9	4	1.6
Employed	39	18.8	60	24.4
Part-time/piece job	14	6.8	9	3.7
Employment status of partner				
Pensioner	1	0.5	5	2.0
Unemployed	47	22.7	53	21.5
Self-employed	1	1.9	2	3.3
Subsistence farmer	1	1.9	0	0.0
Employed	1	1.9	2	3.3
Part-time/piece job	1	1.9	2	3.3
Deceased	31	59.6	41	68.3
Unmarried/singles	18	34.6	11	18.3

Table 4.2: Socio-demographic profiles (continued)

Profile	Control group n = 206		Experimental group n = 246	
	N	%	N	%
Type of dwelling				
Brick/stone	162	78.3	214	86.9
Mud	26	12.6	11	4.5
Shack/tin	1	1.9	8	3.9
Wood	0	0.0	0	0.0
In-law's house	8	3.9	7	2.9
No house	8	3.9	3	1.2
Rented house	0	0.0	6	2.4
Parents house	4	1.9	3	1.2
Government house	7	2.9	0	0.0
Ownership of:				
Bathroom	32	15.5	65	26.5
Kitchen	172	83.5	200	81.3
Electricity	67	32.5	112	45.9
Water access				
Own tap	57	27.8	70	28.5
Communal tap	131	63.9	141	57.3
*Combination	16	7.8	29	11.8
Buy water	1	0.5	5	2.0
Type of toilet				
Water system	17	8.3	34	13.8
Pit latrine	127	61.7	137	55.7
Bucket system	0	0.0	0	0.0
VIP	28	13.6	49	19.9
No toilet	33	16.0	24	9.8
Others	1	0.5	1	0.4
System of cooking				
Use cast iron pot	118	57.8	119	48.6
Do not use cast iron pot	85	41.7	126	51.4
Number of times iron pot used				
Once a week	7	6.0	5	4.3
Very few times	7	6.0	11	9.5
More than once a week	10	8.6	20	17.2
Every day	92	79.3	80	68.9

Table 4.2: Socio-demographic profiles (continued)

Profile	Control group n = 206		Experimental group n = 246	
	N	%	N	%
Ownership of/ Access to:				
Electricity	65	31.6	111	45.1
Stove (gas, etc.)	128	62.1	174	70.7
Paraffin stove	149	72.3	163	66.5
Type of fuel used				
Open fire (cow dung, maize sticks)	72	29.3	57	23.0
Gas/ electricity	18	8.7	34	13.8
Gas/electricity/paraffin	8	3.9	12	4.9
Gas/paraffin	32	15.5	30	12.2
Gas/paraffin/open fire	6	2.8	14	6.6
Ownership of:				
Refrigerator	65	31.6	111	45.1
Stove	128	62.1	174	70.7
Primus stove	149	72.3	163	66.5
Microwave	26	12.7	54	22.0
Radio	173	83.9	217	88.2
Television	94	45.6	112	54.4
Number employed in a household				
None	22	12.9	27	13.9
One	122	71.4	123	63.1
Two	26	15.2	40	20.5
Three and more	1	0.6	4	2.1
Don't know	0	0.0	1	0.5
None	31	15.2	44	17.89
Family income per month				
R100-R500	68	33.3	60	24.4
R501-R1000	33	16.2	41	16.7
R1001-R3000	25	12.3	39	15.9
R3001-R5000	13	6.4	12	4.9
Over R5000	12	5.9	24	9.8
Don't know	22	10.8	26	10.6

4.5 Anthropometric measures of nutritional status

Body Mass Index (BMI), waist circumference and triceps skin fold results will be described in this section.

4.5.1 Body Mass Index

The median BMI was at the top level of overweight (29kg/m^2) (range 15.1-57.2) and obese (30kg/m^2) (range 16.9-57.2) at baseline in the control and experimental groups respectively, and obese (30.18kg/m^2) (range 18.8-48.6) and overweight (29.5kg/m^2) (range 16.4-54.1) in the control and experimental groups respectively, after the intervention.

At baseline, there was no statistically significant difference in the BMIs of the experimental and control groups (95% confidence interval (CI) for the median difference [-2.26; 0.39]). Post-intervention, the median BMI in the control group had increased slightly, while that of the experimental group had decreased slightly. Despite this, the BMIs of the control and intervention groups still did not differ significantly after the intervention (95% CI for the median difference of [-1.79; 1.49]). BMI values of participants are indicated in Table 4.3.

Table4.3: Body Mass Index

BMI reference values (kg/m^2)	Pre-intervention				Post-intervention			
	Control n = 206		Experimental n = 245		Control n = 105		Experimental n = 154	
	N	%	N	%	N	%	N	%
<18,5	1	0.5	2	0.8	2	2	0	0
18.5-24.9	53	27.7	53	21.6	24	22.8	27	25.7
25.0-29.9	55	25.2	67	27.4	27	25.7	53	50.4
30.0-34.9	51	24.8	48	18.8	31	29.5	41	39.0
35.0-39.9	31	15.0	51	20.8	11	10.4	21	20.0
≥40	14	6.8	26	10.6	11	10.4	12	11.4
95%CI for med diff	[-2.26 ; 0.39] not significant				[-1.79; 1.49] not significant			

Table 4.4: BMI, WC, TSF medians

	Pre-intervention		Post-intervention	
	Control	**Experimental**	**Control**	**Experimental**
BMI	2kg/m^2 (range 15.1 – 57.2)	30kg/m^2 (range 16.9-57.2)	29.5kg/m^2 (range 18.8 -48.6)	29.5kg/m^2 (range 16.4-54.1)
WC	89cm (range 47cm– 136cm)	92cm (range 61cm – 127cm	90cm (range 52 cm– 122cm)	90cm (range 65cm – 120cm
TSF	96th percentile (range 16cm – 65cm)	96th percentile (range 14cm – 70cm)	96th percentile (range 25cm – 65cm)	96th percentile (range 15cm – 70cm)

4.5.2 Waist circumference

According to Table 4.5, before intervention, the median waist circumference was 89cm (range 47cm to 136cm) in the control group and 92cm (range 61cm to 127cm) in the experimental group. After intervention, the median waist circumference was 90cm in both the control (range 52cm-122cm) and experimental (range 65cm-120cm) groups. These measurements were above the recommended cut-off point of 88cm.

The median waist circumference in the control group increased with a median of 0.5cm (range -13.8cm to 6.0cm), while in the experimental group the median waist circumference decreased with a median of -2.0cm (range -22cm to 11.5cm). There was no significant change between the control group and the experimental group as indicated by the 95% confidence interval for the median difference [-2; 4] after the experimental group received nutrition education. The waist circumference measurements in the experimental group were still in the high risk category after the intervention.

Table 4.5: Waist circumference

	Waist circumference reference values	**Pre-intervention**				**Post-intervention**			
		Control n = 206		Experimental n = 245		Control n = 105		Experimental n = 154	
		n	%	n	%	n	%	n	%
Women	<88	59	28.6	56	22.9	16	15.0	12	11.4
	>88	39	18.9	48	20.0	9	8.5	11	10.4
	>88	107	52.4	141	57.6	24	22.8	24	28.8
95% CI for med diff		[-6 ; 0] not significant				[-2 ; 4] not significant			

4.5.3 Triceps

At baseline, the triceps percentile measurements fell above the 95th percentile in 66% of participants in the control group and in 70% of participants in the experimental group. After intervention, triceps percentile measurements that fell above the 95th percentile were seen in 70% of participants in the control group and 61% of participants in the experimental group.

Although just slight, the change between the groups was significant after intervention in which the fat percentages in the experimental group tended to decrease while the control group did not (95% confidence interval for the median difference [2; 7]). Table 4.6 shows percentiles of body fat as determined by triceps skin fold thickness.

Table 4.6: Percentiles of body fat as determined by triceps skin fold thickness

Triceps reference values	Pre-intervention				Post-intervention			
	Control n= 206		Experimental n= 243		Control n= 105		Experimental n=154	
The percentile values	N	%	N	%	N	%	N	%
5	0	0	1	1	0	0	0	0
10	0	0	1	1	0	0	2	1
15	0	0	2	1	0	0	0	0
25	9	4	2	1	3	3	4	3
50	24	12	21	9	10	10	10	7
75	18	9	16	7	10	10	20	13
85	8	4	11	5	5	5	9	6
90	9	4	6	2	3	3	8	5
95	2	1	13	5	1	1	7	5
96	136	66	170	70	73	70	94	61
95% CI for med diff	[-3 ; 1] not significant				[2 ; 7]* significant			

4. 6 Health status and use of supplements and botanicals

In this section, acute illnesses as well as chronic illnesses commonly suffered by the participants will be described (Tables 4.7 and 4.8). These were included in the second half of the anthropometry questionnaire (appendix B).

According to Table 4.7, in both control and experimental groups, a lack of appetite was experienced by a relatively large percentage of participants (C = 38.5%; E39.6%) at baseline. After intervention this had not changed in the control group, but had decreased to 5.8% in the experimental group after intervention. A similar trend was noticed with chest pain (C = 34.5%; E = 32.2%); (C = 39.1%; E = 13.0%); unexplained weight loss (C = 36.9%; E = 31.8%); (C = 35.2%; E = 5.2%); and painful joints (C= 34.0%; 36.7%); (C = 34.3%; E = 12.3%) with no changes in the control group while some changes occurred in the experimental group.

Table 4.7: Acute illnesses commonly suffered

	Pre-intervention				Post-intervention			
	Control n = 206		Experimental n = 245		control n=103		Experimental n = 154	
	N	%	N	%	N	%	N	%
Chest pain	71	34.5	79	32.2	41	39.1	20	12.9
Heavy breathing	44	21.4	54	22.0	29	27.6	10	6.5
Cough	19	9.2	30	12.2	12	11.4	9	5.8
Whistle	30	14.5	40	16.3	20	19.1	7	4.6
Diarrhoea	22	10.7	22	8.9	13	12.4	4	2.6
Vomiting	16	7.8	13	5.3	10	9.5	4	2.6
Lack of appetite	79	38.5	97	39.6	33	31.4	9	5.8
Unexplained loss of weight	79	36.9	78	31.8	37	35.2	8	5.2
Allergy	26	12.6	50	20.4	16	15.2	12	7.8
Painful joints	70	33.9	90	36.7	36	34.3	19	12.3
Sexually transmitted infections	25	12.2	25	10.2	17	16.2	3	1.9
Swollen feet	44	21.67	45	18.4	27	26.2	11	7.1

Table 4.8 presents results of chronic illnesses commonly suffered by the participants. According to this table, before intervention, high blood pressure was the only highly reported chronic illness according to Table 4.8 (C = 34%; E = 41%). After intervention the trend remained similar (C = 39%; E = 42%). Similarly, baseline trends for heart disease (C = 16%; E = 18%), weak heart (C = 14%; E = 17%), allergy (C = 12%; E = 21%) and HIV and AIDS (C = 12%; E = 12%) expectedly remained almost unchanged at baseline as well as after intervention. Diabetes was reported by a surprisingly low percentage of participants before and after intervention ([C = 5.8%; E = 19.8%; C = 6.7%; E = 11.0%]).

Table 4.8: Chronic illnesses

Chronic illness	Pre-intervention				Post-intervention			
	Control n = 206		Experimental n = 245		control n = 103		Experimental n = 154	
	yes	%	yes	%	yes	%	yes	%
Diabetes	12	5.8	24	19.8	7	6.7	17	11.0
High blood Pressure	70	33.9	100	40.8	41	39.1	65	42.2
Stroke	4	1.9	4	1.6	1	0.9	0	0.0
Heart disease	33	16.0	44	18.0	16	15.2	19	12.3
Weak heart	29	14.2	41	16.7	13	12.4	13	8.4
Cancer	1	0.5	3	1.2	1	0.9	0	0.0
Hepatitis B	2	0.9	7	2.9	1	0.9	1	0.9
Pneumonia	9	4.4	18	7.4	6	5.7	6	3.9
TB	20	9.7	22	8.9	9	8.6	10	6.5
HIV/AIDS	24	11.7	30	12.2	15	14.4	27	17.5
Epilepsy	0	0.0	11	4.5	0	0.0	1	0.0
Allergy	23	11.7	48	20.9	17	16.5	5	3.3

Although percentages reporting medication usage were low according to Table 4.9, the most commonly used western medicines were for hypertension (C =15.9%; E = 16.7%) at baseline. After intervention, the control group reported less use of hypertension medicines while the experimental group remained the same. The change in the control group could be due to a large dropout rate in this group in the second round of interviews. Other medications included medication for diabetes (pills and injection), Panado, ARV's, TB medication, anti-biotics, DPH syrup/cold medicine, Indocid/Brufen/Stop pain (unnamed painkillers), green tea, medication for the heart, iron tablets, allergex, herpes drugs and asthma treatment. Use of these did not change after intervention.

Table 4.9: Western medications commonly used

Name of medicine	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
High blood tablets	33	15.9	41	16.7	14	5.7	41	16.7
Diabetes medication (pills and injection)	8	3.9	12	4.9	5	2.0	12	4.9
Panado	5	2.4	4	1.6	4	1.6	4	1.6
ARV's	8	3.9	17	6.9	10	4.1	17	6.9
TB medication	5	2.4	6	2.4	5	2.0	6	2.4
Anti-biotics	1	0.5	1	0.4	1	0.4	1	0.4
DPH syrup/cold medicine	0	0.0	4	1.6	0	0.0	4	1.6
Indocid /brufen/ stop pain (unnamed painkillers)	10	4.8	10	4.1	10	4.1	10	4.1
Green tea	1	0.5	3	1.2	1	0.4	3	1.2
Medication for the heart	0	0.0	1	0.4	0	0.0	1	0.4
Iron tablets	1	0.5	1	0.4	1	0.4	1	0.4
Allergex	0	0.0	1	0.4	0	0.0	1	0.4
Herpes drugs	1	0.5	0	0.0	1	0.4	0	0.0
Asthma treatment	2	0.9	1	0.4	1	0.4	1	0.4

As indicated in Table 4.10, the most commonly used herbs were *hloenya, lengana, sehala-hala-sa-matlaka, lekhala-la Quthing, lekhalana/ mohalakane/seholobe and khomo-ea-balisa*. Use of these did not change after intervention.

Table 4.10: Traditional herbs commonly used

Name of herb	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Kholu	2	0.9	2	0.8	0	0.0	1	0.4
Mofere-fere	1	0.5	1	0.4	2	0.9	1	0.4
Mokoko oa lihlaba	6	2.9	1	0.4	1	0.5	1	0.4
Hloenya	53	25.6	48	19.5	23	11.1	22	8.9
Nyoponyopo	4	1.9	3	1.2	1	0.5	3	1.2
Lekhalana/ mohalakane/seholobe	33	15.9	44	17.9	13	6.3	19	7.7
Khomo ea balisa	16	7.7	22	8.9	5	2.4	4	1,6
Lekhala la Quthing	23	10.9	22	8.9	14	6.8	14	5.7
Lengana	23	10.9	19	7.8	4	1.9	3	1.2
Pitsa	1	0.5	1	0.4	2	0.9	3	1.2
Sehala-hala sa matlaka	23	11	26	10.6	10	4.8	14	5.7
Moroto oa lipela	1	0.5	0	0.0	1	0.5	0	00
Koena	4	1.9	4	1.6	1	0.5	4	1.6
Bleikomo	2	0.9	3	1.2	2	0.9	2	0.8
Mohale ha likoe	1	0.5	0	0.0	1	0.5	0	0.0
Bolila ba linonyana	1	0.5	0	0.0	0	0.0	2	0.8
Lithotse tsa mokopu	1	0.5	1	0.4	0	0.0	2	0.8
Anyanese (onion)	1	0.5	1	0.4	1	0.5	1	0.4
Qobo	5	2.4	4	1.6	3	1.4	2	0.8
Poho ts’ehla	5	2.4	3	1.2	1	0.5	1	0.4
Monyela-ntja	10	4.8	14	5.7	5	2.4	3	1.2
Mofifi, cheche	5	2.4	10	4.1	4	1.9	5	2.0
Labatheke	2	0.5	1	0.4	1	0.5	1	0.4
Khonathi	2	0.9	3	1.2	2	0.5	2	0.8
Setima-mollo	1	0.5	0	0.0	1	0.5	0	0.0
Khamane	1	0.5	0	0.0	0	0.0	2	0.8
Khoara	1	0.5	1	0.4	0	0.0	2	0.8
Phate ea ngaka	1	0.5	1	0.4	1	0.5	1	0.4
African potato	5	2.4	4	1.6	3	1.4	2	0.8
Tsoene ea thaba	5	2.4	3	1.2	1	0.5	1	0.4
Mofufutso oa pitsa	2	0.9	1	0.4	1	0.5	1	0.4
Moli	2	0.9	3	1.2	2	0.9	2	0.8
Makhapetla a liperekisi	1	0.5	0	0.0	1	0.5	0	0.0
Matlapa-tsoinyane	1	0.5	0	0.0	0	0.0	2	0.8
Kholu remedies	1	0.5	1	0.4	0	0.0	2	0.8
Lesoko	1	0.5	1	0.4	1	0.5	1	0.4
Ralikokotoana	9	4.3	4	1.6	3	1.4	2	0.8
Seletjana	5	2.4	3	1.2	1	0.5	1	0.4
Tsikitla	1	0.5	0	0.0	0	0.0	2	0.8
Qhaqholla – moriana oa nyoko	1	0.5	1	0.4	0	0.0	2	0.8
Hamore – moriana oa nyoko	1	0.5	1	0.4	1	0.5	1	0.4
Leihlo la khomo	5	2.4	3	1.2	1	0.5	1	0.4
Bohome ba lipoli	1	0.5	1	0.4	0	0.0	2	0.8
Qhibolla	1	0.5	1	0.4	1	0.5	1	0.4

At baseline, 28.2% of participants in the control group and 35.1% in the experimental group used supplements. As indicated in Table 4.11, the most commonly used supplements were multivitamins, vitamin C and B-complex. No significant change in supplement use occurred after intervention.

Table 4.11: Supplements commonly used

Use supplements	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Number of participants who used supplements	56	28.2	86	35.1	33	31.4	59	38.3
Name of supplement								
Multivitamins	18	32.1	34	37.8	12	41.4	20	35.7
Spirulina	0	0.0	2	2.2	0	0.0	2	3.6
Herbal life (shake + aloe) (aloe and thermo)	6	10.7	17	18.9	5	17.2	9	16.1
Ensure	0	0.0	1	2.2	0	0.0	1	1.8
Instant soya	3	8.9	4	4.4	3	10.3	1	1.8
Prosit/d	1	3.6	2	2.2	0	0.0	2	3.6
*Lerumo la mali	1	1.8	9	10.0	0	0.0	0	0.0
Tree –en-en	3	8.9	9	10.0	3	10.3	2	3.6
Omega 3	4	7.1	8	8.9	1	17.2	4	7.1
Vitamin c	4	7.1	6	6.7	3	10.3	3	5.4
B complex	15	26.8	25	27.8	8	27.6	17	30.4
GNLD (golden products)	4	7.1	6	6.7	6	6.7	4	7.1
Carotenoid complex	1	1.8	1	1.1	0	0.0	2	3.6
Immune boosters	1	1.8	5	5.6	5	5.6	5	8.9
Instant porridge, e-pap, lepopo (morvite)	8	14.3	6	6.7	6	6.7	6	10.7
Nutri – xx	1	1.8	4	4.4	4	4.4	4	7.1
Mix of life	2	3.6	1	1.1	2	6.9	1	1.8
Garlic	1	1.8	1	1.1	0	0.0	1	1.8
Calcium (cal – mag)	1	3.6	2	2.2	0	0.0	2	3.6
*Pitsa ea litutla	1	1.8	1	1.1	0	0.0	1	1.8

*Mixtures/concoctions so named, but not of Sesotho origin

Table 4.11: Supplements commonly used (continued)

Name of Supplement	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Number of participants who used supplements	56	28.2	86	35.1	33	31.4	59	38.3
ZCC tea	2	3.6	1	1.1	2	6.9	0	0.0
*Sebusiso	1	1.8	2	2.2	0	0.0	2	3.6
*Posamantla	1	1.8	0	0.0	0	0.0	1	1.8
Omega 6	1	1.8	2	2.	0	0.0	0	0.0
Stress mart	1	1.8	1	1.1	0	0.0	0	0.0
Energy booster	1	1.8	0	0.0	1	3.4	0	0.0
Gingseng (a Chinese product)	1	1.8	3	3.3	0	0.0	0	0.0
Tihanshi (a Chinese product)	4	7.1	1	1.1	0	0.0	0	0.0

4.7 Usual food intake

The usual food intake, including the types of foods usually consumed in the grains, vegetable, fruit, milk, meat and fats and oils groups are presented. Healthy change from pre to post intervention and the number of times these foods were eaten per day, are also reported. Comparisons are based on the recommendations of the FGP and SAFBDG including the types of foods usually consumed and the number of times they were eaten per day. Healthy change from pre to post intervention is also reported.

4.7.1 Usual food intake from the grains group

Table 4.12 presents the types and frequency of consumption of foods that were usually eaten by the Basotho in the breads, cereals, rice, pasta, and other grain products group.

At baseline, 206 control participants and 245 participants from the experimental group answered questions related to the intake of starchy foods. After intervention, 106 participants from the control group and 154 from the experimental group were available to answer these questions.

Before intervention, in the control group, 33.2% people ate *papa* (stiff maize meal/porridge made from chai or induna everyday, 18.1% ate it regularly and 25.9% ate it sometimes. In the experimental group 41.2% ate papa made from chai or induna every day, 24.1% ate it regularly and 18.8% ate it sometimes. Home-made papa was consumed by 33.3%, 22.1% and 21.1% eating it every day, regularly and sometimes respectively in the control group, while in the experimental group 18.8%, 22.5% and 27.4% ate it every day, regularly and sometimes respectively. Iwisa, white star and others of the refined group were consumed less.

An improvement was observed in the experimental group intake of papa made from *chai* and *induna* in which 53%, 44% and 2% ate *papa* every day, regularly and sometimes as compared to the pre-intervention control group intake in which 41% ate *papa* made from *chai* or *induna* every day, 24% ate it regularly and 19% ate it sometimes. The experimental group improved significantly (95% CI for the percentage difference [22.2; 37.0]) after the intervention as compared to the control group which showed no significant improvement (95% CI for the percentage difference [-3.3; 3.3]) in consumption of *papa* made from *induna* and *chai.*

In the control group only 2.9% of the participants ate white bread every day, 9.8% ate it regularly while 55.6% ate it sometimes. The experimental group was no different, with 1.2%, 13.1% and 41.6% eating it every day, regularly and sometimes respectively. Brown bread on the other hand was consumed more often, with 25.4%, 34.2% and 37.1% consuming it every day, regularly and sometimes respectively in the control group, while in the experimental group it was consumed by 33.1% everyday, 39.6% regularly and 22.5% sometimes. Whole wheat bread was eaten much less frequently.

Brown bread consumption improved in the experimental group with 62% of participants consuming it every day as compared to the control group where only 30% did. The change in the experimental group (95% CI for the percentage difference [7.7; 19.0) indicates a significant improvement after the intervention as compared to the control group (95% CI for the percentage difference [-1.8; 3.8]).

Corn flakes were eaten relatively (C=1.5%, 6.8% and 27.3%; E= 2.9%, 6.9%, 22.5%) every day, regularly and sometimes respectively). The other breakfast cereals such as all bran flakes, oats and wheat bix were eaten much less commonly, while muesli was the least consumed. A significant improvement in consumption of oats was evident after intervention in the experimental group (95% CI for the percentage difference [13.9; 28.2]) as compared to the control group (95% CI for the percentage difference [-3.0; 5.5]).

White rice responses were unreliable, so they are not reported. Brown rice was hardly consumed at baseline (C =0.9%, 0.9% and 7.3%; E = 0.4%, 2.5% and 11.4% every day, regularly and sometimes, respectively). There was no change in the consumption of brown rice within the experimental group after the intervention (95% CI for the percentage difference [-4.4; 4.4]).

Pasta, samp and cake were sometimes consumed by almost 64% of participants before and after intervention, while sorghum-soft porridge (*leshele-shele*) was regularly consumed by almost 40% of participants. Although the number of people who consumed corn flakes, pasta and sorghum soft porridge were few, there were some improvements in their consumption in the experimental group after the intervention. Consumption of sorghum soft porridge improved significantly (95% CI for the percentage difference [2.9; 15.4]).

Table 4.12: Intake of breads, cereals and other grain products

Name of Food	Pre-intervention				Post-intervention			
	control		Experimental		control		Experimental	
	N	%	N	%	N	%	N	%
***Papa –induna, chai**	205		245		105		153	
Everyday	68	33.2	101	41.2	51	48.1	81	52.6
Regularly	37	18.1	59	24.1	13	12.3	68	44.2
Sometimes	53	25.9	46	18.8	15	14.2	3	1.9
Never	47	22.9	39	15.9	27	25.5	2	1.3
***Papa – iwiza and others**	205		245		105		153	
Everyday	6	2.9	14	5.7	4	3.8	0	0.0
Regularly	26	12.7	49	20.0	7	6.6	2	1.3
Sometimes	52	25.7	62	25.3	26	24.5	22	14.3
Never	121	59.1	120	48.9	69	65.1	130	84.4
***Papa-home made**	204		245		104		153	
Everyday	68	33.3	46	18.8	36	34.3	15	9.7
Regularly	45	22.1	55	22.5	11	10.5	45	29.2
Sometimes	43	21.1	67	27.4	26	24.8	41	26.6
Never	48	23.5	77	31.4	32	30.5	53	34.4
White bread	205		245		105		153	
Everyday	6	2.9	3	1.2	6	5.7	2	1.3
Regularly	20	9.8	32	13.1	9	8.5	3	1.9
Sometimes	114	55.6	102	41.6	56	52.8	47	30.5
Never	65	31.7	108	44.1	35	33.0	102	66.2
Brown bread	205		245		105		153	
Everyday	52	25.4	81	33.1	32	30.2	96	62.3
Regularly	70	34.2	97	39.6	37	34.9	44	28.6
Sometimes	76	37.1	55	22.5	34	32.1	13	8.4
Never	7	3.4	12	4.9	3	2.8	1	0.7
Whole wheat bread	205		245		105		153	
Everyday	2	0.98	5	2.0	2	1.9	4	2.6
Regularly	4	1.95	17	6.9	1	0.9	17	11.0
Sometimes	45	21.9	70	28.6	26	24.5	44	28.6
Never	154	75.1	153	62.5	77	72.6	89	57.8
All bran flakes	205		245		105		153	
Everyday	4	1.9	7	2.9	2	1.9	5	3.3
Regularly	4	1.9	9	3.7	2	1.9	24	15.6
Sometimes	33	16.1	57	23.3	18	16.9	28	18.2
Never	164	80.0	172	70.2	84	79.3	97	62.9

*Chai and Induna -minimally refined maize meal, darker in colour (fortified)

*Iwisa, white star and others of the same class – refined and white maize meal (fortified)

*Home-made maize meal made from regular grinding meals (unfortified)

Table 4.12: Intake of breads, cereals and other grain products (continued)

Name of food	Pre-intervention				Post-intervention			
	control		Experimental		control		Experimental	
	N	%	N	%	N	%	N	%
Corn flakes	205		245		105		153	
Everyday	3	1.5	7	2.9	3	2.8	4	2.6
Regularly	14	6.8	17	6.9	6	5.7	40	25.9
Sometimes	56	27.3	55	22.5	32	30.2	31	20.1
Never	132	64.4	166	67.8	65	61.3	79	51.3
Weet bix	205		245		105		153	
Everyday	3	1.5	5	2.0	3	2.8	9	5.8
Regularly	10	4.9	17	6.9	4	3.8	9	5.8
Sometimes	30	14.6	34	13.9	18	16.9	15	9.7
Never	162	79.0	189	77.1	81	76.4	121	78.6
Muesli	205		245		105		153	
Everyday	3	1.5	5	2.0	2	1.9	4	2.6
Regularly	1	0.5	4	1.6	1	0.9	4	2.6
Sometimes	8	3.9	8	3.3	8	7.6	9	5.8
Never	193	94.2	228	93.1	95	89.6	137	88.9
Oats	205		245		105		153	
Everyday	4	1.9	3	1.2	4	3.8	1	0.7
Regularly	10	4.9	14	5.7	6	5.7	41	26.6
Sometimes	39	19.0	67	27.4	19	17.9	48	31.2
Never	152	74.2	161	65.7	77	72.6	64	41.6
Brown rice	205		245		105		153	
Everyday	2	0.9	1	0.4	1	0.9	0	0.0
Regularly	2	0.9	6	2.5	2	1.9	5	3.3
Sometimes	15	7.3	28	11.4	4	3.8	11	7.1
Never	186	90.7	210	85.7	99	93.4	138	89.6
Pasta	205		245		105		153	
Everyday	4	1.9	3	1.2	3	2.8	4	2.6
Regularly	37	18.1	68	27.8	20	18.9	60	38.9
Sometimes	114	55.6	109	44.5	52	49.1	61	39.6
Never	50	24.4	65	26.5	31	29.3	29	18.8
Sorghum-soft	205		245		105		153	
Everyday	60	29.3	63	25.7	32	30.2	43	27.9
Regularly	75	36.6	100	40.8	33	31.1	70	45.5
Sometimes	59	28.8	69	28.2	31	29.3	34	22.1
Never	11	5.4	13	5.3	10	9.4	7	4.6
Sour porridge	205		245		105		153	
Everyday	49	23.9	49	20.0	23	21.7	27	17.5
Regularly	70	34.2	84	34.3	27	25.5	50	32.5
Sometimes	68	33.2	84	34.3	47	44.3	59	38.3
Never	18	8.8	28	11.4	9	8.5	18	11.7

4.12: Intake of breads, cereals and other grain products (continued)

Name of food	Pre-intervention				Post-intervention			
	control		Experimental		control		Experimental	
	N	%	N	%	N	%	N	%
Scones	205		245		105		153	
Everyday	7	3.4	1	0.4	5	4.7	1	0.7
Regularly	21	10.2	29	11.8	14	13.2	9	5.8
Sometimes	118	57.6	134	54.7	57	53.8	84	54.6
Never	59	28.8	81	33.1	30	28.3	60	38.9
Samp	205		245		105		105	
Everyday	10	4.9	2	0.8	6	5.7	2	1.3
Regularly	50	24.4	74	30.2	25	23.6	46	29.9
Sometimes	132	64.4	149	60.8	71	66.9	91	59.1
Never	13	6.3	20	8.2	4	3.8	15	9.7
Cake	204		245		104		104	
Everyday	2	0.9	3	1.2	5	4.7	1	0.7
Regularly	13	6.4	29	11.9	11	10.4	7	4.6
Sometimes	134	65.7	131	53.7	59	55.7	79	51.3
Never	55	26.9	81	33.2	31	29.3	67	43.5

A healthy change was considered as a change from everyday or regularly to sometimes or never for white bread, scones and cake, while the reverse was true for porridges, brown bread, whole wheat bread and breakfast cereals (Table 4. 13).

Table 4.13 Healthy change in intake of breads, cereals, and other grain products group from baseline to post-intervention

Name of food	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
Papa-induna-Chai	105/205	51.2	64/106	60.4	-3.3; 3.3	160/245	65.3	149/154	96.8	22.2; 37.0
Papa-iwiza etc.	32/205	15.6	11/106	10.4	-4.9; 2.7	63/245	25.7	2/154	1.3	-28.1; -14.6*
White bread	26/205	12.7	15/106	14.2	-3.1; 3.1	35/245	14.3	5/154	3.2	-16.5; -5.3*
Brown bread	122/205	59.5	69/106	65.1	-1.8; 3.8	178/245	72.7	140/154	90.9	7.7; 19.0*
Whole wheat bread	6/205	2.93	3/106	2.8	-3.8; 3.8	22/245	8.9	21/154	13.6	1.0; 10.0*
All bran flakes	8/205	3.9	4/3106	3.8	-3.7; 3.7	16/245	6.5	29/154	18.8	6.9; 18.7*
Corn flakes	17/205	8.3	9/106	8.5	-2.8; 5.1	24/245	9.8	44/154	28.6	13.6; 28.4*
Weet bix	13/205	6.3	7/106	6.6	-3.6; 3.6	22/245	8.9	18/154	11.7	2.1; 11.8*
Muesli	4/205	1.9	3/106	2.8	-3.8; 3.8	9/245	3.7	8/154	5.2	-2.4; 6.7
Oats	14/205	6.8	10/106	9.4	-3.4; 3.4	17/245	6.9	42/154	27.3	13.9; 28.2*
Brown rice	4/205	1.9	3/106	2.8	-3.0; 5.5	7/245	2.9	5/154	3.3	-4.4; 4.4
Sorghum-soft	135/205	65.9	65/106	61.3	-5.2; 1.4	163/245	66.5	113/154	73.4	2.9; 15.4*
Scones	28/205	13.7	19/106	17.9	-0.6; 10.6	30/245	12.2	10/154	6.5	-11.0; -1.5*
Samp	60/205	29.2	31/106	29.3	-3.1; 9.0	76/245	31.0	48/154	31.2	-6.1; 0.8
Cake	15/204	7.4	16/106	15.09	0.8; 11.6*	32/244	13.1	8/154	5.2	-13.1; -3.5*

*Indicates a statistically significant result

Table 4.14 shows that the median number of times participants ate breads, cereals, rice, pasta and *papa* group in both phases of the intervention was three times (range 1- 5) per day.

The 95% confidence interval for the median difference [0; 0] indicates no statistically significant difference between control and experimental groups before and after the intervention regarding the number of times the grains group was consumed per day.

Table 4.14: Number of times foods in the grains group were eaten per day

Number of times	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Once	15	7.39	18	7.38	3	2.91	0	0
Twice	43	21.18	45	18.44	18	17.48	4	2.60
3 times	105	51.72	135	55.33	62	60.19	125	81.17
4 times	19	9.36	21	8.61	10	9.71	21	13.64
5 times	5	2.46	9	3.69	2	1.94	3	1.95
When hungry	16	7.88	16	6.56	8	7.77	1	0.65

4.7.2 Usual food intake from the vegetable group

Participants were presented with a list of vegetables that were believed to be commonly eaten by the Basotho. These vegetables were ccabbage, green pepper, green beans, broccoli, spinach, tomato, potatoes, wild vegetables, carrots, green peas, lettuce, onion, garlic, turnip and pumpkin. Green leafy vegetables (usually made from cabbage, spinach, wild growing vegetables, pumpkin leaves etc.) are usually cooked and eaten with *papa*. Participants' contributions to the section on others included pumpkin leaves (usually mixed with baby pumpkins/baby marrows) called *lihaba* when not mixed, and *lepu* when mixed, *lithotse tsa mokopu* (pumpkin seeds), cucumber, cauliflower, baby marrows, mixed vegetables, squash, perm (a type of kale), Chinese cabbage and beetroot. The latter were not tabulated because of small percentages. Table 4.15 presents results of vegetables usually consumed.

According to Table 4.15 the most commonly consumed vegetables at baseline were pumpkin (C = 10.7%, 50.7%, 37.1%; E = 3.7%, 59.6%, 34.3% every day, regularly and sometimes, respectively) and cabbage (C = 24.9%, 40.0%, 33.7%; E =20.8%, 40.4%, 38.4%, every day, regularly, and sometimes, respectively). Tomatoes, spinach, potatoes, wild vegetables, carrots, onions and turnip were also commonly consumed.

After intervention, while no change was observed in the control group, in the experimental group a significant improvement was observed in the rate of consumption of the majority of these vegetables as indicated in the table above in which these were being consumed more every day and regularly. For example, pumpkin (95% CI for the percentage difference [31.8; 47.6]), tomatoes (95% CI for the percentage difference [21.0; 35.7]); spinach (95% CI for the percentage difference [27.6; 43.0]); potatoes (95% CI for the percentage difference [27.8; 43.6]); wild vegetables (95% CI for the percentage difference [9.7; 22.6]); carrots (95% CI for the percentage difference [23.4; 38.6]); onions (95% CI for the percentage difference [6.5; 19.6]); and turnip (95% CI for the percentage difference [12.5; 27.6]). A marked improvement (although seasonal) was also observed in the rate of every day and regular consumption of green beans (95% CI for the percentage difference [38.0; 54.7]) and green pepper (95% CI for the percentage difference [33.4; 49.1]).

As far as cabbage is concerned, after the intervention most participants were no longer eating it every day and regularly. Instead they were eating it sometimes (95% CI for the percentage difference [-4.6; 4.6]) indicating a significant decline in its consumption.

Broccoli was the least eaten, with reports of its consumption before intervention being only 6% and 12.3% after intervention in the sometimes column.

Table 4.15: Intake of vegetable

Name of vegetable	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Cabbage	205		245		106		154	
Everyday	51	24.9	51	20.8	39	36.8	19	12.3
Regularly	82	40.0	99	40.4	38	35.9	78	50.7
Sometimes	69	33.7	94	38.4	27	25.5	56	36.4
Never	3	1.5	1	0.4	2	1.9	1	0.7
Green pepper	205		245		106		154	
Everyday	7	3.4	6	2.5	4	3.8	7	4.6
Regularly	36	17.6	84	34.3	16	15.1	112	72.7
Sometimes	107	52.2	97	39.6	66	62.3	24	15.6
Never	55	26.8	58	23.7	20	18.9	11	7.1
Green beans	205		245		106		154	
Everyday	11	5.4	11	4.5	8	7.6	10	6.5
Regularly	48	23.4	54	22.0	22	20.8	108	70.1
Sometimes	122	59.5	149	60.8	64	60.4	34	22.1
Never	23	11.2	31	12.7	12	11.3	2	1.3
Broccoli	205		245		106		154	
Everyday	2	0.9	0	0.0	2	1.9	0	0.0
Regularly	1	0.5	9	3.7	0	0.0	11	7.1
Sometimes	12	5.9	30	12.2	6	5.7	19	12.3
Never	190	92.7	206	84.1	98	92.5	124	80.5
Spinach	205		245		106		154	
Everyday	30	14.6	20	8.1	22	20.8	54	35.1
Regularly	56	27.3	117	47.8	33	31.1	93	60.4
Sometimes	107	52.2	97	39.6	48	45.3	7	4.6
Never	12	5.9	11	4.5	3	2.8	0	0.0
Tomato	205		245		106		154	
Everyday	24	11.7	25	10.2	15	14.2	49	31.8
Regularly	85	41.5	143	58.4	45	42.5	102	66.2
Sometimes	91	44.4	74	30.2	42	39.6	2	1.3
Never	5	2.4	3	1.2	4	3.8	1	0.7
Potatoes	205		245		106		154	
Everyday	18	8.8	10	4.1	9	8.5	32	20.8
Regularly	84	40.9	116	47.4	46	43.4	107	69.5
Sometimes	96	46.8	113	46.1	50	47.2	13	8.4
Never	7	3.4	6	2.5	1	0.9	2	1.3

Table 4.15: Intake of vegetable (continued)

Name of vegetable	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Wild vegetables	205		245		106		154	
Everyday	11	5.4	12	4.9	7	6.6	10	6.5
Regularly	70	34.2	67	27.4	30	28.3	72	46.8
Sometimes	93	45.4	125	51.0	50	47.2	63	40.9
Never	31	15.1	41	16.7	19	17.9	9	5.8
Carrots	205		245		106		154	
Everyday	10	4.8	11	4.5	5	4.7	17	11.0
Regularly	64	31.2	112	45.7	31	29.3	131	85.1
Sometimes	123	60.0	109	44.5	67	63.2	4	2.6
Never	8	3.9	13	5.3	3	2.8	2	1.3
Green peas	205		245		106		154	
Everyday	12	5.9	5	2.0	6	5.7	3	1.9
Regularly	53	25.9	65	26.5	24	22.9	97	62.9
Sometimes	123	60.0	152	62.0	65	61.9	47	30.5
Never	17	8.3	23	9.4	10	9.5	7	4.6
Lettuce	205		245		106		154	
Everyday	1	0.5	0	0.0	2	1.9	1	0.7
Regularly	12	5.9	30	12.2	7	6.6	39	25.3
Sometimes	44	21.5	63	25.7	28	26.4	22	14.1
Never	148	72.2	152	62.0	69	65.1	92	59.7
Onion	205		245		106		154	
Everyday	37	18.1	42	17.1	22	20.8	42	27.3
Regularly	102	49.8	142	57.9	52	49.1	101	65.6
Sometimes	52	25.4	48	19.6	26	24.5	8	5.2
Never	14	6.8	13	5.3	6	5.7	3	1.9
Garlic	205		245		106		154	
Everyday	10	4.9	9	3.7	7	6.6	9	5.8
Regularly	20	9.8	49	20.0	16	15.1	50	32.5
Sometimes	80	39.0	85	34.7	47	44.3	36	23.4
Never	95	46.3	102	41.6	36	33.9	59	38.3
Turnip	205		245		106		154	
Everyday	24	11.7	28	11.4	14	13.2	16	10.4
Regularly	85	41.5	107	43.7	35	33.0	95	61.7
Sometimes	86	41.9	97	39.6	50	47.2	37	24.0
Never	10	4.9	13	5.3	7	6.6	6	3.9
Pumpkin	205		245		106		154	
Everyday	22	10.7	9	3.7	11	10.4	17	11.0
Regularly	104	50.7	146	59.6	51	48.1	129	83.8
Sometimes	76	37.1	84	34.3	41	38.7	7	4.6
Never	3	1.5	6	2.5	3	2.8	1	0.7

A healthy change was considered as a change from sometimes or never to every day and regularly for all the vegetables (Table 4.16).

Table 4.16: Healthy change in intake of vegetable from baseline to post-intervention

Name of vegetable	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
Cabbage	133/205	64.9	77/106	72.6	-0.4; 8.2	150/245	61.2	97/154	62.9	-4.6; 4.6
Green Pepper	43/205	20.9	20/106	18.9	-1.8; 5.9	90/245	36.7	119/154	77.3	33.4; 49.1*
Green beans	59/205	28.8	30/106	28.3	-1.6; 5.5	65/245	26.5	118/154	76.6	38.0; 54.7*
Broccoli	3/205	1.5	2/106	1.9	-3.9; 3.9	9/245	3.7	11/154	7.1	-2.8; 7.0
Spinach	86/205	41.9	55/106	51.9	-3.5; 5.4	137/245	55.9	147/154	95.5	27.6; 43.0*
Tomatoes	109/205	53.2	60/106	56.6	0.3; 9.1	168/245	68.6	151/154	98.1	21.0; 35.7*
Potatoes	102/205	49.8	55/106	51.9	-0.3; 7.8	126/245	51.43	139/154	90.3	27.8; 43.6*
Wild vegetables	81/205	39.5	37/106	34.9	-4.8; 2.8	79/245	32.2	82/53.25	53.3	9.7; 22.6*
Carrots	74/205	36.1	36/106	33.9	-7.5; 3.7	123/245	50.2	148/154	96.1	40.6; 56.7*
Green peas	65/205	31.7	30/105	28.6	-1.8; 7.7	70/245	28.6	100/154	64.9	23.4; 38.6*
Lettuce	13/205	6.3	9/106	8.5	-5.1; 5.1	30/245	12.2	40/154	25.9	5.2; 16.1*
Onion	139/205	67.8	74/106	69.8	-6.9; 1.0	184/245	75.1	143/154	92.9	14.5; 27.8*
Garlic	30/205	14.6	23/106	21.7	-0.6; 8.6	58/245	23.7	59/154	38.3	6.5; 19.6*
Turnip	109/205	53.2	49/106	46.2	-4.6; 2.7	135/245	55.1	111/154	72.1	12.5; 27.6*
Pumpkin	126/205	61.5	62/106	58.5	-0.8; 6.5	155/245	63.3	146/154	94.8	31.8; 47.6*

*indicates a statistically significant result

According to Table 4.17, the median number of times a day in which participants ate vegetables was three times (range 1- 5) before and after intervention (C = 3; E = 3).

There was no statistically significant difference in the number of times that vegetables were eaten between the control and experimental groups before and after the intervention as indicated by the 95% confidence interval for the median difference ([0 ; 0] ; [-1 ; 0]).

Table 4.17: Number of times vegetables were eaten per day

Number of times	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Once	6	2.9	12	4.9	5	4.7	0	0
Twice	85	41.5	104	42.5	36	33.9	9	5.9
3 times	82	40.0	87	35.5	47	44.3	101	66.0
4 times	12	5.9	13	5.3	8	7.6	37	24.2
5 times	7	3.4	8	3.3	5	4.7	6	3.9
When hungry	13	6.3	20	8.2	5	4.7	0	0.0
*When available			1	0.4	0	0.0	0	0.0

*When available, once in a while, once a month

4.7.3 Usual food intake from the fruit group

Table 4.18 presents results of fruit intake by participants in pre- and post-intervention phases. Results show that some fruits were commonly consumed before and after intervention. While the control group showed little change in fruit intake, significant improvements in regular consumption of fruits occurred in the experimental group after the intervention.

The following fruits were most popular at baseline: peaches, oranges and apples, which were regularly consumed by percentages ranging between 40% and 50% of participants, apricot, banana and pear, were sometimes consumed by more than 60% of participants.

After the intervention, consumption of some fruits had improved more significantly in the experimental group as indicated in Table 4.18. These fruits included peaches (95% confidence interval for the percentage difference [21.0; 35.7]); oranges (95% confidence interval for the percentage difference [26.4; 41.8]), apples (95% confidence interval for the percentage difference [25.5; 40.6]); plums (95% confidence interval for the percentage difference [9.0; 22.5]); apricot (95% confidence interval for the percentage difference [18.3; 34.6]), bananas

(95% confidence interval for the percentage difference [28.5; 43.8]); pears (95% confidence interval for the percentage difference [20.1; 35.8]); strawberries (95% confidence interval for the percentage difference [12.4; 26.7]); and grapes (95% confidence interval for the percentage difference [6.8; 20.6]).

Although percentages consuming pineapples were still small, there was a significant improvement in the experimental group after intervention (95% confidence interval for the percentage difference [1.3; 12.3]).

Table 4.18: Intake of fruit

Name of fruit	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Apricot	202		245		102		154	
Everyday	18	8.9	12	4.9	14	13.7	11	7.1
Regularly	45	22.3	48	19.6	26	25.5	77	50.0
Sometimes	129	63.9	153	62.5	57	55.8	56	36.4
Never	10	4.9	32	13.1	5	4.9	10	6.5
Apples	205		245		106		154	
Everyday	17	8.3	21	8.6	11	10.4	21	13.6
Regularly	77	37.6	118	48.2	39	36.8	108	70.1
Sometimes	106	51.7	102	41.6	52	49.1	23	14.9
Never	5	2.4	4	1.6	4	3.8	2	1.3
Banana	205		245		106		154	
Everyday	7	3.4	8	3.3	5	4.7	10	6.5
Regularly	64	31.2	107	43.7	30	28.3	105	68.2
Sometimes	128	62.4	115	46.9	69	65.1	31	20.1
Never	6	2.9	15	6.1	2	1.9	8	5.2
Grapes	205		245		106		154	
Everyday	7	3.4	6	2.45	7	6.6	4	2.6
Regularly	39	19.0	54	22.0	20	18.9	67	43.5
Sometimes	143	69.8	151	61.6	69	65.1	57	37.0
Never	16	7.8	34	13.9	10	9.4	26	16.9
Guava	205		245		106		154	
Everyday	3	1.5	3	1.2	2	1.9	1	0.7
Regularly	29	14.2	41	16.7	14	13.2	49	31.8
Sometimes	115	56.1	124	50.6	64	60.4	58	37.7
Never	58	28.3	77	31.4	26	24.5	46	29.9
Oranges	205		245		106		154	
Everyday	37	18.1	55	22.5	29	27.4	84	54.6
Regularly	85	41.5	108	44.1	38	35.9	67	43.5
Sometimes	79	38.5	78	31.8	36	33.9	3	1.9
Never	4	1.9	4	1.6	3	2.8	0	0.0
Peaches	205		245		106		154	
Everyday	54	26.3	55	22.5	37	34.9	95	61.7
Regularly	79	38.5	113	46.1	35	33.0	56	36.4
Sometimes	71	34.6	73	29.8	33	31.1	3	1.9
Never	1	0.5	4	1.6	1	0.9	0	0.0
Pears	205		245		106		154	
Everyday	8	3.9	13	5.3	5	4.7	11	7.2
Regularly	47	22.9	63	25.7	18	16.9	78	50.9
Sometimes	139	67.8	152	62.0	77	72.6	55	35.9
Never	11	5.4	17	6.9	6	5.7	9	5.9

Table 4.18: Intake of fruit (continued)

Name of fruit	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Strawberry	205		245		106		154	
Everyday	13	6.3	11	4.1	8	7.6	13	8.4
Regularly	24	11.7	27	11.0	15	14.2	47	30.5
Sometimes	90	43.9	124	50.6	49	46.2	43	27.9
Never	78	38.1	83	33.9	34	32.1	51	33.1
Mango	205		245		106		154	
Everyday	3	1.5	2	0.8	1	0.9	0	0.0
Regularly	16	7.8	15	6.1	9	8.5	28	18.2
Sometimes	94	45.9	135	55.1	50	47.2	65	42.2
Never	92	44.9	93	37.9	46	43.4	61	39.6
Plums	205		245		106		154	
Everyday	12	5.8	7	2.9	6	5.7	3	1.9
Regularly	22	10.7	27	11.0	10	9.4	41	26.6
Sometimes	114	55.6	136	55.5	58	54.7	58	37.7
Never	57	27.8	75	30.6	32	30.2	52	33.8
Raisins	205		245		106		154	
Everyday	4	1.9	1	0.4	3	2.8	0	0.0
Regularly	25	12.2	41	16.7	6	5.7	23	14.9
Sometimes	83	40.5	96	39.2	50	47.2	57	37.0
Never	93	45.4	107	43.7	47	44.3	74	48.1
Figs	205		245		106		154	
Everyday	7	3.4	5	2.0	5	4.7	3	1.9
Regularly	11	5.4	8	3.3	6	5.7	11	7.1
Sometimes	55	26.8	91	37.1	29	27.4	49	31.8
Never	132	64.4	141	57.6	66	62.3	91	59.1
Pineapple	205		244		106		154	
Everyday	6	2.9	3	1.2	2	1.9	2	1.3
Regularly	9	4.4	12	4.9	4	3.8	19	12.3
Sometimes	129	62.9	170	69.7	63	59.4	87	56.5
Never	61	29.8	59	24.2	37	34.9	46	29.9

A healthy change in fruit consumption was considered as a change from ‘sometimes’ or ‘never’ to ‘everyday’ and ‘regular’ consumption (Table 4.19).

Table 4.19: Healthy change in intake of fruit from baseline to post-intervention

Name of fruit	Control					Experimental				
	Baseline	%	Post-intervention	%	95% CI for % diff	Baseline	%	Post-intervention	%	95% CI for % diff
Apricot	63/202	31.3	40/102	39.2	-0.9; 6.9	60/245	24.5	88/154	57.1	18.3; 34.6*
Apples	94/205	45.9	50/106	47.2	-1.7; 3.5	139/245	56.7	129/154	83.8	25.5; 40.6*
Banana	71/205	34.6	35/106	33.0	-2.9; 4.8	115/245	46.9	115/154	74.7	28.5; 43.8*
Grapes	46/205	22.4	27/106	25.5	-2.5; 8.4	60/245	24.5	71/154	46.1	12.9; 27.3*
Guava	32/205	15.6	16/106	15.1	-5.4; 3.4	44/245	18.0	50/154	32.5	6.8; 20.6*
Oranges	122/205	59.5	67/106	63.2	-0.9; 6.6	163/245	66.5	151/154	98.1	26.4; 41.8
Peaches	133/205	64.8	72/106	67.9	1.6; 13.6*	168/245	68.6	151/154	98.1	21.0; 35.7*
Pears	55/205	26.8	23/106	21.7	-5.9; 3.9	76/245	31.0	89/153	58.2	20.1; 35.8*
Strawberry	37/205	18.1	23/106	21.7	-2.8; 2.8	38/245	15.5	60/154	39.0	12.4; 26.7*
Mango	19/205	9.3	10/106	9.4	-5.7; 3.6	17/245	6.9	28/154	18.2	3.4; 16.5*
Plums	34/205	16.6	16/106	15.1	-4.0; 4.0	34/245	13.9	44/154	28.6	9.0; 22.5*
Raisins	29/205	14.2	9/106	8.5	-5.0; 2.8	42/245	17.1	23/154	14.9	-0.3; 9.8
Fig	18/205	8.8	11/106	10.4	-3.3; 3.3	13/245	5.3	14/154	9.1	-2.4; 6.6
Pineapple	15/205	7.3	6/106	5.7	-5.2; 2.9	15/244	6.2	21/154	13.6	1.3; 12.3*

*Indicates a statistically significant result

According to Table 4.20, at baseline, the median number of fruits consumed by the participants per day (C = 6; E = 3) before intervention showed that many fruits were eaten when in season, with a range of 'when available' to many fruits per day. After intervention the number of fruits consumed per day decreased from 6 to 4 in the control group while it increased from 3 to 4 in the experimental group.

There was no statistically significant difference between the number of fruits eaten per day in the control and experimental groups before and after the intervention as indicated by the 95%

confidence interval for the median difference ([0 ; 1] in the control group and [-1 ; 0]) in the experimental group.

Table 4.20: Number of fruits consumed per day

Number of times	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
1	27	13.6	48	19.6	21	20.8	1	0.7
2	35	17.7	53	21.6	16	15.8	13	8.5
3	24	12.1	33	13.6	13	12.9	26	16.9
4	9	4.6	13	5.3	5	4.9	39	25.5
5	1	0.5	2	0.8	1	0.9	11	7.2
Many fruits	73	36.9	57	23.3	22	21.8	61	39.9
when available	28	14.1	37	15.1	23	22.8	2	1.3
Don't eat fruits	0	0.5	1	0.4	0	0.0	0	0.0

4.7.4 Intake of foods from the meats group

According to Table 4.21, the most eaten food in the meats group before intervention, was eggs (C =7.8%, 47.8%, 40.9%; E =19.8%, 30.2%, 47.2% every day, regularly and sometimes), and (C = 19.8%, 30.2%, 47.2%; E = 11.0%, 46.8%, 37.0% every day, regularly and sometimes) after intervention. After intervention, consumption of eggs improved significantly in the experimental group (95% CI for the percentage difference [-3.6; 11.3]).

Chicken was the next most commonly eaten food in the meats group at baseline (C = 3.9%, 12.2%, 79.5%; E =3.7%, 15.1%, 75.5% every day, regularly and sometimes) and after intervention (C = 10.4%, 48.1%, 39.6%; E =9.7%, 59.1%, 29.2% every day, regularly and sometimes). After intervention a significant improvement occurred in 'everyday' and 'regular' consumption of chicken in the experimental group (95% CI for the percentage difference [4.9; 14.7]).

Dried beans were also regularly consumed at baseline (C =7.4%, 45.6%, 36.3%; E =6.1%, 56.7%, 28.2% every day, regularly and sometimes), and after intervention (C = 9.4%, 44.3%, 33.9% E =7.1%, 85.1%, 5.2% every day, regularly and sometimes). A significant improvement in regular and everyday consumption of beans was observed after intervention (95% CI for percentage difference [22.7; 37.5]) in the experimental group as compared to a minimal change in the control group.

At baseline, fish was mostly consumed in the ‘sometimes’ category (C =1.9%, 30.7%, 56.6%; E = 2.0%, 42.0%, 42.9% every day, regularly and sometimes). After intervention, regular consumption of fish improved significantly in the experimental group (C=3.8%, 27.4%, 56.6%; E =5.8%, 70.1%, 17.5% every day, regularly and sometimes), (95% CI for the percentage difference [28.3; 44.0]).

Improvements were also seen in consumption of the other foods in this group after the experimental group received nutrition education. For example, before intervention, dried peas were also most regularly consumed (C = 2.5%, 28.9%, 51.9%; E = 4.1%, 31.0%, 43.7% every day, regularly and sometimes) in both groups. This regular consumption of peas significantly improved in the experimental group (95% CI for the percentage difference [15.6; 30.9]) after intervention. Sausage, which was mostly consumed ‘sometimes’ at baseline (C =2.4%, 32.7%, 59.5%; E =4.1%, 44.5%, 44.9% every day, regularly and sometimes), after intervention, regular consumption had declined significantly in the experimental group and shifted more to sometimes (95% CI for the percentage difference [-39.7; -24.2]). The same was true for polony the consumption of which also declined significantly in the experimental group after intervention (95% CI for the percentage difference [-27.1; -13.5]).

Consumption of the other foods in the meats group, such as offal, mincemeat, lentils, nuts, soya and goat meat was very low ranging from 4% to 24% ‘regularly’ at baseline and remained unchanged after intervention.

Table 4.21 presents results of the commonly eaten foods in the meat group.

Table 4.21: Intake of meat, poultry, fish, legumes, eggs and nuts

Name of meat	Pre-Intervention				Post-Intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Beef	205		245		106		154	
Everyday	8	3.9	9	3.7	5	4.7	0	0.0
Regularly	25	12.2	37	15.1	14	13.2	7	4.6
Sometimes	163	79.5	185	75.5	84	79.3	137	88.9
Never	9	4.4	14	5.7	3	2.8	10	6.5
Chicken	205		245		106		154	
Everyday	8	3.9	9	3.7	11	10.4	15	9.7
Regularly	25	12.2	37	15.1	51	48.1	91	59.1
Sometimes	163	79.5	185	75.5	42	39.6	45	29.2
Never	9	4.4	14	5.7	2	1.9	3	1.9
Eggs	205		245		106		154	
Everyday	16	7.8	17	6.9	21	19.8	17	11.0
Regularly	98	47.8	134	54.7	32	30.2	72	46.8
Sometimes	84	40.9	88	35.9	50	47.2	57	37.0
Never	7	3.4	6	2.5	3	2.8	8	5.2
Goat meat	205		245		106		154	
Everyday	28	13.7	27	11.0	1	0.9	0	0.0
Regularly	63	30.7	124	50.6	2	1.9	7	4.6
Sometimes	103	50.2	79	32.2	54	50.9	70	45.5
Never	11	5.4	15	6.1	49	46.2	77	50.0
Mutton	205		245		106		154	
Everyday	2	0.9	0	0.0	2	1.9	0	0.0
Regularly	15	7.3	13	5.3	9	8.5	10	6.5
Sometimes	97	47.3	99	40.4	87	82.1	130	84.4
Never	91	44.4	133	54.3	8	7.6	14	9.1
Offal	205		245		106		154	
Everyday	6	2.9	1	0.4	4	3.8	1	0.7
Regularly	19	9.3	29	11.8	25	23.6	12	7.8
Sometimes	161	78.5	195	79.6	73	68.9	135	87.7
Never	19	9.3	20	8.2	4	3.8	6	3.9
Polony	205		245		106		154	
Everyday	15	7.3	23	9.4	15	14.2	0	0.0
Regularly	48	23.4	77	31.4	20	18.9	20	12.9
Sometimes	104	50.7	108	44.1	49	46.2	98	63.6
Never	38	18.5	37	15.1	22	20.8	36	23.4
Pork	205		245		106		154	
Everyday	3	1.5	1	0.4	3	2.8	0	0.0
Regularly	30	14.6	79	32.2	14	13.2	54	35.1
Sometimes	88	42.9	83	33.8	49	46.2	48	31.2
Never	84	40.9	82	33.5	40	37.7	52	33.8

Table 4.21: Intake of meat, poultry, fish, legumes, eggs and nuts (Continued)

Name of meat	Pre-Intervention				Post-Intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Sausage	205		245		106		154	
Everyday	5	2.4	10	4.1	3	2.8	0	0.0
Regularly	67	32.7	109	44.5	32	30.2	13	8.4
Sometimes	122	59.5	110	44.9	64	60.4	119	77.3
Never	11	5.4	16	6.5	7	6.6	22	14.3
Fish	205		245		106		154	
Everyday	4	1.9	5	2.0	4	3.8	9	5.8
Regularly	63	30.7	103	42.0	29	27.4	108	70.1
Sometimes	116	56.6	105	42.9	60	56.6	27	17.5
Never	22	10.7	32	13.1	13	12.3	10	6.5
Mince meat	205		245		106		154	
Everyday	0	0.0	3	1.2	0	0.0	2	1.3
Regularly	46	22.4	67	27.4	22	20.8	6	3.9
Sometimes	137	66.8	146	59.6	74	69.8	112	72.7
Never	22	10.7	29	11.8	10	9.4	34	22.1
Dried beans	204		245		106		154	
Everyday	15	7.4	15	6.1	10	9.4	11	7.1
Regularly	93	45.6	139	56.7	47	44.3	131	85.1
Sometimes	74	36.3	69	28.2	36	33.9	8	5.2
Never	22	10.8	22	8.9	13	12.3	4	2.6
Dried peas	204		245		106		154	
Everyday	5	2.5	10	4.1	6	5.7	8	5.2
Regularly	59	28.9	76	31.0	25	23.6	84	54.6
Sometimes	106	51.9	107	43.7	56	52.8	33	21.4
Never	34	16.7	52	21.2	19	17.9	29	18.8
Lentils	204		245		106		154	
Everyday	1	0.5	0	0.0	1	0.9	0	0.0
Regularly	8	3.9	10	4.1	6	5.7	11	7.1
Sometimes	71	34.8	71	28.9	44	41.5	40	25.9
Never	124	60.8	164	66.9	55	51.9	103	66.9
Nuts	202		245		106		154	
Everyday	5	2.5	10	4.1	2	1.9	10	6.5
Regularly	25	12.4	41	16.7	13	12.4	31	20.1
Sometimes	134	66.3	147	60.0	74	70.5	82	53.3
Never	38	18.8	47	19.2	16	15.2	31	10.1
Soya beans	199		244		106		154	
Everyday	3	1.5	0	0.0	4	3.8	0	0.0
Regularly	10	5.0	1	0.4	7	6.7	0	0.0
Sometimes	42	21.1	18	7.4	27	25.7	8	5.2
Never	144	72.4	225	92.2	67	63.8	146	94.8

According to Table 4.22, a healthy change was considered as a change from 'everyday' and 'regularly' to 'sometimes' and 'never' for the following foods: beef, goat meat, mutton, offal, polony (processed meat product), sausage and mincemeat. The reverse was true for the following foods: chicken, eggs (not more than four eggs per week), fish, dried beans, lentils, nuts and soya beans.

Table 4.22: Healthy change in intake of meat, poultry, fish, legumes, eggs and nuts from baseline to post-intervention

Name of meat	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
Beef	33/205	16.1	19/106	17.9	-7.3; 3.3	46/245	18.8	7/154	4.6	-20.0; -8.4*
Chicken	114/205	55.6	62/106	58.5	-7.9; 0.3	151/245	61.6	106/154	68.8	4.9; 14.7*
Eggs	91/205	44.4	53/106	50.0	-1.0; 8.6	151/245	61.6	89/154	57.8	-3.6; 11.3
Goat meat	17/205	8.2	3/106	2.8	-3.0; 5.5	13/245	5.3	7/154	4.6	-4.6; 1.5
Mutton	25/205	12.2	11/106	10.4	-4.9; 2.7	30/245	12.2	10/154	6.5	-10.1; -1.0*
Offal	58/205	28.3	29/106	27.4	-3.5; 3.5	91/245	37.1	13/154	8.4	-28.7; -14.7*
Polony	63/205	30.7	35/106	33.0	-2.3; 6.2	100/245	40.8	20/154	13.0	-27.1; -13.5*
Sausage	72/205	35.1	35/106	33.0	-6.9; 3.1	119/245	48.6	13/154	8.4	-39.7; -24.2*
Fish	67/205	32.7	33/106	31.1	-5.3; 1.5	108/245	44.1	117/154	76.0	28.3; 44.0*
Mince meat	46/205	22.4	22/106	20.8	-1.3; 9.2	70/245	28.6	8/154	5.2	-23.1; -10.2*
Dried beans	108/204	52.9	57/106	53.8	-4.9; 4.9	154/245	62.9	142/154	92.2	22.7; 37.5*
Dried peas	64/204	31.4	31/106	29.3	-3.8; 5.7	86/245	35.1	92/154	59.7	15.6; 30.9*
Lentils	9/204	4.4	7/106	6.6	-4.4; 4.4	10/245	4.1	11/154	7.1	0; 8.6
Nuts	30/202	14.9	15/105	14.3	-3.2; 3.2	51/245	20.8	41/154	26.6	-0.8; 7.5
Soya beans	13/199	6.5	11/105	10.5	-2.8; 5.1	1/244	0.4	0	0	-2.4; 2.4

*Indicates a statistically significant result

The median number of times the participants ate the meats group was two times before and after intervention, with a range of 'when hungry/ when available' to five times per day (Table

4.23). The 95% confidence interval for the median difference [0; 0]; [0; 0] indicates no statistically significant difference between the control and experimental groups before and after the intervention regarding the number of times the meats group were consumed per day.

Table 4.23: Number of times foods in the meats group were consumed per day

Number of times	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Once	24	11.8	35	14.3	13	12.3	1	0.7
Twice	84	41.4	104	42.6	46	43.4	102	66.7
3 times	61	30.1	80	32.8	33	31.1	41	26.8
4 times	8	3.9	4	1.6	2	1.9	4	2.6
5 times	3	1.5	2	0.8	1	0.9	0	0
When hungry	23	11.3	18	7.4	7	6.6	2	1.3
When available	0	0.0	1	0.4	4	3.8	2	1.3

4.7.5 Intake of milk, cheese and yoghurt group

As indicated in Table 4.24, at baseline, milk was consumed more ‘regularly’ and ‘sometimes’ than everyday(C =14.4%, 39.0%, 41.9%; E =23.3%, 34.7%, 35.5%). After intervention, the consumption pattern was a little different (C =20.8%, 39.6%, 37.7%; E =29.2%, 55.8%, 12.3% every day, regularly and sometimes respectively), indicating a significant improvement in the ‘everyday’ and ‘regular’ consumption of milk (95% CI for percentage difference ([27.4; 42.7]) in the experimental group after intervention.

According to Table 4.24, yoghurt, although not so popular, fared better than cheese in its consumption. Both these did not improve significantly after intervention in the experimental group as indicated in Table 4.25.

Table 4.24: Intake of milk, cheese, and yoghurt

Milk products	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Milk	205		245		106		154	
Everyday	30	14.4	57	23.3	22	20.8	45	29.2
Regularly	80	39.0	85	34.7	42	39.6	86	55.8
Sometimes	86	41.9	87	35.5	40	37.7	19	12.3
Never	9	4.4	16	6.5	2	1.9	4	2.6
Cheese	205		245		106		154	
Everyday	7	3.4	1	0.4	3	2.8	1	0.7
Regularly	15	7.3	28	11.4	9	8.5	19	12.3
Sometimes	79	38.5	115	46.9	44	41.5	70	45.5
Never	104	50.7	101	41.2	50	47.2	64	41.6
Yoghurt	205		245		106		154	
Everyday	4	1.9	1	0.4	2	1.9	1	0.7
Regularly	25	12.2	45	18.4	10	9.4	26	16.9
Sometimes	109	53.2	132	53.9	66	62.3	88	57.1
Never	67	32.7	67	27.4	28	26.4	39	25.3

According to Table 4.25, a healthy change was considered as a change from 'sometimes' and 'never' to 'everyday' and 'regularly' for milk and yoghurt, while the reverse was true for cheese.

Table 4.25: Healthy change in intake of milk, cheese and yoghurt from baseline to post-intervention

Type of food	Control					Experimental				
	Baseline	%	Post-intervention	%	95% CI for % diff	Baseline	%	Post-intervention	%	95% CI for % diff
Milk	110/205	53.7	64/106	60.4	-0.3; 7.9	142/245	58.0	131/154	85.1	27.4; 42.7*
Cheese	22/205	10.7	12/106	11.3	-2.0; 6.4	29/245	11.8	20/154	13.0	-2.4; 5.2
Yoghurt	29/205	14.2	12/106	11.32	-2.7; 4.9	46/245	18.8	27/154	17.5	1.7; 11.8

*Indicates a statistically significant result

As indicated in Table 4.26, the majority of participants consumed foods in the milk group once a day before intervention (C = 39.9%; E = 47.9%) as well as after intervention (C = 44.2%, E =

64.3%), the median being one (range 2-3 times a week – 3 times) in both phases. A significant number of participants at baseline (C =35.9%; E = 23.3%) ate milk and milk products when available, once in a while, once a week or month and when they craved them. Some improvement in the percentages of participants who ate milk at least once a day was observed after intervention in the experimental group (C = 36.5%; E = 6.5%).

The 95% confidence interval for the median difference ([0; 0; 0; 0]) indicates no statistically significant difference between the control and experimental groups before and after the intervention in the number of times milk and milk products were consumed per day.

Table 4.26: Number of times milk, cheese and yoghurt were consumed per day

Number of times	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Once	79	39.9	115	47.9	46	44.2	99	64.3
Twice	29	14.75	37	15.4	7	6.7	33	21.4
3 times	9	4.6	14	5.8	10	9.6	7	4.6
4 times	2	1.0	1	0.4	0	0	0	0.0
When available	71	35.9	56	23.3	38	36.5	10	6.5
2-3-days a week	2	1.0	12	5.0	1	0.9	3	1.9
Don't eat milk	6	3.0	5	2.1	2	1.9	0	0.0

4.7.6 Intake of fats, oils and sweets

Sunflower oil was the most commonly consumed cooking oil before intervention (C = 46.8%, 34.6%, 17.1%; E = 50.6%, 30.6%, 15.5% every day, regularly and sometimes), and after intervention (C = 53.8%; E = 77.3% every day, regularly and sometimes). After intervention, the experimental group had significantly improved its consumption of sunflower oil (95% CI for the percentage difference [11.2; 23.8]) after receiving nutrition education.

According to Table 4.27, olive oil, canola oil and avocado were the least commonly consumed fats before and after intervention. Their consumption ranged from 0% every day, to 1% 'regularly', to 22% 'sometimes'. After intervention, there was no change in consumption of these fats.

Sweets in the form of candy, cold drinks, jam and sugar were consumed fairly often, with sugar being the most commonly consumed before intervention as indicated in Table 4.26. After the intervention, consumption of sweets (95% CI for the percentage difference [-40.5; -24.5]); sweetened cold drinks (95% CI for the percentage difference [-47.6; -31.8]); sugar (95% CI for the percentage difference [-19.7; -6.6]); jam (95% CI for the percentage difference [-19.5; -7.5]); and cookies (95% CI for the percentage difference [-20.2; 8.4]) declined significantly in the experimental group as compared to the control group in which there was little or no change.

Table 4.27 presents results of the commonly consumed foods in the fats, oils and sweets group at baseline and after intervention.

Table 4.27: Intake of fats, oils and sweets

Name of fat and sweets	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Butter	204		245		105		154	
Everyday	10	4.9	3	1.2	5	4.8	0	0.0
Regularly	17	8.3	4	1.6	10	9.5	0	0.0
Sometimes	61	29.9	52	21.2	24	22.9	3	1.9
Never	116	56.9	186	75.9	66	62.9	151	98.1
Hard margarine	205		245		106		154	
Everyday	2	0.9	4	1.6	1	0.9	1	0.7
Regularly	37	18.1	48	19.6	25	23.6	1	0.7
Sometimes	102	49.8	103	42.0	45	42.5	11	7.1
Never	64	31.2	90	36.7	35	33.0	141	91.6
Soft margarine	205		245		106		154	
Everyday	11	5.4	9	3.7	7	6.6	6	3.9
Regularly	23	11.2	59	24.1	11	10.4	50	32.5
Sometimes	108	52.9	92	37.5	62	58.5	70	45.5
Never	63	30.7	85	34.7	26	24.5	28	18.2
Mayonnaise	205		245		106		154	
Everyday	3	1.5	1	0.4	4	3.4	1	0.7
Regularly	68	33.2	102	41.6	37	34.9	56	36.4
Sometimes	122	59.5	126	51.4	57	53.8	85	55.2
Never	12	5.9	16	6.5	8	7.6	12	7.8
Olive oil	205		245		106		154	
Everyday	8	3.90	0	0.00	5	4.7	0	0.0
Regularly	1	0.49	14	5.71	2	1.9	4	2.6
Sometimes	7	3.41	26	10.61	4	3.8	24	15.58
Never	189	92.20	205	83.67	95	89.6	126	81.82
Canola oil	205		245		106		154	
Everyday	2	0.9	2	0.8	2	1.9	9	5.8
Regularly	5	2.4	15	6.1	1	0.9	15	9.7
Sometimes	6	2.9	17	6.9	2	1.9	12	7.8
Never	192	93.7	211	86.1	101	95.3	118	76.6

Table 4.27: Intake of fats, oils, sweets (continued)

Name of fats and sweets	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Sunflower oil	205		245		106		154	
Everyday	96	46.8	124	50.6	57	53.8	119	77.3
Regularly	71	34.6	75	30.6	33	31.1	32	20.8
Sometimes	35	17.1	38	15.5	13	12.3	2	1.3
Never	3	1.5	8	3.3	3	2.8	1	0.7
Avocado	205		245		106		154	
Everyday	0	0.0	0	0.0	3	2.8	4	2.6
Regularly	4	1.9	12	4.9	23	21.7	25	16.2
Sometimes	32	15.6	45	18.4	80	75.5	125	81.2
Never	169	82.4	188	76.7	0	0.0	0	0.0
Lard	205		245		106		154	
Everyday	7	3.4	3	1.2	4	3.8	1	0.7
Regularly	35	17.1	14	5.7	3	2.8	0	0.0
Sometimes	61	29.8	77	31.4	37	34.9	4	2.6
Never	102	49.8	151	61.6	62	58.5	149	96.8
Sweets	205		245		106		154	
Everyday	27	13.2	22	8.9	22	20.8	1	0.7
Regularly	72	35.1	91	37.1	32	30.2	12	7.8
Sometimes	92	44.9	96	39.2	46	43.4	112	72.7
Never	14	6.8	36	14.7	6	5.7	29	18.8
Squash (oros)	205		245		106		154	
Everyday	10	4.9	4	1.6	4	3.8	2	1.3
Regularly	41	20.0	76	31.0	23	21.7	9	5.8
Sometimes	110	53.7	112	45.7	54	50.9	104	67.5
Never	44	21.5	53	21.6	25	23.6	39	25.3
Jam	205		245		106		154	
Everyday	4	1.9	2	0.8	1	0.9	0	0.0
Regularly	21	10.2	35	14.3	12	11.3	5	3.3
Sometimes	118	57.6	138	56.3	61	57.6	98	63.6
Never	62	30.2	70	28.6	32	30.2	51	33.1
Cookies	205		245		106		154	
Everyday	13	6.3	6	2.5	9	8.5	0	0.0
Regularly	25	12.2	41	16.7	9	8.5	3	1.9
Sometimes	118	57.6	139	56.7	54	50.9	91	59.1
Never	48	23.4	59	24.1	34	32.1	60	38.9
Sweetened cold drinks	205		245		106		154	
Everyday	11	5.4	14	5.7	7	6.6	0	0.0
Regularly	55	26.8	102	41.6	27	25.5	9	5.8
Sometimes	118	57.6	107	43.7	60	56.6	123	79.9
Never	21	10.2	22	8.9	12	11.3	22	14.3
Sugar	204		245		106		154	
Everyday	95	46.6	114	46.5	43	40.6	37	24.0
Regularly	63	30.9	67	27.4	32	30.2	43	27.9
Sometimes	41	20.1	54	22.0	28	26.4	65	42.2
Never	5	2.5	10	4.1	3	2.8	9	5.8

A healthy change was considered as a change from 'everyday' and 'regularly' to 'sometimes' or 'never' for the following foods: butter, hard margarine, mayonnaise, lard, sweets, squash (oros), jam, cookies, sweetened cold drinks and sugar. The reverse was true for the following foods: olive oil, canola oil, sunflower oil and avocado (Table 4.28).

Table 4.28: Healthy change in intake of fats, oils and sweets from baseline to post-intervention

Name of fats and sweets	Control					Experimental				
	Baseline	%	Post-intervention	%	95% CI for % diff	Baseline	%	Post-intervention	%	95% CI for % diff
Butter	27/204	13.2	15/105	14.3	-15.5; -2.3*	7/245	2.9	0	0	92.8; 99.0%
Hard margarine	39/205	19.0	26/106	24.5	-2.6; 2.6	52/245	21.22	2/154	1.3	-25.2; -12.3*
Soft margarine	34/205	16.6	18/106	17.0	-2.4; 4.5	68/245	27.8	56/154	36.4	6.2; 19.8*
Mayonnaise	71/205	34.6	41/106	38.7	-1.7; 3.7	103/245	42.0	57/154	37.0	-5.1; 2.5
Olive oil	9/205	4.4	7/106	6.6	-3.6; 3.6	14/245	5.7	4/154	2.6	-5.5; 2.6
Canola oil	7/205	3.4	3/106	2.8	-3.8; 3.8	17/245	6.9	24/154	15.6	5.6; 16.2*
Sunflower oil	167/205	81.5	90/106	84.9	-1.3; 9.3	199/245	81.22	151/154	98.0	11.2; 23.8
Avocado	4/205	2.0	3/106	2.8	-3.8; 3.8	12/245	4.9	4/154	2.6	-6.6; 0.5
Lard	42/205	20.5	7/106	6.6	-5.1; 2.8	17/245	6.9	1/154	0.7	-10.1; -1.5
Sweets	99/205	48.3	54/106	50.9	-3.2; 3.2	113/245	46.1	13/154	8.4	-40.5; -24.5*
Squash (oros)	51/205	24.9	27/106	25.5	-5.0; 3.0	80/245	32.7	11/154	7.1	-30.6; -16.8*
Jam	25/205	12.2	13/106	12.3	-3.2; 3.2	37/245	15.1	5/154	3.3	-19.5; -7.5*
Cookies	38/205	18.5	18/106	17.0	-4.5; 2.4	47/245	19.2	3/154	2.0	-20.1; 8.4*
Sweetened cold drinks	66/205	32.2	34/106	32.1	-1.0; 6.8	116/245	47.4	9/154	5.8	-47.6; -31.8*
Sugar	158/204	77.5	75/106	70.8	-6.9; 1.0	181/245	73.9	80/154	52.0	-19.7; -6.6*

*Indicates a statistically significant result

The median number of times participants consumed fats, sweets and oils was three times a day was three (range 'when available' to 5 times per day) in both the control and experimental groups (Table 4.29).

The 95% confidence interval for the median difference [0; 0; 0; 0] indicates no statistically significant difference between control and experimental groups before and after the intervention regarding the number of times fats, sweets and oils were consumed per day.

Table 4.29 shows the number of times foods from the fats, oils and sweets group were consumed per day.

Table 4.29: Number of times fats, oils and sweets group were consumed per day

Number of times	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Once	26	12.8	30	12.2	12	11.8	4	2.6
Twice	65	32.0	74	30.2	33	32.4	39	25.5
3 times	59	29.1	93	37.9	26	25.5	77	50.3
4 times	7	3.5	19	7.8	6	5.9	30	19.6
5 times	40	19.7	20	8.2	20	19.6	1	0.7
When hungry	6	2.9	8	3.3	5	4.9	2	1.3
When available	0	0.0	1	0.4	0	0.0	0	0.0

4.7.7 Usual food intake based on the recommendations of the South African Food Based Dietary Guidelines (SAFBDG)

As indicated in Table 30, fewer than 50% of participants indicated that they ate a variety of foods at baseline (C= 36.8%; E = 49.8%). After the intervention, a marked improvement was evident in the experimental group as indicated by the 95% CI for the percentage difference ([25.0%; 40.9%*]).

At baseline, over 90% of participants indicated that they drank water every day (C = 98.1%; E = 99.4%); and the same percentages also drank coffee every day (C = 93.2%; E = 92.2%). This trend remained unchanged after intervention.

Before intervention, over 60% of participants took caffeinated tea/coffee with meals before intervention (C = 66.7%). There was an observed reduction in the percentage of participants that took caffeinated tea/coffee with meals in the experimental group after intervention (E = 7.8%).

Fewer than 20% of participants indicated that they removed fat from meat before cooking at baseline (C = 14.6%; E = 17.9%); and that they removed chicken skin before cooking (C = 15.8%; E = 11.8%). After the experimental group received nutrition education, an improvement was observed in those participants who removed fat and chicken skin before cooking (95% CI for the percentage difference [55.8%; 71.6 %*]).

At baseline, about 20% of participants reported that they consumed low fat milk and products (C = 14.15%; E = 20.1%). Although the percentages who indicated consuming low fat milk and products were still low after the intervention, the percentage change (C = 1.9%; E = 16.3%) indicates some improvements in the experimental group's consumption of low fat milk and products after the experimental group received nutrition education.

An improvement was also noted in the experimental group in their reported consumption of sugary drinks in between meals, the percentage of which declined significantly after receiving nutrition education (C = 73.6%, E = 29.9%); (95% CI for the percentage difference [7.1%; 20.7%*]).

Table 4.30 presents results of eating practices in relation to recommendations of the SAFBDG before and after intervention.

Table 4.30 Intake of foods based on the SAFBDG

Name of food/action	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Variety of Foods	204		245		102		153	
Yes	75	36.8	122	49.8	38	36.9	121	78.6
No	129	63.2	123	50.2	65	63.1	33	21.4
Drink water	205		245		105		153	
Yes	201	98.1	228	93.1	97	91.5	153	99.4
No	4	1.9	17	6.9	9	8.5	1	0.7
Drink tea/ Coffee	205		245		105		153	
Yes	191	93.2	228	93.1	100	94.3	142	92.2
No	14	6.8	17	6.9	6	5.7	12	7.8
Drink caffeinated T/C	204		244		104		153	
Yes	136	66.7	139	56.9	69	65.1	12	7.8
No	68	33.3	105	43.0	36	33.9	142	92.2
Remove fat fm/ meat	205		245		105		152	
Yes	30	14.6	44	17.9	15	14.2	104	67.9
No	175	85.4	201	82.0	91	85.9	49	32.0
Remove chicken skin	204		245		104		153	
Yes	32	15.7	29	11.8	15	14.2	118	76.6
No	172	84.3	216	88.2	91	85.9	36	23.4
Add fats/ oils to meat	205		245		105		153	
Yes	42	20.5	60	24.5	14	13.2	8	5.2
No	163	79.5	185	75.5	92	86.8	146	94.8
Eat low fat milk/products	205		245		105		153	
Yes	29	14.2	20	8.2	15	15.1	31	20.1
No	176	85.9	224	91.8	90	84.9	123	79.9
Add salt when cooking	205		245		105		153	
Yes	194	94.6	229	93.5	100	94.3	140	90.9
No	11	5.4	16	6.5	6	5.7	14	9.1
Add salt at table	205		244		105		153	
Yes	53	25.9	52	21.2	24	22.6	3	1.9
No	152	74.2	193	78.8	81	76.4	151	98.1

Table 4.30: Intake of foods based on the SAFBDG (Continued)

Name of food/action	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	yes	%	yes	%	yes	%	yes	%
Eat sugary snacks	205		245		105		153	
Yes	140	68.3	157	64.1	71	66.9	46	29.9
No	65	31.7	88	35.9	35	33.0	108	70.1
Sugary drinks					105		153	
Yes	156	76.1	175	71.4	78	73.6	46	29.9
No	49	23.9	70	28.6	28	26.4	108	70.1

A healthy change was considered eating a variety of foods, drinking not less than eight glasses of water per day, not drinking caffeinated tea/coffee with meals, removing visible fat from meat before cooking, removing chicken skin before cooking, not adding fats/oils to meat when cooking, eating low fat milk and products, preparing meals with reduced salt, not adding salt to food at table and reducing intake of sugary snacks and sugary drinks (Table 4.31).

Table 4.31: Healthy change in intake of foods based on the SAFBDG from baseline to post-intervention

Type of food	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
Variety of foods	204/204	100	103/103	100	-3.4%; 3.4	245/245	100	154/154	100	25%; 40.9%
Drink water	205/205	100	106/106	100	-12.0%; -0.8%*	245/245	100	154/154	100	3.0%; 12.5%
Remove fat f/m meat	205/205	100	106/106	100	-7.4%; 1.3%	245/245	100	153/153	100	40%; 57.2%*
Remove fat f/m chicken skin	204/204	100	106/106	100	-8.2%; 2.1%	245/245	100	154/154	100	55.8%; 71.6%*
Add fats/oils to meat	205/205	100	106/106	100	-6.8%; 2.7%	245/245	100	154/154	100	-23.1%; -8.5%
Eat low fat milk products	205/205	100	106/106	100	-6.1%; 4.1%	244/244	100	154/154	100	7.1%; 20.7%*
Add salt when cooking	205/205	100	106/106	100	-5.2%; 5.2%	245/245	100	154/154	100	-6.7%; 3.9%
Add salt at table	205/205	100	105/106	99.1	-7.9%; 1.9%	245/245	100	154/154	100	-26.3%; -12.0%*
Eat sugary snacks	205/205	100	106/106	100	-2.9%; 4.8%	245/245	100	154/154	100	-37.5%; -20.5%*
Sugary drinks	205/205	100	106/106	100	-5.0%; 3.0%	245/245	100	154/154	100	-44.4%; -27.8%*

*Indicates a statistically significant result

According to Table 32, the median number of glasses of water that participants drank per day was four before intervention (range 1 -11 glasses), and significantly improved to eight after intervention in the experimental group (95% confidence interval for the median difference [-4; -2]).

Table 4.32: Number of glasses of water drank per day

	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
*1 glass	52	25	81	33	32	30	96	62
2 glasses	70	34	97	40	33	35	44	29
3 glasses	76	37	55	22	34	32	13	8
4 glasses	7	3	12	5	3	3	1	1
5 glasses	0	0	0	0	3	3	8	5
6 glasses	0	0	0	0	21	21	16	10
7 glasses	0	0	0	0	1	1	0	0
8 glasses	0	0	0	0	19	19	120	78
10 glasses	0	0	0	0	1	1	2	1
11 glasses	0	0	0	0	1	1	1	1

*1 glass = 1 glass and drinking water when thirsty

4.8 Nutrition-related knowledge, attitudes, beliefs and practices

This part describes results pertaining to knowledge, attitudes, beliefs and practices related to food (practices also include food habits). Healthy changes from pre- to post- intervention are also described.

4.8.1 Nutrition-related kknowledge

To assess basic knowledge about nutrition, participants were asked general nutrition-related questions informed by nutrition knowledge based on the recommendations of the FGP and the SAFBDG in which they indicated whether the statements put to them were true or false.

According to Table 4.33, the majority of participants already possessed a relatively good level of nutrition-related knowledge at baseline. The areas which were poorly represented in knowledge included knowledge that caffeinated tea/coffee should not be eaten with meals (C = 32.7%; 25.31%); that drinking a glass of milk once a week was not enough for the body (C = 36.7%; E = 41.2%); that rice gave as much energy as cereal (C = 41.7%; E = 34.7%); that eating less than six slices of bread per day was not good for health (C = 41.7%, E = 37.9%); and that eating two eggs every day was not good for health (C = 22.1%; E = 19.2%).

After intervention, the experimental group's nutrition-related knowledge improved significantly in all the areas and in particular in the areas in which knowledge was low at baseline. For example, improvements were seen in the percentages of participants that knew that caffeinated tea/coffee should not be taken with meals (95% CI for the percentage difference [-25.9; 12.4]); that drinking a glass of milk once a week was not enough for the body (95% CI for the percentage difference [-47.6;31.4]); and that eating less than six slices of bread per day was not good for health (95% CI for the percentage difference [1.6; 12.1]).

The experimental group's knowledge that rice gave as much energy as cereal did not however, improve significantly after intervention (95% CI for the percentage difference [-18.1; 1.5]).

Table 4.33 presents a list of these statements as well as participants' responses to them. Healthy change from pre to post intervention is also shown in Table 4.33.

Table 4.33: Nutrition-related knowledge

Nutrition-related knowledge assessed	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Milk is a good source of calcium	199		245		105		154	
True	153	79.9	198	80.8	93	88.6	154	99.4
False	1	0.5	3	1.2	1	0.9	0	0.0
Do not know	39	19.6	44	17.9	11	10.5	1	0.7
Eating yellow and green vegetables and fruits everyday is good for health	198		245		104		154	
True	165	83.3	213	86.9	92	88.5	155	100.0
False	10	5.1	6	2.5	4	3.9	0	0.0
Do not know	23	11.6	26	10.6	8	7.7	0	0.0
Eating five fruits and vegetables everyday protects body from illness	199		245		105		154	
True	142	71.4	191	77.9	73	69.5	154	99.4
False	25	12.6	20	8.2	12	11.4	0	0.0
Do not know	32	16.1	34	13.9	20	19.1	1	0.7
Eating less than six slices of bread a day is a healthy way to eat	199		245		105		154	
True	83	41.7	93	37.9	41	39.1	2	1.3
False	59	29.7	69	28.2	33	31.4	151	97.4
Do not know	57	28.6	82	33.5	31	29.5	2	1.3
I should eat a lot of sugar to have energy	199		245		105		154	
True	62	31.2	69	28.2	33	31.4	3	1.9
False	95	47.7	124	50.6	44	41.9	151	97.4
Do not know	42	21.1	52	21.2	28	26.7	1	0.7
My body gets energy from papa, bread, rice, cereals, pasta	198		245		104		153	
True	161	81.3	200	81.9	82	78.9	153	98.7
False	13	6.6	17	6.9	7	6.7	0	0.0
Do not know	24	12.1	27	11.1	15	14.4	2	1.3
Drinking two glasses of water a day is enough for my body	199		245		105		154	
True	31	15.6	33	13.5	14	13.3	5	3.2
False	135	67.8	175	71.4	79	75.2	148	95.5
Do not know	33	16.6	37	15.1	12	11.4	2	1.3
Eating a lot of meat is healthier than eating a lot of vegetables and fruit	199		245		105		154	
True	51	25.6	61	24.9	20	19.1	6	3.9
False	96	48.2	141	57.6	62	59.1	149	96.1
Do not know	52	26.1	43	17.6	23	21.9	0	0.0
I get the same nutrients from eating beans as I get from eating meat	199		244		105		153	
True	173	86.9	214	87.7	97	92.4	154	99.4
False	6	3.0	5	2.1	5	4.8	1	0.7
Do not know	20	10.1	25	10.3	3	2.9	0	0.0

Table 4.33: Nutrition-related knowledge (Continued)

Nutrition-related knowledge assessed	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Indigenous food-plants are good for my health	199		245		105		154	
True	174	87.4	215	87.8	101	96.2	155	100.0
False	5	2.5	7	2.9	1	0.9	0	0.0
Do not know	20	10.1	23	9.4	3	2.9	0	0.0
Eating fat from animal meat is good for my health	199		245		105		154	
True	43	21.6	57	23.3	14	13.3	3	1.9
False	103	51.8	142	57.9	67	63.8	151	97.4
Do not know	52	26.1	46	18.8	24	22.9	1	0.7
Vegetable oils are better for my health than animal fats	199		245		105		154	
True	122	61.3	156	63.7	71	67.6	152	98.1
False	16	8.0	30	12.2	9	8.6	2	1.3
Do not know	61	30.7	59	24.1	25	23.8	1	0.7
Caffeinated tea/coffee should be eaten with meals					105		154	
True	65	32.7	62	25.3	33	31.4	2	1.3
False	53	26.6	104	42.5	29	27.6	151	97.4
Do not know	81	40.7	79	32.2	43	40.9	2	1.3
Physical activity (exercise) is good for health	199		245		105		154	
True	179	89.9	217	88.57	100	95.2	152	98.1
False	5	2.5	10	4.08	1	0.9	0	0.0
Do not know	15	7.5	18	7.35	4	3.8	3	1.9
Rice does not give my body the same energy as cereal	199		245		105		154	
True	83	41.7	85	34.7	35	33.3	32	20.7
False	61	30.7	93	37.9	39	37.1	65	41.9
Do not know	55	27.6	67	27.4	31	29.5	58	37.4
Drinking a glass of milk once a week is enough for my body	199		245		105		154	
True	73	36.7	101	41.2	38	36.2	3	1.9
False	62	31.2	69	28.2	38	36.2	151	97.4
Do not know	64	32.2	75	30.6	29	27.6	1	0.7
Eating two eggs everyday is good for my health	199		245		105		154	
True	111	55.8	150	61.2	58	55.2	3	1.9
False	44	22.1	47	19.2	28	26.7	151	97.4
Do not know	61	30.7	59	24.1	25	23.8	1	0.7
Caffeinated tea/coffee should be eaten with meals					105		154	
True	65	32.7	62	25.3	33	31.4	2	1.3
False	53	26.6	104	42.5	29	27.6	151	97.4
Do not know	81	40.7	79	32.2	43	40.9	2	1.3

A healthy change was considered as an improvement in knowledge indicated by a correct response to all the preceding nutrition-related statements (Table 4.34).

Table 4.34: Healthy change in nutrition-related knowledge from baseline to post-intervention

Nutrition-related knowledge assessed	Control					Experimental				
	Baseline	%	Post – inter – vention	%	95% CI	Baseline	%	Post- inter - vention	%	95% CI
Milk is a good source of calcium	159/199	79.9	93/105	88.6	-3.3; 3.3	198/245	80.8	154/155	99.4	7.5;19.3*
Eating yellow and green vegetables and fruits everyday is good for health	165/198	83.3	92/104	88.5	-3.3;3.3	213/245	86.9	155/155	100	7.4;18.5*
Eating five fruits and vegetables everyday protects body from illness	142/199	71.4	73/105	69.5	-6.8;1.0	191/245	78.0	154/155	99.4	16.5;30.7*
Eating less than six slices of bread a day is a healthy way to eat	83/199	41.8	41/105	39.1	-1.7;3.7	93/245	38.0	2/155	1.3	-38.3; -22.9*
I should eat a lot of sugar to have energy	62/199	31.2	33/105	31.4	0.2;9.5*	69/245	28.2	3/155	1.9	-27.9;-14.5*
My body gets energy from papa, bread, rice, cereals, pasta	161/198	81.3	82/104	78.9	-5.3;3.2	200/244	82.0	153/155	98.7	9.4; 22.5*
Drinking two glasses of water a day is enough for my body	31/199	15.6	14/105	13.3	-2.6;4.8	33/245	13.5	5/155	3.2	-16.2;-3.7*

*Indicates a statistically significant result

Table 4.34: Healthy change in nutrition-related knowledge from baseline to post-intervention (Continued)

Nutrition-related knowledge assessed	Control					Experimental				
	Baseline	%	Post – inter – vention	%	95% CI	Baseline	%	Post-inter - vention	%	95% CI
Indigenous food-plants are good for my health	174/199	87.4	101/105	96.2	-2.9;5.3	215/245	87.8	155/155	100	3.7;13.1*
Eating fat from animal meat is good for my health	43/199	43	14/105	13.3	-2.6;4.8	57/245	23.3	3/155	1.9	-25.2;-11.9*
Vegetable oils are better for my health than animal fats	122/199	61.3	71/105	67.6	-6.2;2.4	156/245	63.7	152/155	98.1	24.1;39.6*
Caffeinated tea/coffee should be eaten with meals	65/199	32.7	33/105	31.4	-1.5;5.4	62/245	25.3	2/155	1.3	-25.9;12.4*
Physical activity (exercise) is good for health	179/199	90.0	100/105	95.2	-3.7;3.7	217/245	88.6	152/155	98.1	1.6;12.1*
Rice does not give my body the same energy as cereal	83/199	41.7	35/105	33.3	-4.8;2.9	85/245	34.7	32/155	20.7	-18.1;1.5
Drinking a glass of milk once a week is enough for my body	73/199	36.7	38/105	36.2	-3.3;3.3	101/245	41.2	3/155	1.9	-47.6;-31.4*
Eating two eggs everyday is good For my health	111/199	55.8	58/105	55.2	-1.9;1.9	150/245	61.2	3/155	1.9	-65.6;-45.5*

*Indicates a statistically significant result

4.8.2 Nutrition- related attitudes

To assess participants' nutrition-related attitudes towards food and nutrition, they were presented with statements to which they indicated whether they agreed or disagreed with the statements. Healthy change from pre to post intervention is also reported.

According to Table 4.35, more than 60% of participants indicated that they did not like eating animal fat (C= 62.31%; E = 67.6%) at baseline. After intervention this positive attitude improved even more significantly in the experimental group (95% CI for the percentage difference [-25.2; 11.9]).

At baseline, the majority of participants indicated that they believed that eating a variety of foods was good for their health (C = 54.77%; E = 60.82%). Despite this, a significant improvement was still observed in the experimental group after receiving nutrition education (95% CI for the percentage difference [-25.1; -12.2]).

Participants were almost split equally with regards to whether they liked to eat foods that made them fat (C = 45.73%; E = 31.02%) and not liking to eat food that made them fat (C = 43.72%; E = 53.47%). However, this changed after intervention with the experimental group improving in this attitude after receiving nutrition education (95% CI for the percentage difference [-21.2; -0.5]).

At baseline, more than 60% of participants believed that the food they ate could affect their health in future (C = 62.31%; E = 67.76%). This positive attitude further improved significantly in the experimental group after receiving nutrition education (95% CI for the percentage difference [17.6; 32.2]).

For most statements related to attitudes, an improvement was seen in the experimental group after intervention. Although minimal, the same was not true for the control group.

Table 4.35: Nutrition-related attitudes

Attitude	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Eating fat from animal meat makes me feel well	199		245		105		154	
Agree	44	22.1	52	21.2	20	19.1	3	1.9
Disagree	124	62.3	164	66.9	71	67.6	151	97.4
Do not know	31	15.6	29	11.8	14	13.3	1	0.7
Eating different kinds of food is a waste	199		245		105		154	
Agree	40	20.1	49	20.0	21	20.0	1	0.7
Disagree	109	54.8	149	60.8	63	60.0	154	99.4
Do not know	50	25.1	47	19.2	21	20.0	0	0.0
I like eating food that will make me fat	199		245		105		154	
Agree	91	45.7	76	31.0	39	37.1	34	21.9
Disagree	87	43.7	131	53.5	59	56.2	120	77.4
Do not know	21	10.6	38	15.5	7	6.7	1	0.7
I only buy food that is good for my body	199		243		105		152	
Agree	142	71.4	162	66.7	80	76.2	130	83.89
Disagree	31	15.6	34	13.9	14	13.3	24	15.5
Do not know	26	13.1	47	19.34	11	10.5	1	0.7
I only buy food that I can afford	199		245		105		154	
Agree	175	87.9	222	90.6	92	87.6	155	100.0
Disagree	17	8.5	16	6.5	10	9.5	0	0.0
Do not know	7	3.5	7	2.9	3	2.9	0	0.0
I believe that the food I eat now will affect my health in future	199		245		105		154	
Agree	124	62.3	166	67.8	70	66.7	153	98.7
Disagree	20	10.1	22	8.9	7	6.7	1	0.7
Do not know	55	27.6	57	23.3	28	26.7	1	0.7
I just do not have time to think about food and nutrition	199		245		105		154	
Agree	60	30.15	66	26.94	28	26.67	0	0.00
Disagree	116	58.29	152	62.04	69	65.71	155	100.0
Do not know	23	11.56	27	11.02	8	7.62	0	0.0

Table 4.35: Nutrition-related attitudes (Continued)

Attitude	Pre-intervention				Post-intervention			
	Control		Experimental		Control n = 104-105		Experimental n = 155	
	N	%	N	%	N	%	N	%
My husband/partner/men like it when I am fat	193		238		104		153	
Agree	44	22.8	35	14.7	22	21.2	1	0.7
Disagree	81	41.9	105	44.1	49	47.1	128	82.6
Do not know	68	35.2	98	41.2	33	31.7	26	16.8
I eat what I like and do not really care if it is healthy or not	199		245		105		154	
Agree	86	43.2	93	37.9	51	48.6	116	74.8
Disagree	86	43.2	121	49.4	46	43.8	39	25.2
Do not know	26	13.1	31	12.7	8	7.6	0	0.0
I believe that my husband/Partner deserves to get good food than the children	194		237		104		153	
Agree	24	12.4	27	11.4	16	15.2	5	3.2
Disagree	148	76.3	191	80.6	79	75.2	148	95.5
Do not know	20	10.3	19	8.0	10	9.5	2	1.3

A healthy change in nutrition-related attitudes was considered as a change from a negative attitude to a positive attitude related to statements about food and nutrition (Table 4.36).

Table 4.36 Healthy change in nutrition-related attitudes from baseline to post-intervention

Attitude	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
Eating fat from animal Meat makes me feel well	44/199	22.1	20/105	19.1	-2.9; 2.9	52/245	21.2	3/155	1.9	-25.2; 11.9*
Eating different kinds of Food is a waste	40/199	20.1	21/105	20.0	-4.3; 2.3	49/245	20.0	1/155	0.7	-25.1; -12.2*

*Indicates a statistically significant result

Table 4.36 Healthy change in nutrition-related attitudes from baseline to post-intervention (Continued)

Attitude	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
I like eating food that will make me fat	91/199	45.7	39/105	37.1	-3.3; 3.3	76/245	31.0	34/155	21.9	-21.2; -0.5*
I only buy food that is good for my body	142/199	71.4	80/105	76.2	-5.8; 5.8	162/243	66.7	130/155	83.9	3.4; 22.6*
I believe that the food I eat now will affect my health in future	124/199	62.3	70/105	66.7	-8.2; 2.4	166/245	67.8	153/155	98.7	17.6; 32.2*
I just do not have time To think about food and nutrition	60/199	30.2	28/105	26.7	-2.5; 2.5	66/245	26.9	155/155	100.0	-25.7; -12.9*
My husband/ partner/men like it when I am fat	44/193	22.8	22/104	21.2	-2.3; 4.4	35/238	14.7	1/155	0.7	-21.7; -9.2*
I eat what I like and do not really care if it is healthy or not	86/199	43.2	51/105	48.6	-1.6; 3.5	93/245	38.0	116/155	74.8	19.1; 40.9*
I believe that my husband/ Partner deserves to get good food than the children	24/192	12.4	16/105	15.2	-4.1; 4.1	27/237	22.4	5/155	3.2	-15.4; -3.5*

*Indicates a statistically significant result

4.8.3 Beliefs

Beliefs related to foods are depicted by results obtained about beliefs informed by the health belief model, self-efficacy, theory of reasoned action and theory of planned behaviour, locus of control and social support. These are reported in the following section:

4.8.3.1 HBM (I) as it explains nutrition-related beliefs

Participants' beliefs were assessed using the questioning mode of the HBM. Four constructs of the HBM were used to assess whether participants believed in the benefits/pros of eating a healthy diet, in their own vulnerability to disease that might be caused by not eating a healthy diet, what they perceived as barriers to eating a healthy diet and what they believed enabled their eating a healthy diet. Healthy change from pre to post intervention is also presented where applicable.

(i) Benefits/pros of eating a healthy diet

Even before intervention, participants reported many perceived benefits of eating a healthy diet. According to Table 4.37, some perceived benefits were reported more commonly than others. For example, at baseline, the following perceived benefits were reported more often than others: 'protection or prevention of disease' (C =38.2%; E = 43.3%), 'good nutrition, energy, fitness, good body growth, good strong body' (C=59.3%; E = 48.9%) and 'good physical and mental health, general good feeling of wellness (C = 49.7%; E = 41.2%)'. After intervention, these perceptions remained more or less the same relative to the dropout rate.

(ii) Vulnerability /Cons of not eating a healthy diet

Regarding perceived cons of not eating well, at baseline participants reported that if they did not eat a healthy diet they would be vulnerable to diseases (e.g., diabetes, high blood pressure), sickness (mentally and physically) and recurrent diseases (C = 66. 3%; E = 54.3%). They also perceived a lack of energy, lethargy, fatigue and tiredness (C = 34.7. %; E = 32.2 %), and perceived loss of weight (C = 37.7 %; E = 27.3 %). According to participants these were the other major cons of not eating well.

(iii) Barriers to eating a healthy diet

At baseline, the majority of participants reported that barriers to eating a healthy diet included lack of money, poverty and unemployment (underemployment) and that food was expensive and therefore they lacked food to cook (C = 80.4%; E =75.1%). After intervention, this perception was reported less in both the control and experimental groups (C = 44.4; E = 48.4). Participants also indicated that they did not eat a healthy diet because of a lack of knowledge (and a lack of knowledge of good food preparation methods) (C = 13.1%; E = 21.6%). This perception was reported more after intervention by the experimental group (C = 5.8%; E = 38.6%).

(vi) Enablers to eating a healthy diet

The majority of participants indicated that factors that enabled them to eat a healthy diet were having money, being employed and getting better pay (C = 59.3%; E = 53.9%); producing food/vegetables and fruits in the garden and fields (C = 35.7%; E = 29.8%) and having knowledge and getting motivation from other people (C = 13.6%; E = 15.9%). After intervention the first two perceptions were reported less in both groups (C = 31.9%; E = 30.5%) and (C = 20.3%; 24.8%) respectively, while the latter perception was reported more by the experimental group (C = 8.2%; E = 41.5%).

Between 1% and 4% of participants reported a number of factors that they perceived would enable them to eat a healthy diet as indicated in Table 4.36 above. These also did not change after intervention.

Table4.37: Nutrition-related beliefs informed by the HBM (I)

Belief	Pre-Intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Protection / prevention of disease	76	38.2	106	43.3	47	22.7	90	36.6
Good nutrition, energy, fitness, good body growth, good strong	118	59.3	120	48.9	56	27.1	69	28.0
Desirable weight, good body, beautiful body, good body posture	2	1.0	12	4.9	5	2.4	23	9.3
I would be fat	13	6.5	12	4.9	4	1.9	1	0.4
Good physical and mental health, general good feeling of wellness	99	49.7	101	41.2	56	27.0	99	40.2
Good skin, beautiful skin	3	1.5	5	2.0	1	0.5	3	1.2
Immune boost, strong immune system, improve immune system	8	4.0	7	2.9	3	1.4	7	2.8
Longevity	4	2.0	4	2.0	4	1.9	5	2.0
Reduce the impact of diseases, better health	1	0.5	6	2.4	1	0.5	4	1.6
Normal blood pressure/reduced impact of diabetes	2	1.0	6	2.4	0	0.0	2	0.8
Strong bones and teeth	5	2.5	6	2.4	2	0.9	1	0.4
Improved appetite	0	0.0	1	0.4	0	0.0	2	0.8
Prevent malnutrition	0	0.0	2	0.8	0	0.0	3	1.2
I would be happy	0	0.0	2	0.8	0	0.0	2	0.8
Promote good wound healing	2	1.0	0	0.0	0	0.0	0	0.0
Inner peace	1	0.5	1	0.4	0	0.0	0	0.0
Good mental health	1	0.5	0	0.0	1	0.9	3	1.2
Vitamin C and other vitamins	3	1.5	13	5.3	0	0.0	1	0.4
Good sleep	0	0.0	0	0.0	0	0.0	1	0.4
Cons of not eating well:								
Having no husband	0	0.0	1	0.4	0	0.0	1	0.4
Will have a disability	1	0.5	1	0.4	0	0.0	1	0.4
Poor wound healing	2	1.0	0	0.0	0	0.0	0	0.0
General feeling of being unwell	0	0.0	1	0.4	0	0.0	1	0.4
Aggravate already existing diseases	0	0.0	1	0.4	0	0.0	1	0.4

Table4.37: Nutrition-related beliefs informed by the HBM (I) (continued)

Belief	Pre-Intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Unhappiness/depression	1	0.5	1	0.4	0	0.0	1	0.4
Headache	0	0.0	1	0.4	0	0.0	1	0.4
Stress	0	0.0	1	0.4	0	0.0	1	0.4
TB	0	0.0	1	0.4	0	0.0	1	0.4
Swollen feet	0	0.0	1	0.4	0	0.0	1	0.4
Poor mental health	0	0.0	1	0.4	0	0.0	1	0.4
Weak immune system	2	0.5	11	4.5	1	0.5	6	2.4
Vulnerability to diseases	132	66.3	133	54.3	72	34.8	123	50.0
Lack of energy, lethargy, fatigue	69	34.7	79	32.2	34	16.4	52	21.1
Loss of weight	75	37.7	67	27.3	43	20.8	24	9.8
Gain weight, getting too fat, overweight, bad body posture	16	8.0	16	6.5	7	3.4	25	10.2
Diarrhoea/vomiting/headache	2	1.0	0	0.0	1	0.5	1	0.4
Bile (nyooko)	2	1.0	1	0.4	1	0.5	0	0.0
Malnutrition (not getting nutrients)	10	5.0	26	10.6	4	1.9	15	6.1
Early old age	2	1.0	5	2.0	2	0.9	4	1.6
Pimpled skin/bad skin	1	1.0	4	1.6	1	0.5	1	0.4
Low blood	3	1.5	4	1.6	3	1.4	2	0.8
Too thin/ unhealthy loss of weight	0	0.0	0	0.0	2	0.9	1	0.4
Premature death	0	0.0	3	1.2	0	0.0	2	0.8
High blood/diabetes	0	0.0	6	2.4	0	0.0	7	2.8
Bad sight	1	0.5	1	0.4	0	0.0	2	0.8
Dry lips/ dehydration	0	0.0	1	0.4	1	0.5	0	0.0
Pellagra	2	1.0	0	0.0	2	0.9	0	0.0
Not sleep well	0	0.0	1	0.4	0	0.0	1	0.4
Barriers to eating a healthy diet:								
Having to pay school fees	0	0.0	7	2.9	0	0.0	7	2.8
Not budgeting	1	0.5	1	0.4	0	0.0	1	0.4
Not caring/not value good health	4	2.0	9	3.7	0	0.0	9	3,7
Being stingy (to buy food)	0	0.0	1	0.4	0	0.0	1	0.4
Inaccessibility/seasonality	1	0.5	0	0.0	1	0.5	0	0.0
Greed (wanting to eat everything that not supposed to it, eating too much)	0	0.0	2	0.8	0	0.0	2	0.8
Lack of fields, seeds and other farm implements	3	1.5	5	2.0	6	2.9	5	2.0
Lack of money, expensive, poverty, unemployment (underemployment), lack of food to cook	160	80.4	184	75.1	92	44.4	119	48.4
Lack of knowledge (lack of knowledge of good preparation methods)	26	13.1	53	21.6	12	5.8	95	38.6

Table4.37: Nutrition-related beliefs informed by the HBM (I) (continued)

Belief	Pre-Intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Laziness, lack of strength, energy, tiredness	8	4.0	15	6.1	6	2.9	14	5.7
Not producing food in the fields-garden	5	2.5	15	6.1	4	1.9	12	4.9
Drinking	4	2.0	1	0.4	3	1.4	1	0.4
Stress, sickness	8	4.0	12	4.9	6	2.9	17	6.9
Lack of appetite, not liking certain foods	3	1.5	8	3.3	2	0.9	5	2.0
Lack of time	2	1.0	19	7.8	3	1.4	17	6.9
Big family (disabled husband), too many children	0	0.0	2	0.8	0	0.0	3	1.2
Unavailability from the shops, affordability, healthy foodstuffs expensive	6	3.0	2	0.8	3	1.4	1	0.4
Craving of food/ lack of will power/ liking nice food	2	1.0	5	2.0	0	0.0	2	0.8
Drought/ lack of water	0	0.0	9	3.7	0	0.0	5	2.0
Not asking for help	0	0.0	1	0.4	0	0.0	0	0.0
Inflation	0	0.0	1	0.4	0	0.0	1	0.4
Lack of fridge	2	1.0	1	0.4	1	0.5	1	0.4
Not wanting to be fat/to gain weight	2	1.0	0	0.0	2	0.9	0	0.0
Cannot eat well because has to select food because of diabetes and high blood	1	0.5	1	0.4	0	0.0	0	0.0
Lack of cooking facilities	1	0.5	0	0.0	1	0.5	0	0.0
Enablers to eating a Healthy diet:								
Manageable family size	0	0.0	1	0.4	0	0.0	0	0.0
Being able to access credit	2	1.0	3	1.2	0	0.0	0	0.0
Availability/accessibility	2	1.0	0	0.0	1	0.5	3	1.2
Having appetite	1	0.5	0	0.0	0	0.0	0	0.0
Not drinking	0	0.0	1	0.4	0	0.0	0	0.0
Having food to eat	2	1.0	0	0.0	1	0.5	0	0.0
Buying good/healthy food	5	2.5	2	0.8	0	0.0	0	0.0
Cooking well	0	0.0	3	1.2	0	0.0	1	0.4
Through prayer, going to church	1	0.5	0	0.0	0	0.0	0	0.0
Producing food/vegetables and fruits in the garden/ fields	71	35.7	73	29.8	42	20.3	61	24.8
Money, employment, getting better pay	118	59.3	132	53.9	66	31.9	75	30.5
Sale of vegetables and snacks	4	2.0	9	3.7	0	0.0	7	2.8
Knowledge, motivation from other people	27	13.6	39	15.9	17	8.2	102	41.5
Being well, strength, good health, energy	4	2.0	7	2.9	1	0.5	11	4.5
Water for watering plants	0	0.0	1	0.4	0	0.0	0	0.0
Working hard, good business, self-employment	5	2.5	7	2.9	7	3.4	5	2.0
Having land (fields)	3	1.5	1	0.4	2	0.9	1	0.4
Time	0	0.0	10	4.1	3	1.4	17	6.1

Table4.37: Nutrition-related beliefs informed by the HBM (I) (Continued)

Belief	Pre-Intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Eating good food	0	0.0	3	1.2	2	0.9	8	3.3
Budgeting, planning	0	0.0	2	0.8	0	0.0	5	2.0
Good rains	0	0.0	3	1.2	0	0.0	3	1.2
Rearing animals and poultry	3	1.5	1	0.4	3	1.4	1	0.4
Asking for help/ being given food by friends	4	2.0	3	1.2	0	0.0	0	0.0
Hoeing the fields and getting money from that to buy food	0	0.0	0	0.0	0	0.0	1	0.4
Having someone to support me	1	0.5	1	0.4	0	0.0	0	0.0
Having a milk cow	2	1.0	0	0.0	1	0.5	0	0.0
Bartering farm produce/selling farm produce	2	1.0	8	3.3	0	0.0	0	0.0
Listening to the radio/watching television	2	1.0	7	2.9	0	0.0	0	0.0
Fiend	0	0.0	8	3.3	0	0.0	0	0.0
Nurse/doctor	0	0.0	4	1.6	0	0.0	0	0.0

4.8.3.2 Nutrition-related beliefs informed by the HBM (II)

Participants' perceived personal vulnerability to contracting diseases if they did not eat a healthy diet was further assessed by asking several belief statements guided by the HBM, in which they indicated whether they agreed or disagreed with the statements (Table 4.38).

At baseline, the majority of participants believed in their vulnerability to developing diseases easily if they did not eat a healthy diet (C = 83.9%; E = 86.5%). After intervention there was a significant improvement in the percentage of participants from the experimental group after receiving nutrition education (95% CI for the percentage difference [5.8; 16.2]).

At baseline about 50% of participants (C = 55.8%; E = 48.9%) believed that they could develop diabetes if they did not eat a healthy diet. A significant improvement in this perception was observed in the experimental group after receiving nutrition education (95% CI for the percentage difference [37.9; 53.9]);

Before intervention, nearly 80% of participants believed in the seriousness/severity of developing diabetes if they did not eat a healthy diet. This perception also improved significantly after intervention in the experimental group (95% CI for the percentage difference

[12.7; 26.7]). The experimental participants' belief that they could protect themselves from developing disease by eating a healthy diet also improved significantly after the intervention (95% CI for the percentage difference [5.3; 15.4]).

Table 4.38: Nutrition-related beliefs informed by the HBH (II)

Belief	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
I am at risk of developing diseases easily if I do not eat a healthy diet	199		245		105		154	
Agree	167	83.9	212	86.5	95	90.5	155	100.0
Disagree	12	6.0	9	3.7	5	4.8	0	0.0
Do not know	20	10.1	24	9.8	5	4.8	0	0.0
I believe that I can develop diabetes if I do not eat a healthy diet	199		245		105		154	
Agree	111	55.8	120	48.9	58	55.2	151	97.4
Disagree	38	19.1	51	20.8	29	27.6	2	1.3
Do not know	50	25.1	74	30.2	18	17.1	2	1.3
I believe that developing diabetes has very serious consequences for my health	199		245		105		154	
Agree	156	78.4	189	77.1	90	85.7	152	98.0
Disagree	8	4.0	11	4.5	3	2.9	0	0.0
Do not know	35	17.6	45	18.4	12	11.4	3	1.9
I believe that I can protect myself from developing diseases by eating a healthy diet	199		245		105		154	
Agree	157	78.9	213	86.9	86	81.9	155	100.0
Disagree	15	7.5	11	4.5	9	8.6	0	0.0
Do not know	27	13.6	21	8.6	10	9.5	0	0.0

A healthy change in nutrition-related beliefs was considered as a change from a negative belief to a positive attitude related to statements about food and nutrition (Table 4.39).

Table 4.39: Healthy change in nutrition-related beliefs informed by the HBM (II) from baseline to post-intervention

Belief	Control					Experimental				
	Baseline	%	Post-intervention	%	95% CI for % diff	Baseline	%	Post-intervention	%	95% CI for % diff
I am at risk of developing diseases easily if I do not eat a healthy diet	167/199	83.9	95/105	90.5	-3.6; 5.7	212/245	86.5	155/155	100.0	5.8; 16.2*
I believe that I can develop diabetes if I do not eat a healthy diet	111/199	55.8	58/105	55.2	-3.2; 3.2	120/245	49.0	151/155	97.4	37.9; 53.9*
I believe that developing diabetes has very serious consequences for my health	156/199	78.4	90/105	85.7	-4.1; 4.1	189/245	77.1	152/155	98.1	12.7; 26.7*
I believe that I can protect myself from developing diseases by eating a healthy diet	157/199	78.9	86/105	81.9	-77; 5.8	213/245	86.9	155/155	100.0	5.3; 15.4*

*Indicates a statistically significant result

4.8.4 Nutrition-related beliefs informed by self-efficacy theory

To establish self-efficacy, participants were presented with statements denoting self-efficacy to indicate their level of confidence in their ability to perform certain actions regarding food (Table 4.40). Healthy change from pre to post intervention is also reported in Table 4.41.

At baseline, 30% of participants indicated that they had confidence that they could eat a healthy diet every day (C = 32.3%; E = 31.9%). After intervention the experimental group improved significantly in confidence (C = 29.9%; E = 95.5%); (95% CI for the percentage difference [61.5; 76.7]).

To determine whether or not participants had the food to enable them to eat a healthy diet every day, they were asked if they had the following foods in their houses: breakfast cereal, pasta, rice, mealie-meal, samp, vegetables, fruits, meat, beans, peas, milk, eggs and bread flour.

The percentage of participants that indicated that they had these foods at baseline included (in descending order) mealie-meal (C = 99.5%; E = 98.4%), (leaving very small room for improvement after intervention); vegetables (C = 87.4%; E = 91.8%), (also leaving very small room for improvement); and beans (C = 68.8%; E = 64.5%) with a significant improvement in the experimental group after nutrition education (95% CI for the percentage difference [25.5; 40.7]). Bread flour was also among the most frequently reported food items available in the house (C = 60.8%; E = 57.9%), also improving significantly in the experimental group after nutrition education 95% CI for the percentage difference [28.7; 45.5]).

At baseline, currently having milk in the house was reported by about 40% of the participants while after intervention it was reported by 75% of the participants in the experimental group. The experimental group showed a significant improvement after the intervention as indicated by the 95% CI for the percentage difference [26.2; 42.2]. The other foods which were reported less at baseline also significantly improved in the experimental group after intervention. These were: fruits (95% CI for the percentage difference [34.2; 50.4]); breakfast cereal (95% CI for the percentage difference [36.3; 5.2]); rice (95% CI for the percentage difference [17.9; 32.2]); and peas (95% CI for the percentage difference [4.8; 20.9]).

To further assess self-efficacy, participants were asked to indicate their confidence in performing certain activities related to food and other life style factors. Participants were asked if they had money to buy food, ability to grow vegetables in the garden, removed fat from meat every time before cooking, engaged in physical activity for 30 minutes or longer at least three times a week and if they tried to reduce the amount of salt in food.

Almost all the items except ability to grow vegetables (C = 88.9%; E = 80.4%) were reported by less than 40% of the participants at baseline. After intervention, however, improvements were observed in all the items in the experimental group, some more significant than others as follows: ability to remove fat from meat every time before cooking (95% CI for the percentage difference [21.0; 39.0]); physical activity for 30 minutes or longer at least three times a week (95% CI for the percentage difference [29.5; 46.6]); and ability to try to reduce the amount of salt in food (95% CI for the percentage difference [2.1; 14.0]).

Table 4.40: Nutrition-related beliefs informed by self-efficacy theory

Self-efficacy	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
I can eat a healthy diet everyday	198		244		104		154	
Agree	64	32.3	78	31.9	28	26.9	148	95.5
Disagree	103	52.0	136	55.7	68	65.4	7	4.5
Do not know	31	15.7	30	12.3	8	7.7	0	0.0
I have the following foods in my house	199		245		105		154	
Breakfast cereal	33	16.6	53	21.6	26	24.8	100	64.5
Pasta	45	22.6	70	28.6	24	22.9	55	35.5
Rice	72	36.2	94	38.4	41	39.1	94	60.7
Mealie-meal	198	99.5	241	98.4	104	99.1	154	99.4
Samp	56	28.1	67	27.4	35	33.3	60	38.7
Vegetables	174	87.4	225	91.8	99	94.3	149	96.1
Fruits	77	36.7	106	43.3	41	39.1	124	80.0
Meat	51	25.6	81	33.1	31	29.5	69	44.5
Beans	137	68.8	158	64.5	77	73.3	145	93.6
Peas	55	27.6	622	25.3	37	35.2	60	38.7

Table 4.40: Nutrition-related beliefs informed by self-efficacy theory (Continued)

Self-efficacy	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
I have the following foods in my house	199		245		105		154	
Milk (post n = 153)	70	35.18	110	45.1	43	40.9	116	74.8
Eggs (post n = 153)	107	53.8	148	60.7	66	62.8	131	84.5
Soup (post n = 153)	58	29.2	82	33.6	36	34.3	54	34.8
Bread flour (post n = 147)	121	60.8	136	57.9	70	66.7	139	90.3
	N	%	N	%	N	%	N	%
Money to buy food	199		245		105		154	
Yes	56	28.3	81	33.1	34	32.4	57	36.8
No	142	71.7	164	66.9	71	67.6	94	60.7
Sometimes	0	0.0	0	0.0	0	0.0	4	2.6
Ability to grow vegetables in the garden	199		245		105		154	
Yes	177	88.9	197	80.4	90	85.7	131	84.5
No	22	11.1	48	19.6	15	14.3	23	14.8
sometimes	0	0.0	0	0.0	0	0.0	1	0.7
Remove fat from meat every time before cooking	199		245		105		151	
Yes	58	29.2	66	26.9	28	26.7	85	55.9
No	141	70.9	179	73.1	77	73.3	28	18.4
sometimes	0	0.0	0	0.0	0	0.0	39	25.7
Engage in physical activity for 30 minutes or longer at least three times a week	199		245		105		153	
Yes	50	25.1	52	21.2	19	18.1	95	61.7
No	149	74.9	193	78.8	86	81.9	40	25.9
sometimes	0	0.0	0	0.0	0	0.0	19	12.3
Try to reduce the amount of salt in food	199		245		105		154	
Yes	154	77.4	213	87.3	77	73.3	146	94.2
No	45	22.6	31	12.7	28	26.7	8	5.2
sometimes	0	0.0	0.00	0.0	0	0.0	1	0.7

A healthy change was considered as a change from a negative response to a positive response to a statement indicating self-efficacy (Table 4.41).

Table 4.41: Healthy change in nutrition-related self-efficacy from baseline to post-intervention

Self-efficacy	Control					Experimental				
	Baseline	**%**	**Post-intervention**	**%**	**95% CI for % diff**	**Baseline**	**%**	**Post-intervention**	**%**	**95% CI for % diff**
I can eat a healthy diet everyday	64/198	32.3	28/104	26.9		78/244	32.0	148/155	95.5	61.5; 76.7*
Foods that participants had in their houses										
Breakfast cereal	33/199	16.6	26/105	24.8	0.3; 13.3*	53/245	21.6	100/155	64.5	36.3; 52.1*
Pasta	45/199	22.6	24/105	22.9	-7.7; 3.8	70/245	28.6	55/155	35.5	0.8; 10.9*
Rice	72/199	36.2	41/105	39.1	-3.6; 1.7	94/245	38.4	94/155	60.7	17.9; 32.2*
Mealie-meal	198/199	99.5	104/105	99.1	-2.7; 5.2	241/245	98.4	154/155	99.4	-2.1; 3.8
Samp	56/199	24.1	35/105	33.3	-4.1; 9.8	67/245	27.4	60/155	38.71	5.6; 17. 7*
Vegetables	174/199	87.4	99/105	94.3	-3.6; 7.8	225/245	91.8	149/155	96.1	-1.0; 8.0
Fruits	77/199	38.7	41/105	39.1	-5.6; 5.6	106/245	43.3	124/155	80.0	34.2; 50.4*
Meat	51/199	25.6	31/105	29.5	-1.5; 5.5	81/245	33.1	69/155	44.5	7.2; 19.9*
Dries beans	137/199	68.8	77/105	73.3	-1.2; 8.9	158/245	64.5	145/155	93.6	25.5; 40.7*
Dried peas	55/199	27.6	37/105	35.2	-1.1; 8.8	62/245	25.3	60/155	38.7	4.8; 20.9*
Milk	70/199	35.1	43/105	41.0	-6.0; 2.2	110/244	45.1	116/155	74.8	26.2; 42.2*

Table 4.41: Healthy change in nutrition-related self-efficacy from baseline to post-intervention (Continued)

Self-efficacy	Control					Experimental				
	Baseline	%	Post-intervention	%	95% CI for % diff	Baseline	%	Post-intervention	%	95% CI for % diff
Eggs	107/199	53.8	66/105	62.7	-4.2; 4.2	148/244	60.7	131/155	84.5	19.9; 34.7*
Bread flour	121/199	60.8	70/105	66.7	-0.9; 6.7	136/235	57.9	139/154	90.3	28.7; 45.5*
Ability to grow vegetables in the garden	177/199	88.9	90/105	85.7	-7.6; 1.3	197/245	80.4	131/155	84.5	-1.4; 11.9
Remove fat from meat every time before cooking	58/199	29.2	28/105	26.7	-2.5; 2.5	66/245	26.9	85/152	55.9	21.0; 39.0*
Engage in physical activity for30 minutes or longer at least three times a week	50/199	25.1	19/105	18.1	-10.4; 0.6	52/245	21.2	95/154	61.7	29.5; 46.6*
Try to reduce the amount of salt in food	154/199	77.4	77/105	73.3	-7.7; 3.8	213/244	87.3	146/155	94.2	2.1; 14.0*

*Indicates a statistically significant result

4.8.3 Nutrition-related beliefs informed by TRA/TPB

To assess TRA and TPB, participants were asked to indicate their own beliefs regarding several statements informed by these theories. This was to establish whether participants were governed by social norms and social pressure and whether they believed in their own power to make decisions regarding food. These are reported in Table 4.42. Healthy change from pre to post intervention is also reported in Table 4.43.

According to Table 4.42, at baseline, more than 80% of participants indicated that they believed in their own power to make decisions about the food they ate (C = 82.8%; E = 87.7%) and that they had an intention to eat a healthy diet (C = 72.2%; E = 79.1%). On the other hand they indicated being under the influence of their husbands regarding the food they ate (C = 68.8%; E = 70.3%), and believing everything that the radio or television said about food (C = 61.1%, E = 47.8%). Most of these beliefs improved in the experimental group after the intervention, for example, participants improved on the belief that all the information that the nurse or health worker said about food was true (95% CI for the percentage difference [10.5; 23.8]); were no longer under the influence of husband/partner (95% CI for the percentage difference [-66.0; -49.9]); or their culture (95% CI for the percentage difference [-39.6; -24.1]); while the belief in every thing that the radio or television said about food did not improve as after intervention more women believed that all that the radio and television said about food was true. They also improved on their intention to eat a healthy diet (95% CI for the percentage difference [12.4; 25.0]); and on their own power to make decisions about the food they ate (95% CI for the percentage difference [7.9; 19.2]). However, after intervention, participants' belief that all the information that the radio and television said about food was true increased (95% CI for the percentage difference [11.1; 32.3]).

Negligible changes were observed in the control group.

Table 4.42: Nutrition-related beliefs informed by TRA/TPB

Belief/planned behaviour	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
I Eat what my neighbours and friends eat	198		245		104		154	
Agree	66	33.3	89	36.3	30	28.9	18	11.6
Disagree	70	35.4	97	39.6	37	35.6	101	65.2
Do not know	62	31.3	59	24.1	37	35.6	36	23.2
All the information that the radio and television say about food is true	198		243		104		154	
Agree	121	61.1	117	47.8	61	58.7	115	74.2
Disagree	21	10.6	40	16.3	10	9.6	27	17.4
Do not know	56	28.3	88	35.9	33	31.7	13	8.4
All the information that the nurse or health worker says about food is true	198		245		104		154	
Agree	158	79.8	192	78.4	92	88.5	153	98.7
Disagree	13	6.6	19	7.8	4	3.9	2	1.3
Do not know	27	13.6	34	13.9	8	7.7	0	0.0
I usually eat what my husband/partner likes	189		239		101		153	
Agree	130	68.8	168	70.3	69	66.9	22	14.2
Disagree	39	20.6	42	17.6	20	19.4	128	82.6
Do not know	20	10.6	29	12.1	14	13.6	5	3.2
I will not eat anything that is against my culture	198		245		104		154	
Agree	46	23.2	65	26.5	22	21.2	3	1.9
Disagree	99	50.0	139	56.7	65	62.5	149	96.1
Do not know	53	26.8	41	16.7	17	16.4	3	1.9
I intend to eat a healthy diet from now on	198		244		104		154	
Agree	143	72.2	193	79.1	79	75.9	155	100.0
Disagree	10	5.1	11	4.5	4	3.9	0	0.0
Do not know	45	22.7	40	16.4	21	20.2	0	0.0
I believe in my power to make decisions about the food I eat	198		244		104		154	
Agree	164	82.8	214	87.7	93	89.4	155	100.0
Disagree	19	9.6	14	5.7	9	8.7	0	0.0
Do not know	15	7.6	16	6.6	2	1.9	0	0.0

As indicated in Table 4.43, a healthy change was considered as a change from negative statements denoting lack of personal control, to positive statements denoting personal control.

Table 4.43: Healthy change in nutrition-related TRA/TPB from baseline to post-intervention

Belief/planned behaviour	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
I Eat what my neighbours and friends eat	66/198	33.3	30/104	28.9	-8.9; 1.1	89/245	36.3	18/155	11.6	-34.5; -17.1*
All the information that the radio and television say about food is true	121/198	61.1	61/104	58.7	-6.6; 0.8	117/245	47.8	115/155	74.2	11.1; 32.3*
All the information that the nurse or health worker says about food is true	158/198	79.8	92/104	88.5	-3.3; 3.3	192/245	78.4	153/155	98.7	10.5; 23.8*
I usually eat what my husband/partner likes	130/189	68.8	69/103	67.0	-2.0; 4.0	168/239	70.3	22/155	14.2	-66.0; -49.9*
I intend to eat a healthy diet from now on	143/198	72.2	79/104	76.0	-7.2; 3.3	193/244	79.1	155/155	100.0	12.4; 25.0*
I believe in my power to make decisions About the food I eat	164/198	82.3	93/104	89.4	-2.7; 4.9	214/244	87.7	155/155	100.0	7.9; 19.2*

*Indicates a statistically significant result

4.8.6 Nutrition-related beliefs in locus of control

To assess whether participants had an internal or external locus of control they were asked to indicate whether or not they agreed with several statements informed by the theory as reported in Table 4.44. Healthy changes from pre to post intervention are also reported in Table 4.45.

According to Table 4.44, at baseline, participants reported conflicting beliefs about their personal control regarding nutrition. The majority of participants indicated that they believed that illness and health were caused by luck, fate or chance (C = 68.2%; E = 54.7%), on the other hand a large percentage indicated that they did not believe that illness and health were caused by witchcraft (C = 64.1%; E = 73.1%). They also indicated that they believed they could take control of their health (C = 58.1%; E = 66.5%) and that they could prevent some illnesses by the food they ate (C = 70.7%; E = 74.7%).

After the intervention, participants reported more consistently in the experimental group. The belief that illness and health were not caused by luck, fate or chance improved significantly in the experimental group after intervention (95% CI for the percentage difference [-59.0; -42.9]). Significant improvements were also observed in the belief that illness and health were not caused by witchcraft (95% CI for the percentage difference [-10.1; -1.1]); and that they could prevent some illnesses by the food they ate (95% CI for the percentage difference [12.4; 25.0]).

Table 4.44: Nutrition-related beliefs in locus of control

Belief	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Illness and health are caused by luck, fate or chance	198		245		104		154	
Agree	135	68.2	134	54.7	69	66.4	2	1.3
Disagree	42	21.2	74	30.2	27	25.9	153	98.7
Do not know	21	10.6	37	15.1	8	7.7	0	0.0
Illness and health are caused by Witchcraft	198		245		104		154	
Agree	23	11.6	16	6.5	6	5.8	1	0.7
Disagree	127	64.1	179	73.1	80	76.9	153	98.7
Do not know	48	24.2	50	20.4	18	17.3	1	0.7
I can take control of my health	198		254		104		154	
Agree	115	58.1	163	66.5	72	69.2	150	96.8
Disagree	58	29.3	69	28.2	27	25.9	3	1.9
Do not know	25	12.6	13	5.3	5	4.8	2	1.3
I can prevent some illnesses by the food I eat	198		245		104		154	
Agree	140	70.7	183	74.7	75	72.1	155	100.0
Disagree	35	17.7	24	9.8	17	16.4	0	0.0

A healthy change was considered as a change from stating negative food and nutrition-related beliefs to stating positive food and nutrition-related beliefs (Table 4.45).

Table 4.45: Healthy change in nutrition-related locus of control from baseline to post-intervention

Belief	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
Illness and health are caused by luck, fate or chance	135/198	68.2	69/104	66.4	-5.2; 2.9	134/245	54.7	2/155	1.3	-59.0; -42.9*
Illness and health are caused by witchcraft	23/198	11.6	6/104	5.8	-5.2; 2.9	16/245	6.5	1/155	0.7	-10.1; -1.1*
I can take control of my health	115/198	58.1	72/104	69.2	-3.8; 7.6	163/245	66.5	150/100	96.8	16.0; 28.1*
I can prevent some illnesses by the food I eat	140/198	70.7	75/104	72.1	-15.9; 0.4	183/245	74.7	155/155	100.0	12.4; 25.0*

*Indicates a statistically significant result

4.8.7 Nutrition-related believes in social support

To assess social support, participants were presented with statements denoting social support to assess their own perceptions of the support that they received from close family and friends by indicating whether they agreed with the statements or not (Table 4.46). Healthy change from pre to post intervention is also reported in Table 4.47.

As indicated in Table 4.46, at baseline, more than 80% of participants reported that they believed that their husbands/partners and their children could support them in their decisions about food (C = 80.7%; E = 83.9%). This belief improved significantly in the experimental group after intervention (95% CI for the percentage difference [4.5; 16.8]).

At baseline, less than 50% of participants reported that they believed their friends could support them in their decisions about food (C = 39.9%; E = 44.59%). A significant improvement was observed in the experimental group after intervention (95% CI for the percentage difference [27.9; 45.2]).

Table 4.46: Nutrition-related beliefs in social support

Belief	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
My husband/partner and my children can support me in my decisions about food	197		242		104		154	
Agree	159	80.7	203	83.9	87	83.7	150	96.8
Disagree	27	13.7	30	12.4	17	16.4	0	0.0
Do not know	11	5.6	9	3.7	0	0.0	5	3.2
My friends can support me in my decisions about food	198		245		104		154	
Agree	78	39.4	109	44.5	42	40.48	122	78.7
Disagree	75	37.9	84	34.3	41	39.4	4	2.6
Do not know	45	22.7	52	21.2	21	20.2	29	18.7

According to Table 4.47, a healthy change was considered as a change from statements denoting negative beliefs in social support related to nutrition to positive ones.

Table 4.47: Healthy change from baseline to post-intervention in nutrition-related beliefs in social support

Belief	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
My husband/partner and my children can support me in my decisions about food	159/197	80.7	87/104	83.7	-2.5; 4.6	203/242	83.9	150/155	96.8	4.5; 16.8*
My friends can support me in my decisions about food	78/198	39.4	42/104	40.4	-3.3; 3.3	109/245	44.5	122/155	78.7	27.9; 45.2*

*Indicates a statistically significant result

4.9 Food practices

Food practices include food choices, food preparation and eating habits.

4.9.1 Food choices

Food choices were assessed by asking participants to indicate whether or not they performed certain practices when handling food.

At baseline, few participants reported compiling a budget and a list of foods to buy each month, least of all each week, ranging from 10% to 39%. However, a significant improvement was realised in the experimental group after intervention, ranging from 71% to 97% of participants compiling a budget each month (95% CI for the percentage difference [56.1; 72.1]); drawing a list of foods to buy each week (95% CI for the percentage difference [46.9; 65.4]); and compiling a list of foods to buy every month (95% CI for the percentage difference [48.9; 65.4]).

At baseline, more than 50% of participants reported that they did not just buy anything that came into their minds while grocery shopping (C = 56.1%; E = 57.1%), with a significant improvement in the experimental group after intervention (95% CI for the percentage difference [-32.7; -18.7]). More than 60% of participants reported that they had a garden (C = 67% E = 75%); did not grow only cabbage in their gardens (C = 66%; E = 67%); did not buy food every day after work (C = 82%; E = 74%); and grew different kinds of vegetables in their gardens (C = 53.5; E = 59.6). These indicators improved significantly after intervention in the experimental group, e.g., ownership of a garden (95% CI for the percentage difference [3.9; 13.3]); not only growing cabbage in their garden (95% CI for the percentage difference [-11.5; -2.7]); and not buying food every day after work (95% CI for the percentage difference [-8.3; -0.7]).

These results are presented in Table 4.48 and Table 4.49 respectively.

Table 4.48: Actions related to food choices

Food choices actions	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Compile a budget for food purchases every month	198		245		104		154	
Everyday	76	38.4	82	33.5	41	39.4	150	96.8
Sometimes	62	31.3	96	39.2	25	24.0	4	2.6
Never	60	30.3	67	27.4	38	36.5	1	0.7
Compile a list of foods to buy every week	198		245		104		154	
Everyday	21	10.6	26	10.6	13	12.5	110	70.9
Sometimes	77	38.9	74	30.2	39	37.5	29	18.7
Never	100	50.5	145	59.2	52	50.0	16	10.3
Compile a list of foods to buy every month	198		245		104			
Everyday	75	37.9	95	38.8	44	42.3	151	97.4
Sometimes	62	31.3	85	34.7	27	25.9	3	1.9
Never	61	30.8	65	26.5	33	31.7	1	0.7
Buy anything that comes into my mind while grocery shopping	198		245		104		154	
Everyday	39	19.70	49	20.00	25	24.04	0	0.00
Sometimes	48	24.24	56	22.86	19	18.27	34	21.94
Never	111	56.06	140	57.14	60	57.69	121	78.06
Only buy food that I can afford	198		245		104		154	
Everyday	117	59.1	145	59.2	63	60.6	29	18.7
Sometimes	77	38.9	80	32.7	39	37.5	123	79.4
Never	4	2.0	20	8.2	2	1.9	3	1.9
Only buy food that I like	198		245		104		154	
Everyday	71	35.9	84	34.3	43	41.4	2	1.3
Sometimes	76	38.4	79	32.2	31	29.8	23	14.8
Never	51	25.8	82	33.5	30	28.9	130	83.9

Table 4.48: Actions related to food choices (Continued)

Food choices actions	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Grow different kinds of vegetables in my garden	198		245		104		154	
Everyday	106	53.5	157	64.1	62	59.6	138	89.0
Sometimes	56	28.3	47	19.2	17	16.4	1	0.7
Never	36	18.2	41	16.7	25	24.0	16	10.3
Grow only cabbage in my garden	198		245		104		154	
Everyday	29	14.7	12	4.9	16	15.4	0	0.0
Sometimes	38	19.2	70	28.6	11	10.6	0	0.0
Never	131	66.2	163	66.5	77	74.0	155	100.0
Have a garden	198		244		104		154	
Everyday	136	68.7	183	75.0	62	59.6	128	82.6
Sometimes	10	5.1	4	1.6	9	8.7	0	0.0
Never	52	26.3	57	23.4	33	31.7	27	17.4
Buy food every day after work	198		245		104		153	
Everyday	10	5.1	9	3.7	7	6.7	0	0.0
Sometimes	26	13.1	54	22.0	17	16.4	1	0.7
Never	162	81.8	182	74.3	80	76.9	153	99.4

A healthy change was considered as a change from not practising the healthy behaviour listed in Table 4.49 to practicing them (Table 4.48).

Table 4.49: Healthy change in actions related to food choices from baseline to post-intervention

Food choices actions	Control					Experimental				
	Baseline	**%**	**Post-inter-vention**	**%**	**95% CI for % diff**	**Baseline**	**%**	**Post-inter-vention**	**%**	**95% CI for % diff**
Compile a budget for food purchases every month	76/198	38.4	41/104	39.4	-3.3; 3.3	82/245	33.5	150/155	96.8	56.1; 72.1*
Compile a list of foods to buy every week	21/198	10.6	13/104	12.5	-3.3; 3.3	26/245	10.6	110/155	71.0	46.9; 65.4*
Compile a list of foods to buy every month	75/198	37.9	44/104	42.3	-5.1; 1.3	95/245	38.8	151/155	97.4	48.9; 65.4*
Buy anything that comes into my mind while grocery shopping	39/198	19.7	25/104	24.0	-5.7; 1.6	49/245	20.0	155/155	100.0	-32.7; -18.7*
Only buy food that i like	71/198	35.9	43/104	41.4	-5.2; 1.3	84/245	34.3	2/155	1.3	-43.3; -28.4*

Table 4.49: Healthy change in actions related to food choices from baseline to post-intervention (Continued)

Food choices actions	Control					Experimental				
	Baseline	**%**	**Post-inter-vention**	**%**	**95% CI for % diff**	**Baseline**	**%**	**Post-inter-vention**	**%**	**95% CI for % diff**
Grow different kinds of vegetables in my garden	106/198	53.5	62/104	59.6	-2.3; 6.1	157/245	64.1	138/155	89.0	11.4; 27.4*
Grow only cabbage in my garden	29/198	14.7	16/104	15.4	-6.8; 2.7	12/245	4.9	155/155	100.0	-11.5; -2.7*
Have a garden	136/198	68.7	62/104	59.6	-2.0; 2.0	183/244	75.0	128/155	82.6	3.9; 13.3*
Buy food every day after work	10/198	5.1	7/104	6.7	-5.2; 2.9	9/245	3.7	154/154	100.0	-8.3; -0.7*

*Indicates a statistically significant result

4.9.2 Food preparation

To further assess food practices, participants were asked to indicate whether they performed several food-related practices as reported in Table 5.50. Healthy change from pre to post intervention is also reported in Table 4.51.

At baseline, the majority of participants reported that they performed all the healthy practices as indicated in Table 4.49. For example, they reported that they washed their hands with water and soap every time before touching food (C = 83.8%; E = 69.8%); that they washed cooking utensils with warm water and soap every time after use (C= 76.8%; E = 72.2%); and that they washed vegetables every time before cutting (C = 95.5%; E = 97.6%). Although little room was left for improvement, improvements were still observed in the experimental group after intervention. For example, the percentage of participants washing hands with water and soap every time before touching food rose to 98.7% (95% CI for the percentage difference [29.9; 45.5]) in the experimental group after the intervention. All the other healthy behaviours improved after the intervention in the experimental group.

Table 4.50: Actions related to food preparation

Food preparation actions	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Wash hands with water and soap every time before touching food	**198**		**245**		**104**		**154**	
Everyday	166	83.8	171	69.8	68	65.4	153	98,7
Sometimes	31	15.7	70	28.6	35	33.7	2	1.3
Never	1	0.5	4	1.6	1	0.9	0	0.0
Wash cooking utensils with warm water and soap every time after use	198		245		104		154	
Everyday	152	76.8	177	72.2	71	68.3	154	99.4
Sometimes	43	21.7	64	26.1	32	30.8	1	0.7
Never	3	1.5	4	1.6	1	0.9	0	0.0
Wash vegetables every time before cutting	198		245		104		154	
Everyday	189	95.5	239	97.6	100	96.4	155	100.0
Sometimes	8	4.0	5	2.0	4	3.9	0	0.0
Never	1	0.5	1	0.4	0	0.0	0	0.0
Wash vegetables every time before eating raw	198		245		104		154	
Everyday	153	77.3	195	79.6	93	89.4	154	99.4
Sometimes	26	13.1	31	12.7	10	9.6	1	0.7
Never	19	9.6	19	7.8	1	0.9	0	0.0
Wash fruits every time before cutting	198		245		104		154	
Everyday	145	73.2	178	72.7	73	70.2	152	98.1
Sometimes	50	25.3	49	20.0	29	27.9	2	1.3
Never	3	1.5	18	7.4	2	1.9	1	0.7
Wash fruits every time before eating	198		245		104		154	
Everyday	115	58.1	147	60.0	57	54.8	109	70.3
Sometimes	75	37.9	78	31.8	43	41.4	45	29.0
Never	8	4.0	20	8.2	4	3.9	1	0.7
Usually boil food instead of frying	198		245		104		154	
Everyday	74	37.4	84	34.3	40	38.5	5	3.2
Sometimes	101	51.0	133	54.3	57	54.8	126	81.3
Never	23	11.6	28	11.4	7	6.7	24	15.5
Usually throw away water with which I cook vegetables	198		245		104		154	
Everyday	27	13.6	31	12.7	14	13.5	0	0.0
Sometimes	35	17.7	57	23.3	20	19.2	2	1.3
Never	136	68.7	157	64.1	70	67.3	153	98.7
I usually re-use water from cooking vegetables instead of throwing it away	197		245		104		154	
Everyday	15	7.6	17	6.9	5	4.8	0	0.0
Sometimes	27	13.7	39	15.9	16	15.4	3	1.9
Never	155	78.7	189	77.1	83	79.8	152	98.1
I cook vegetables until they are well-done	197		245		104		153	
Everyday	96	48.7	110	44.9	40	38.5	1	0.67
Sometimes	68	34.5	84	34.3	44	42.3	148	96.1
Never	33	16.8	51	20.8	20	19.2	5	3.3

A healthy change was considered as a change from not practicing the healthy behaviours listed in the table to practicing them (Table 4.51).

Table 4.51: Healthy change in actions related to food preparation from baseline to post-intervention

Food preparation actions	Control					Experimental				
	Baseline	%	Post-intervention	%	95% CI for % diff	Baseline	%	Post-intervention	%	95% CI for % diff
Wash hands with water and soap every time before touching food	166/198	83.8	68/104	65.4	-20.8; -6.1*	171/245	69.8	153/155	98.7	29.9; 45.5*
Wash cooking utensils with warm water and soap every time after use	152/198	76.8	71/104	68.3	-15.1; -2.3*	177/245	72.2	154/155	99.4	25.6; 40.9*
Wash vegetables every time before cutting	189/198	95.5	100/104	96.2	-5.4; 3.0	239/245	97.6	155/155	100.0	0.2; 7.4*
Wash vegetables every time before eating raw	153/198	77.3	93/104	89.4	-3.6; 5.7	195/245	79.6	154/155	99.4	10.5; 22.9*

*Indicates a statistically significant result

Table 4.51: Healthy change in actions related to food preparation from baseline to post-intervention (Continued)

Food preparation actions	Control					Experimental				
	Baseline	%	Post-inter-vention	%	95% CI for % diff	Baseline	%	Post-inter-vention	%	95% CI for % diff
Wash fruits every time before cutting	145/198	73.2	73/104	70.2	-7.5; 5.6	178/245	72.7	152/155	98.1	24.7; 40.3*
Usually boil food instead of frying	74/198	37.4	40/104	38.5	-2.4; 8.2	84/245	34.3	5/155	3.2	-37.7; -22.0*
Usually throw away water with which I cook vegetable	27/198	13.6	14/104	13.5	-2.6; 4.8	31/245	12.7	155/155	100.0	-17.0; -6.3*
I usually re-use water from cooking vegetables instead of throwing it away	15/197	7.6	5/104	4.8	-3.7; 3.7	17/245	6.9	155/155	100.0	-9.9; -1.7*
I cook vegetables until they are well-done	96/197	48.7	40/104	38.5	-4.7; 2.8	110/245	44.9	1/154	0.7	-51.1; -34.8*

*Indicates a statistically significant result

4.10 Eating habits

The following section presents results of eating habits of participants, in which they were asked open-ended questions about what they ate for breakfast, lunch and supper. Participants were also asked to indicate what they ate as snacks, what their favourite foods were, which foods they disliked and what they bought for take-away. An interesting array of foods consumed by the participants was mentioned. Tables 4.52 to 4. 58 present these results.

4.10.1 Breakfast

Although the majority of participants (C = 86.4%; E = 80.3%) indicated that they ate breakfast at baseline, some reported that they just ate when they were hungry. Table 4.52 describes details of what participants ate at breakfast.

At baseline, the most popular foods eaten for breakfast included sorghum soft porridge (C = 59.9%; E = 53. 1%), as well as bread (with margarine) and tea/coffee (C = 55.8%; E = 68.8%). Compared to the other foods reported, *papa* (stiff maize meal) with *moroho* (cooked green leafy vegetables) (C = 25.6%; E = 21.4%) and cereals/bread with milk were the next most eaten foods for breakfast with very low percentages of (C = 12.8%; 14.3%). The other foods reported to be eaten for breakfast ranged from 1% - 13% as indicated in Table 4.52.

After intervention, the trend was still the same as at baseline with slight differences. For example, sorghum soft porridge (C = 60.3; E = 67.7%) and bread (with margarine) and tea/coffee, (C = 63.2%; E = 67.1%) were still the most eaten foods for breakfast in both the control and experimental groups. Cereals/bread with milk made their way up the list in the experimental group with (C = 8.8%; E = 58.1%) participants reporting that they ate it. Oats (C = 4.4%; E = 20.0%) were reported to be the most eaten cereal.

Table 4.52: Foods eaten for breakfast

Breakfast	Pre-intervention Control n = 199		Pre-intervention Experimental n = 244		Post-intervention Control n = 102		Post-intervention Experimental	
	N	%	N	%	N	%	N	%
Participants who ate breakfast	172	86.4	196	80.3	68	66.7	155	100.0
Foods eaten for breakfast:								
Papa and tea/coffee	1	0.6	8	4.1	1	1.5	4	2.6
Papa with moroho and nama	1	0.6	0	0.0	1	1.5	0	0.0
Makoenya (fat cakes), buns, bread	9	5.2	7	3.6	6	8.8	11	7.1
Sandwich (vegetables, margarine, cheese, polony, eggs)	6	3.5	11	5.6	6	8.8	3	1.9
Only tea/coffee	22	12.8	15	7.7	7	10.3	8	5.2
Papa with meat	6	3.5	3	1.5	3	4.4	8	5.2
Soft porridge (sorghum)	103	59.9	104	53.1	41	60.3	105	67.7
Bread (with margarine) and tea/coffee	96	55.8	125	63.8	43	63.2	104	67.1
Whole meal bread	1	0.6	1	0.5	3	4.4	1	0.6
Eggs	11	6.4	21	10.7	6	8.8	14	9.0
Papa with beans (bread with beans)	7	4.1	12	6.1	2	2.9	5	3.2
Papa with (moroho) and (tomatoes) Eggs	2	1.2	1	0.6	4	5.9	1	0.6
Cereals with milk/bread with milk	22	12.8	28	14.3	6	8.8	90	58.1
Papa with milk	6	3.5	9	4.6	9	13.2	10	6.5
Papa with moroho (cooked green leafy vegetables)	44	25.6	42	21.4	18	26.5	23	14.8
Left-overs from last night (anything that is available)	5	2.9	4	2.0	1	1.5	12	7.7
Green salad	1	0.6	0	0.0	0	0.0	2	1.3
Papa/rice/samp with vegetables	1	0.6	0	0.0	6	8.8	12	8
Motoho (sour porridge)	2	1.2	0	0.0	1	1.5	1	0.6
Papa with milk	3	1.7	0	0.0	0	0.0	1	0.6
Motoho (sour porridge)	8	4.7	15	7.7	1	1.5	1	0.6
Fruits (juice)	4	2.3	6	3.1	0	0.0	1	5.8
Likhobe tsa koro (cooked wheat)	0	0.0	2	1.0	3	4.4	1	0.6
Vienna/Russian/polony	0	0.0	5	2.6	1	1.5	1	0.6
Papa with pumpkin	0	0.0	1	0.6	0	0.0	1	0.6
Oats	5	2.9	4	2.0	3	4.4	31	20.0
Cheese	0	0.0	0	0.0	0	0.0	1	0.6
Porridge with milk	1	0.6	2	1.0	0	0.0	1	0.6
Just milk (whole milk)	1	0.6	1	0.5	0	0.0	0	0.0
Milk (low fat)	2	1.2	1	0.5	1	1.5	1	0.6
Baked beans	1	0.6	0	0.0	0	0.0	0	0.0
Bacon	1	0.6	1	0.6	1	1.5	1	0.6
Toast	1	0.6	1	0.6	1	1.5	0	0.0
Cayne pepper, pronutro, sour porridge, cinnamon, lemon and sugar	1	0.6	0	0.0	1	1.5	0	0.0
Soft porridge with milk and margarine	2	1.2	2	1.0	1	1.5	1	0.6
Bread with peanut butter	2	1.2	1	0.6	2	1.5	0	0.0

4.10.2 Lunch

Table 4.53 lists foods that participants ate for lunch.

Papa with *moroho* was the most popular food eaten for lunch (C = 77.2; E = 65.3%) at baseline. Bread/*papa*/samp with beans, peas were next (C = 28.8; E = 30.7%), followed by *papa* with milk (C = 14.7%; E = 17.8%) and *papa* with eggs (with *moroho* or tomato) (C = 20.7%; E = 24.0%).

After intervention, although the control group also reported eating *Papa* with *moroho* (C =81.4%; E = 78.6%), larger proportions of participants in the experimental group reported consuming more of some dishes that they reported at baseline. For example, bread/*papa*/samp with beans or peas (C = 30.9%; E = 76.6%), *papa* with eggs (with *moroho* or tomato) (C = 20.6%; E = 42.2%), *papa*/samp/rice with meat (stewed, barbecue), *wors*, chicken and salads (cooked and raw green, red, cabbages, pumpkin, green beans) (C = 6.2%; E = 18.8%), and *papa* with milk (C = 19.6%; E = 57.8%) were eaten more often.

Table 4.53: Foods eaten for lunch

Lunch	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Participants who ate lunch	184	92	225	92	97	94.17	154	99.35
Foods eaten for lunch:								
Papa with moroho and nama	19	10.3	42	18.7	8	8.2	46	29.9
Makoenya, bread buns (with drink, soup)	8	4.3	6	2.7	6	6.2	1	0.6
Salad dishes	0	0.0	0	0.0	0	0.0	3	1.9
Potato/pasta/rice dishes (with meat or alternatives	6	3.3	18	8.0	7	7.2	13	8.4
Potatoes (mashed) with papa, potato soup	1	0.5	3	1.3	1	1.0	6	3.9
8.Papa/bread/rice/samp with soup	6	3.3	5	2.2	5	5.2	1	0.6
Only tea/coffee	38	20.7	18	8.0	24	20	19	10
Papa with meat	18	9.8	26	11.6	14	14.4	50	32.5
Bread with (margarine) tea/coffee	5	2.7	9	4.0	2	2.1	9	5.8
Soft porridge	2	1.1	3	1.3	1	1.0	1	0.6
Papa with moroho	142	77.2	147	65.3	79	81.4	121	78.6
Bread/papa/samp with beans, peas	53	28.8	69	30.7	30	30.9	118	76.6
Papa with eggs (with moroho or tomato sometimes)	38	20.7	54	24.0	20	20.6	65	42.2
Papa/samp/rice with meat (stewed, braai), wors, chicken and salads (cooked and raw green, red, cabbages, pumpkin, green beans)	12	6.5	18	8.0	6	6.2	29	18.8
Papa/rice/bread/samp/potatoes/ pasta with fish (frozen or tinned)	8	4.3	7	3.1	1	1.0	18	11.7
Papa/rice/samp with tomatoes and onions	8	4.3	12	5.3	5	5.2	56	36.4
25.Potato chips (with meat, fish, Russian)	5	2.7	7	3.1	3	3.1	1	0.6
Motoho (sour porridge)	12	6.5	19	8.4	5	5.2	5	3.2
Russians, polony, boroso (sausage-wors)	11	5.9	6	2.7	8	8.2	1	0.6
Soup	5	2.7	7	3.1	3	3.1	5	3.2
Pizza	1	0.5	12	5.3	1	1.0	20	13
Kfc/nandos	12	5.3	6	2.7	6	3	2	1.3

Table 4.53: Foods eaten for lunch (Continued)

Lunch	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Papa with milk	12	6.5	19	8.4	19	19.6	89	57.8
Papa with fish (tinned)	1	0.5	6	2.7	1	1.0	20	12.9
Likhobe tsa poone (cooked maize-grains)	2	1.1	5	2.2	1	1.0	1	0.6
Baked beans	1	0.5	0	0.0	0	0.0	1	0.6
Papa with different types of moroho	2	1.1	3	1.3	2	2.1	13	8.4
Fruits	1	1.1	3	1.3	1	1.0	1	0.6
Pumpkin (boiled with skin)	4	2.2	2	0.9	3	3.1	2	1.3
Papa with peaches	1	0.5	0	0.0	0	0.0	1	0.6
Lasagne	1	0.5	0	0.0	1	1.0	0	0.0
Rice with meat	2	1.1	2	0.9	1	1.0	2	1.3
Meat pie	2	1.1	4	1.8	1	1.0	1	0.6
Papa with offal	1	1.1	1	0.4	1	1.0	0	0.0
Just samp	2	1.1	5	2.2	2	1.0	3	1.9
Papa (with moroho) and chicken livers	1	0.5	5	2.2	1	1.0	3	1.9
Rice salad	1	0.5	0	0.0	0	0.0	0	0.0
Potato chips with makoenya	2	1.1	2	0.9	1	1.0	0	0.0
Pasta (with sauce and salad)	1	0.5	1	0.4	1	1.0	0	0.0
Rice (with tomato sauce)	1	0.5	1	0.4	0	0.0	0	0.0
Samp with beans	2	1.1	1	0.4	0	0.0	0	0.0
Corn cooked with beans (likhobe tsa mabele le linaoa)	1	0.5	2	0.9	0	0.0	1	0.6

4.10.3 Dinner

Table 4.54 lists what participants ate for dinner/supper.

Almost all participants at baseline (C= 99% E = 99%) and after intervention (C = 100%; E = 100%) reported that they ate dinner.

Dinner was not different from lunch, with *papa* and *moroho* still being the most popular dish eaten at baseline (C = 77.2%; E = 65.3%). Bread/*papa*/samp with beans or peas were next (C = 73.2%; E = 66.5%), then p*apa* with eggs (with *moroho* or tomato) (C = 37.4%; E = 36.3%) and *papa* with milk (C = 18%; E = 8%). After intervention, *papa* with *moroho's* consumption increased slightly (C = 77.0%; E = 79.4%), along with the other popular dishes:

bread/*papa*/samp with beans or peas (C = 38.0%; E = 75.5%) and *papa* with milk (C = 20.0%; E = 58.1%).

Table 4.54: Foods eaten for dinner/supper

Dinner	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Eat dinner/supper	198	96	242	99	100	100.0	155	100.0
Not eat dinner/supper	1	1	2	1	0	0.0	0	0.0
What eat for dinner/supper:								
Papa with moroho and Nama	19	9.6	42	17.1	6	6.0	47	30.3
Makoenya, bread, buns (with drink, soup)	7	3.5	10	4.1	3	3.0	1	0.6
Salad dishes	0	0.0	0	0.0	0	0.0	5	3.2
Potato/pasta/rice dishes (with meat or alternatives	9	4.5	20	8.2	7	7.0	13	8.4
Potatoes (mashed) with papa, potato soup	2	1.0	2	0.8	0	0	5	3.2
Papa/bread/rice/samp with Soup	7	3.5	9	3.7	6	6.0	1	0.6
Papa with meat	30	15.2	26	10.6	22	22.0	52	33.5
Papa with moroho	142	77.2	147	65.3	77	77.0	123	79.4
Bread/papa/samp with beans, Peas	145	73.2	163	66.5	38	38.0	117	75.5
Papa with eggs (with moroho or tomato sometimes)	74	37.4	89	36.3	22	22.0	67	43.2
Papa/samp/rice with meat (stewed, braai), wors, chicken and salads (cooked and raw green, red, cabbages, pumpkin, green beans)	46	23.2	50	20.4	5	5.0	27	17.4
Papa/rice/bread/samp/potatoes /pasta with fish (frozen or tinned)	14	7.1	17	2.9	1	1.0	20	12.9
Papa/rice/samp with tomatoes and onions	5	2.5	7	2.9	4	4.0	55	35.5
Potato chips (with meat, fish, Russian)	8	4.0	8	3.3	0	0.0	2	1.3
Motoho (sour porridge)	2	1.0	10	4.1	1	1.0	4	2.6
Russians, polony, boroso (sausage-wors)	5	2.5	5	2.0	5	5.0	1	0.6
Soup	6	3.0	8	1.2	0	0.0	1	0.6

Table 4.54: Foods eaten for dinner/supper (continued)

Dinner	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Pizza	0	0.0	2	0.8	1	1.0	0	0.0
Kfc/nandos	3	1.5	3	1.2	1	1.0	1	0.6
Papa with milk					20	20.0	90	58.1
Papa with fish (tinned)	35	17.7	44	17.9	20	20.0	21	13.5
Likhobe tsa poone (cooked maize-grains)	2	1.0	8	1.2	1	1.0	4	2.6
Baked beans	0	0.0	1	0.4	1	1.0	1	1
Papa with different types of Moroho	5	2.5	5	2.0	1	1.0	11	7.1
Fruits	2	1.0	5	2.0	1	1.0	1	0.6
Pumpkin (boiled with skin)	1	0.5	1	0.4	1	1.0	1	0.6
Papa with peaches	5	2.5	1	0.4	0	0.0	0	0.0
Lasagne	1	0.5	0	0.0	1	1.0	0	0.0
Rice with meat	1	0.5	2	0.8	0	0.0	1	0.6
Meat pie	1	0.5	2	0.8	0	0.0	1	0.6
Papa with offal	1	0.5	1	0.4	1	1.0	0	0.0
Just samp	1	0.5	3	1.2	0	0.0	2	1.3
Papa (with moroho) and chicken livers	1	0.5	3	1.2	1	1.0	2	1.3
Rice salad	1	0.5	4	1.6	0	0.0	2	1.3
Potato chips with makoenya	1	0.5	4	1.6	0	0.0	0	0.0
Pasta (with sauce and salad)	1	0.5	2	0.8	0	0.0	0	0.0
Rice (with tomato sauce)	1	0.5	1	0.4	0	0.0	0	0.0
Samp with beans	1	0.5	2	0.8	1	1.0	2	1.3
Corn cooked with beans (likhobe tsa mabele le linaoa)	1	0.5	2	0.8	1	1.0	1	0.6

4.10.4 Snacking

Table 4.55 lists what participants ate for snacks.

At baseline, the majority of participants reported that they snacked (C = 67.84%; E = 70.49%). This did not change in both control and experimental group after intervention (C = 66.99%; E = 71.61%).

At baseline, the most snacked foods were: *simba* chips (crisps) (C = 73.3%; E = 69.2%); fruits (C = 25.2%; E = 49.4%) sweets, cookies, biscuits and cakes (C = 41.5% E = 30.8%) and peanuts (C = 19.3%; E = 27.5%). At baseline, fruits were consumed by less than 50% of the participants, but after intervention, the experimental group's consumption increased significantly from 49% to

98%. *Simba* chips (crisps) were the most popularly consumed snack at baseline, but its consumption declined in the experimental group after intervention from 69% to 13%. Intake of sweets also declined from 31% at baseline to 2% after intervention in the experimental group.

Table 4.55: Foods eaten as snacks

Snacks	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Percept that take snacks	135	67.8	172	70.5	69	66.9	111	71.6
Number of times snacks were eaten per day:								
1	59	45.7	80	46.8	25	42.4	10	9.7
2	24	18.6	35	20.5	10	16.9	19	18.5
3	42	32.6	50	29.2	22	37.3	34	33.0
Many times	2	1.6	1	0.6	1	1.7	34	33.0
Once in a while	2	1.6	5	2.9	1	1.7	6	5.8
Foods eaten as snacks								
Soft-porridge	1	0.7	0	0.0	0	0	0	0.0
Cheese	1	0.7	2	1.2	1.4	1	0	0.0
Fruits	34	25.2	85	49.4	17	24.6	109	98.2
Sweets, cookies, biscuits, cakes	56	41.5	53	30.8	28	40.6	2	1.8
Simba chips	99	73.3	119	69.2	57	82.6	14	12.6
Sandwiches	3	2.2	2	1.2	0	0.0	1	0.9
Peanuts	26	19.3	19	27.5	19	27.5	16	14.4
Makoenya	1	0.7	8	4.7	0	0.0	2	1.8
Papa with (moroho) and eggs	1	0.7	0	0.0	0	0.0	0	0.0
Lipabi	0	0.0	1	0.7	0	0.0	1	0.9
Sour porridge	0	0.0	4	2.3	0	0.0	1	0.9
Meat	0	0.0	1	0.7	0	0.0	0	0.0
Samp	0	0.0	1	0.7	0	0.0	0	0.0
Morvite	0	0.0	1	0.7	0	0.0	0	0.0
Potato chips	1	0.7	0	0.0	1	1.4	0	0.0
Milk	1	0.7	0	0.0	0	0.0	0	0.0
Buns/bread (with tea)	5	3.7	1	0.7	0	0.0	0	0.0
Pop-corns	1	0.7	2	1.2	1	1.4	1	0.9
Chewing gum	0	0.0	1	0.7	0	0.0	0	0.0
Archer	1	0.7	2	1.2	1	1.4	1	0.9
Yoghurt	3	2.2	4	2.3	1	1.4	2	1.8
Makoenya and archer	3	2.2	4	2.3	1	1.4	1	0.9
Mabele cooked with beans	1	0.7	4	2.3	1	1.4	2	1.8
Chocolate	26	19.3	17.4	33	19	27.5	16	14.4

4.10.5 Participants' favourite foods

Table 4.56 lists the foods that participants liked. The most liked food was meat, particularly chicken (with *papa*) (C = 37.7%; E = 56.1%) in both control and experimental groups before and after intervention, with larger proportions of participants in the experimental group after intervention.

Table 4.56: Participants' favourite foods

Favourite food	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
All food	18	8.7	13	5.3	6	2.9	12	6
Papa and moroho	56	27.1	62	25.2	28	13.5	44	21.3
Meat, chicken (papa with)	78	37.7	138	56.1	40	19.3	80	38.6
Fish (tuna) (tinned fish) (frozen)	4	1.9	5	2.0	1	0.5	6	2.9
Fruits (fresh and dried)	14	6.8	17	6.9	9	4.3	10	4.8
*Vegetables (green leafy	18	8.7	32	13.1	12	5.8	19	9.2
Motoho (sour porridge)	3	1.4	7	2.6	3	1.4	4	1.9
Milk (fresh and sour) (and products)	47	22.7	48	19.5	27	13.0	31	14.9
Bread (homemade)	34	16.4	25	10.2	20	9.7	15	7.2
Tea (with milk) (with sugar)	4	1.9	4	1.6	0	0.0	4	1.9
Boerer wors (boroso)/ Russians	2	0.9	1	0.4	1	0.5	0	0.0
Rice	17	8.2	17	6.9	9	4.3	0	0.0
Beans (with papa)	26	12.6	25	10.2	18	8.7	13	6.3
Eggs	11	5.3	21	8.5	4	1.9	11	5.3
Samp	2	0.9	3	1.2	0	0.0	1	0.5
Papa	12	5.8	6	2.4	8	3.9	0	0.0
Makoenya	12	5.8	13	5.3	6	2.9	4	1.9
Archer	0	0.0	1	0.4	0	0.0	1	0.5
Lipabi	0	0.0	1	0.4	0	0.0	1	0.5
Pumpkin	8	3.9	12	4.9	4	1.9	1	0.5
Cheese	4	1.9	1	0.4	3	1.4	0	0.0
Pizza	3	1.4	1	0.4	2	0.9	0	0.0
Custard	2	0.9	0	0.0	1	0.5	2	0.9
Potato chips	1	0.4	1	0.4	0	0.5	1	0.5
Polony	0	0.0	1	0.4	0	0.5	1	0.5
Pork	3	1.4	7	2.8	4	1.9	2	0.9
Potatoes roasted on open fire	0	0.0	2	0.8	0	0.0	0	0.0
Chocolate	0	0.0	2	0.8	0	0.0	0	0.0
Fruit salad	1	0.4	1	0.4	0	0.0	0	0.0

*Vegetables (green leafy, tomatoes and onions, potatoes, salads, green salad, beetroot, carrots)

4.10.6 Foods disliked by the participants

Table 4.57 lists foods that participants disliked.

At baseline, pork was the most disliked food (C = 44.2%; E = 25.2%), remained the most disliked after intervention in both control and experimental groups after intervention (C = 9.7%; E = 14.2%) as indicated in Table 4.57.

Table 4.57: Foods disliked by the participants

Foods disliked	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Garlic	1	0.9	1	0.4	0	0.0	0	0.0
Pork	50	44.2	62	25.2	20	9.7	35	14.2
Fish (tinned, fresh from the river)	6	5.3	11	4.5	3	1.4	4	1.6
Eggs	1	0.9	1	0.4	0	0.0	1	0.4
Some indigenous food plants	7	6.2	3	1.2	3	1.4	2	0.8
Peas (dry)	16	14.2	16	6.5	6	2.9	7	2.8
Milk (fresh) or (sour)	7	6.2	15	6.1	3	1.4	2	0.8
Potatoes	2	1.8	8	3.3	2	0.9	3	1.2
Rice, likhobe	6	5.3	2	0.8	5	2.4	2	0.8
Samp	6	5.3	7	2.8	1	0.5	0	0.0
Moroho (spinach, cucumber, broccoli)	5	4.4	9	3.7	3	1.4	1	0.4
Cheese	5	4.4	5	2.0	3	1.4	2	0.8
Banana	0	0.0	1	0.4	0	0.0	0	0.0
Russian sausage/ boroso	1	0.9	3	1.2	1	0.5	3	1.2
Goat milk	1	0.9	1	0.4	1	0.5	1	0.4
Alcohol	2	1.8	1	0.4	2	0.9	0	0.0
Goat meat	9	7.9	15	6.1	4	1.9	4	1.6
Beans (dry)	2	1.8	3	1.2	1	0.5	1	0.4
Lentils	1	0.9	0	0.0	1	0.5	0	0.0
Horse/donkey meat	0	0.0	2	0.8	0	0.0	1	0.4
Soft porridge	0	0.0	3	1.2	0	0.0	2	0.8
Fatty food/meat	3	2.7	3	1.2	2	0.9	3	1.2
Cabbage	4	3.5	5	2.0	1	0.5	1	0.4
Brown bread	0	0.0	2	0.8	0	0.0	0	0.0
Yellow maize meal	0	0.0	1	0.4	0	0.0	0	0.0
Beef (tinned)	1	0.9	1	0.4	0	0.0	1	0.4
Tea	1	0.9	2	0.8	0	0.0	0	0.0
Polony	2	1.8	3	1.2	0	0.0	3	1.2
Sour porridge	0	0.0	2	0.8	0	0.0	2	0.8
Oats	0	0.0	1	0.4	1	0.5	1	0.4
White bread	0	0.0	1	0.4	0	0.0	1	0.4
Green peas	1	0.9	1	0.4	0	0.0	1	0.4
Soup	1	0.9	0	0.0	0	0.0	0	0.0
Peanuts	0	0.0	0	0.0	1	0.5	0	0.0
Mushroom (khoaeane)	2	1.8	6	2.4	0	0.0	0	0.0
Lentils	0	0.0	1	0.4	0	0.0	0	0.0
Beef	1	0.9	0	0.0	0	0.0	0	0.0
Liver	1	0.9	0	0.0	0	0.0	0	0.0

4.10.7 Take away foods and drinks

Table 4.58 lists the foods that participants bought as take away.

About 60% of participants indicated that they bought take away foods. The median number of times participants bought take away was 'once in a while'.

At baseline, take away foods were Russian sausage, fat cakes (*makoenya*), potato chips, a plate of *papa* with *moroho* and meat, barbecue meat (rice, samp, and pasta) and salads (including pumpkin). A decline in buying take away foods was observed in the experimental group from 60.3% at baseline to 33.1% after intervention. After intervention, a decline was also evident in the experimental group in the percentage of participants who bought Russian sausage from 38% to 18%, and of those who bought fat cakes from 42.2% to 21.6%.

At baseline, about 50% of participants indicated that they bought soda. A decline was evident in the experimental group after intervention from 51% to 12%.

Table 4.58: Take away foods and drinks

Take away	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Buy take away foods	117	58.8	147	60.3	58	58.6	51	33.1
Median frequency	3		3		3		3	
Food/drinks purchased:								
Sodas	88	44.4	125	51.2	52	51.5	19	12.4
Papa with eggs	1	0.9	2	1.4	19	33	0	0.0
Just papa and nama			2	1.4	0	0	0	0.0
Just potato chips	41	35.0	32	21.8	19	32.8	14	27.5
Potato chips (with meat, fish)	5	4.3	32	21.8	6	10.3	9	17.6
Russian sausages	61	52.1	56	38.1	24	41.4	9	17.6
Fat cakes (makoenya)	48	41.0	62	42.2	26	44.8	11	21.6
*A plate of papa with moroho and meat, braai meat	16	13.7	28	19.0	11	18.9	21	41.2
Archer	0	0.0	2	1.4	0	0.0	1	1.9
Polony	15	12.8	17	11.6	8	13.8	0	0.0
Bread, buns	11	9.4	9	6.1	3	5.2	1	1.9
Fish (fish and chips)	15	12.8	17	11.6	7	12.1	5	9.8
KFC/nandos	8	6.8	33	22.4	4	6.9	4	7.8
Pizza	4	3.4	17	11.6	2	3.4	5	9.8
Pasta	0	0.0	4	2.7	3	5.2	3	8.9
Misc. (cakes, cold drink, fruits, simba chips)	0	0.0	3	2.0	0	0.0	1	1.9
Restaurant	2	1.7	0	0.0	0	0.0	0	0.0
Just salad	0	0.0	1	0.7	0	0.0	5	9.8
Lasagne	0	0.0	1	0.7	1	1.7	1	1.9
Baked beans	0	0.0	2	1.4	0	0.0	0	0.0
Chicken feet	0	0.0	2	1.4	0	0.0	0	0.0
Meat pie	0	0.0	2	1.4	0	0.0	0	0.0
Chakalaka	1	0.9	5	3.4	0	0.0	0	0.0

*A plate of papa with moroho and meat, braai meat (rice, samp, pasta) (and salads), pumpkin

4.11 Life style

Life style includes physical activity, drinking alcohol, smoking and taking snuff.

4.11.1 Physical activity

Table 4.59 presents results related to physical activity. Healthy change from pre to post intervention is also reported in Table 4.60.

According to table 4.58, at baseline, the only significantly reported physical activities included cleaning house, (reported by over 80%) and walking (reported by over 60%). Significant improvements were evident after intervention in both activities in the experimental group and included improvements in other activities as well, for example, cleaning house (95% CI for the percentage difference [2.7; 13.4]); walking (95% CI for the percentage difference [5.4; 17.0]); exercise (95% CI for the percentage difference [10.2; 25.0]); and gardening (95% CI for the percentage difference [14.1; 29.5]) improved significantly.

Table 4.59: Participants involvement in physical activity

Physical activity	Pre-intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
Participants did the following:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Gardening	198		244		103		154	
Yes	91	45.9	94	38.5	48	46.6	93	60.0
No	57	28.8	96	39.3	33	32.0	35	22.68
Sometimes	50	25.3	54	22.1	22	21.4	27	17.42
Clean the house	198		244		103		153	
Yes	172	86.9	200	81.9	93	90.3	138	89.6
No	18	9.1	24	9.8	8	7.8	8	5.2
Sometimes	8	4.0	20	8.2	2	1.9	8	5.2
Walk	198		244		103		153	
Yes	134	67.7	166	68.0	78	75.7	126	81.8
No	44	22.2	53	21.7	19	18.5	18	11.7
Sometimes	20	10.1	25	10.3	6	5.8	10	6.5
Jog/run	198		244		103		153	
Yes	31	15.7	32	13.1	14	13.6	45	29.2
No	137	69.2	161	65.9	76	73.8	79	51.3
Sometimes	30	15.2	51	20.9	13	12.6	30	19.5
Cycle	198		244		103		153	
Yes	4	2.0	2	0.8	2	1.9	1	0.7
No	185	93.4	237	97.1	96	93.2	150	97.4
Sometimes	9	4.6	5	2.1	5	4.9	3	1.9
Exercise	198		244		103		153	
Yes	27	13.6	30	12.3	16	15.5	50	32.5
No	160	80.8	190	77.9	85	82.5	83	53.9
Sometimes	11	5.6	24	9.8	2	1.9	21	13.6
Aerobics	198		244		103		153	
Yes	7	3.5	5	2.1	6	5.8	5	3.3
No	185	93.4	234	95.9	96	93.2	146	94.8
Sometimes	6	3.03	5	2.1	1	0.9	3	1.9
Netball	198		244		103		153	
Yes	9	4.6	4	1.6	5	4.9	3	1.9
No	188	94.9	236	96.7	98	95.2	150	97.4
Sometimes	1	0.5	4	1.6	0	0.0	1	0.7
Others:								
Clean surroundings	6	38	8	47	2	67	12	18
Volley ball, squash	5	31	1	6	1	33	2	13
Mokhibo	3	19	1	6	0	0	0	0
Dance sport	0	0	1	6	0	0	0	0
Rear poultry	0	0	1	6	0	0	4	26

A healthy change was considered as a change from not engaging in physical activity to engaging in any physical activity as listed in Table 4.59.

Table 4.60: Healthy change in physical activity from baseline to post-intervention

Physical activity	Control					Experimental				
	Baseline	%	Post-intervention	%	95% CI for % diff	Baseline	%	Post-intervention	%	95% CI for % diff
Gardening	91/198	46.0	48/103	46.6	-3.6; 1.7	94/244	38.5	93/155	60.0	14.1; 29.5*
Clean the house	172/198	86.9	93/103	90.3	-2.8; 5.0	200/244	82.0	138/154	89.6	2.7; 13.4*
Walk	134/198	67.7	78/103	75.7	-4.3; 2.2	166/244	68.0	126/154	81.8	5.4; 17.0*
Jog/run	31/198	15.7	14/103	13.6	-10.2; -0.1*	32/244	13.1	45/154	29.2	7.9; 22.2*
Cycle	4/198	2.0	2/103	1.9	-3.1; 5.6	2/244	0.8	1/154	0.7	-3.8; 2.1
Exercise	27/198	13.6	16/103	15.5	-7.5; 1.3	30/244	13.3	50/154	32.5	10.2; 25.0*
Aerobics	7/198	3.5	6/103	5.8	-3.0; 5.3	5/244	2.1	5/154	3.3	-3.1; 4.6
Netball	9/198	4.6	5/103	4.9	-5.3; 3.0	4/244	1.6	3/154	2.0	-3.2; 3.2

*Indicates a statistically significant result

4.11.2 Lifestyle: Alcohol consumption

Table 4.61 presents results related to alcohol drinking.

Before intervention, results indicated that alcohol consumption was higher in the experimental group than in the control group as indicated by the 95% confidence interval for the median difference [-5; -2]. There was no significant difference in the type of alcohol that participants indicated that they consumed, as indicated by the 95% confidence interval for the median difference[0; 0], However, after the intervention the experimental group was significantly consuming more beer than the control group (95% confidence interval for the median difference [-3; 0]. Regarding total alcohol consumption, the experimental group was still consuming more alcohol than the control group as indicated by the 95% confidence interval for the median difference [-2; 1] after the intervention.

At baseline, the majority of the participants who consumed alcohol reported that they did so on weekends (C = 40.4%; E = 69.0%). After intervention, weekend drinking remained dominant (C = 37.9%); E = 62.8%). Participants also indicated that they drank once in a while with friends (C = 44.7%; E = 43.7%) at baseline and this did not change after intervention (C = 41.4% E = 58.8%). The type of alcohol most commonly consumed was beer and hops and this trend remained the same after intervention in both the control and experimental groups. Those who drank reported that they could drink up to a maximum of five glasses of red wine and twelve glasses of beer per day. There was no improvement in alcohol consumption after intervention in the experimental group.

Table 4.61: Alcohol consumption

Alcohol consumption	Pre-intervention				Post-intervention			
	Control n = 206		Experimental n = 246		Control n = 105		Experimental n = 155	
	N	%	N	%	N	%	N	%
Participants who drink alcohol	47	23.6	71	29.2	29	28.2	43	27.7
Days on which alcohol is consumed:								
During the week	10	21.3	19	26.8	5	17.2	12	27.9
Weekends	19	40.4	49	69.0	11	37.9	27	62.8
Once in a while with friends	21	44.7	31	43.7	12	41.4	24	55.8
Every day	4	8.5	5	7.0	3	10.3	4	9.3
Type of alcohol consumed:								
Red wine	3	6.4	21	29.6	2	6.9	13	30.2
White wine	4	8.5	8	11.3	2	6.9	7	16.3
Beer	25	53.2	36	50.7	14	48.3	27	62.8
Hard stuff	0	0.0	0	0.0	0	0.0	0.0	0.0
Hops	8	17.0	17	23.9	9	31.0	11	25.6
Sesotho brew	9	19.2	10	14.1	4	13.8	6	13.9

4.11.3 Life style: Smoking/taking snuff habits

Table 4.62 presents results related to smoking cigarettes and taking snuff.

At baseline, only about 3% of participants reported that they smoked cigarettes and about 20% reported that they took snuff. There was no change after intervention in the percentages of participants who reported that they smoked cigarettes or took snuff (95% CI for the median difference [0; 1]).

The median cigarettes smoked per day were 20 and the median number of times participants reported that they took snuff was 2 times per day.

Participants reported many reasons why they smoked (as indicated in Table 4.62). The most reported reasons for smoking or taking snuff (by about 50% of participants in both groups) were when sad, when lonely, when feeling out of sorts, when worrying and when stressed. There was no change in the experimental group after intervention in relation to smoking cigarettes or taking snuff as indicated by the 95% CI for the median difference [0; 1].

Table 4.62: Smoking/taking snuff habits

Smoking / snuff habits	**Pre-intervention**				**Post-intervention**			
	Control		**Experimental**		**Control**		**Experimental**	
Participants who smoke cigarettes and take snuff	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Smoke cigarette	4	2.0	8	3.3	3	2.9	4	2.6
Number of cigarettes smoked								
Participants who take snuff	39	19.7	59	24.2	22	21.4	41	26.5
Number of times snuff is taken per day								
Reasons for smoking/taking snuff								
When sad and lonely	22	53.7	28	43.8	10	45.5	22	50.0
When angry, when hurt	6	14.6	16	25.0	2	9.1	9	20.5
When happy, when excited	6	14.6	5	7.8	3	13.6	7	15.9
When drinking	6	14.6	12	18.8	3	13.6	9	20.5
When feeling unwell	12	29.3	20	31.3	4	18.2	11	25
When craving it	5	12.2	16	25.0	4	18.2	6	13.6
After meals	1	2.4	7	10.9	1	4.5	2	4.5
In the morning before I wake up	2	4.9	3	4.7	2	9.1	2	4.5
When wanting to stay awake	0	0.0	2	3.1	0	0.0	2	4.5
Habit	8	19.5	1	1.6	1	4.5	7	15.9
When bored/when tired/when idle	3	7.3	2	3.1	2	9.1	5	11.4
When have trouble with my partner	0	0.0	6	9.4	0	0.0	2	4.5
When working hard	0	0.0	3	4.7	0	0.0	0	0.0
When under pressure	0	0.0	1	1.6	0	0.0	2	4.5
When depressed	0	0.0	1	1.6	0	0.0	3	6.8
When sleepless	0	0.0	2	3.1	0	0.0	2	4.5
When have toothache	0	0.0	3	4.7	0	0.0	1	2.3
When hungry	2	4.9	3	4.7	1	4.5	0	0.0
Heart disease	0	0.0	3	4.7	0	0.0	0	0.0

4.12 Motivation to change lifestyle

It was important to find out whether participants were motivated to change their eating habits as well as lifestyle factors such as engaging in physical activity, drinking alcohol or smoking/taking snuff. Table 4.63 presents results related to motivation.

Before intervention, 95% of participants reported that they were motivated to change their physical activity habits for the better as well as changing their eating habits.

After intervention, this remained more or less the same, with over 96% in both control and experimental groups reporting that they were motivated to change their physical activity behaviour and eating habits for the better. At baseline, participants reporting in favour of positive change were already high, leaving small room for change.

Table 4.63: Motivation to change lifestyle

Participants' motivation to:	Pre-Intervention				Post-intervention			
	Control		Experimental		Control		Experimental	
	N	%	N	%	N	%	N	%
Change physical activity habits	188	95.43	233	95.43	99	96.12	154	100.00
Change drinking habits	35	17.77	48	19.75	16	15.53	20	12.99
Change smoking habits	33	16.75	58	23.87	15	14.56	35	22.73
Change eating habits	196	99.49	241	99.18	103	100.00	154	100.00

Chapter 5: Discussion

5.1 Introduction

In this chapter, results relating to the impact of a nutrition education intervention on nutritional status and nutrition-related knowledge, attitudes, beliefs and practices of women in urban and rural areas in Lesotho are interpreted and discussed. Reference is made to the FGP and SAFBDG, which were the main nutrition education tools used in this study. Reference is also made to the guiding principles of this study, six theoretical models/theories of health behaviour, which were selected on the basis of their complementary strengths to provide a framework for research and a guide to planning and implementing the nutrition education intervention. Results are related to the literature to bring out important similarities and differences. Weaknesses observed in the data are also discussed.

5.2 Limitations of the study

Portion sizes of foods consumed were not determined, this made it difficult to assess adequacy of diets. Some sampled villages could not be reached because of several reasons. Firstly, some chiefs were not available or failed to call *pitsos*. Secondly, heavy rains had destroyed the otherwise accessible roads. Thirdly, wworkshops were originally planned over weekends, but this was not successful because on weekends people attended the rising number of funerals (with the death toll from HIV and AIDS soaring by the year among other factors); people attended political rallies and church group meetings, wedding and other celebrations; and workers did their washing. The sample frame developed was very useful in enabling the researcher to overcome this problem as the next village on the list was chosen as a substitute.

Other limitations included the length of questionnaires (1hr 20m for each interview) and monotony of interviews arising from homogeneity of the Basotho society which limited variation in food intake. In addition, educated women were extremely difficult to reach and seasonal differences in availability of food affected the reporting of food intake (everyday, regularly and sometimes).

5.3 Socio-demographic profiles

Socio-demographic data were collected only at baseline. This was because it was believed that socio-demographic characteristics could not have changed within a period of six months.

5.3.1 Age

Although the women's age was pre-determined through inclusion and exclusion criteria, the median age (41 years in the control group and 45 years in the experimental group) reflects the demographic structure of women in Lesotho. At this age women in Lesotho have matured into the challenges of providing food for themselves and their families, therefore the information they contribute in this regard can safely be regarded as representative of food patterns and practices in Lesotho.

5.3.2 Education

Women who had only gone through primary school education were the most highly represented participants (C = 54.4%; E = 48.0%) while tertiary educational level was the least represented (C = 8.7%; E = 15.5%). This is consistent with UNESCO (2003: 122) findings that young women in developing countries have to leave school early to look after the home. In addition, although women in Lesotho are more literate than their male counterparts, the latter are better able to attain higher level education (LDHS, 2004/9: 27, 3; BOS, 2006: iii). Low representation of tertiary educational level in this study means that views of this category are least expressed. It is expected that food patterns of participants at these unequal educational strata would differ. Although general educational qualification does not guarantee healthy eating practices, higher educational attainment is associated with better food knowledge (Charlton & Ferreira,1997: 13; Harnack *et al*., 1998: 135; Kearney *et al*., 1998: 45) and better income (Ewles & Simnett, 2003: 48) enabling affordability and accessibility of a variety of food.

5.3.3 Urban and rural residence

Consistent with the national situation where 76% of Basotho reside in rural areas (BOS, 2006: 4), in this study there were more rural (C = 65.2%; 51.7%) than urban participants (C = 34.8%; E = 48.3%). This could also have been due to the fact that rural residents would be more susceptible to cooperation with the village authorities than the urban residents. Compared to rural residents, urban residents are more likely to possess better knowledge, have a means of earning some income and are better exposed to access and variety of foods (MacIntyre *et al*., 2012: 122). Although according to MacIntyre *et al*. (2012) urbanisation also presupposes a change in eating patterns, a factor which may impact negatively on health, low representation of urban residents in this study may reduce the opportunity to access complete information about their food patterns.

5.3.4 Other socio-demographic indicators

High ownership of a house (C = 78.3%; 87.0%), low divorce (C = 2.0%; E = 2.9%) and separation (C = 3.4%; E = 2.0%) rates as well as low single-parenthood (C = 10.7%; E = 6.9%) that characterize the women in this study may point to stability of a home in Lesotho. A stable home may potentially provide a favourable atmosphere for successful nutrition education with a consequent conducive atmosphere for desirable food patterns.

5.3.5 Socio-economic indicators

A housewife in Lesotho in most cases means that the husband is working in the mines in South Africa. This status is perceived to continue even after the husband retires and after widowhood. Very few women in Lesotho are housewives by choice. About 50% of women in this study indicated that they were housewives. Being a housewife in Lesotho and in this study, is an indicator of poverty. In addition, the other indicators for poverty evident in this study are being self-employed in an informal sector (C = 11.6%; E = 12.6%); being unemployed (C = 14.5%; E = 18.3%) and being a subsistence farmer (C = 1.9%; E = 1.6%). Poverty in this study is also indicated by low access to running water (C = 27.8%; E = 28.5%); low ownership of a bathroom (C = 8.3%; E = 13.8%); low access to a water system toilet (C = 8.3%; E = 13.8%); use of a pit latrine and the velt, lack of electricity, use of open fire for cooking and low income among others. The results of this study are consistent with the National and United Nations rankings of Lesotho as one of the poorest countries of the world (UNDP 2003: 5); and women in particular bearing the brunt of the poverty situation in the country (World Bank, 2003: 56). While home stability could potentially create favourable conditions for effective nutrition education, the poverty situation may negatively impact on the likely outcomes of such an intervention.

5.4 Anthropometric measures of nutritional status

The study showed that women in the sample had a median BMI of 30 kg/m^2 in the control group and 29.5kg/m^2 in the experimental group. This is overweight, according to the classifications of Hammond (2008: 400) and Thomas and Bishop (2007: 63). No significant improvements in this regard were observed after the nutrition intervention was provided. This could be the result of two factors. Firstly, it could be that the nutrition education intervention was not effective, and secondly, it could be the short interval that was allowed to elapse between the intervention and the measurements.

The findings of this study are consistent with the national anthropometry reflected in the LDHS(2004/9: 27, 2) which indicate that although the mean BMI of Basotho women in the age group 15-49 years was 25kg/m^2, 42% of women in the same age group had a BMI higher than 25kg/m^2. Moreover 68% of women in the age group 45-49 years had a BMI higher than 25kg/m^2.

The BMI healthy categories as indicated above have however been found to be too strict both on the lowest and highest normal point; cut off points of a BMI of above 18.5kg/m^2 up to 27kg/m^2 have been found to represent a healthy weight status (Hammond, 2008: 401; De Koning *et al.,* 2010: 1323, 1327). This argument is, however, still controversial. Even with these new cut off points, the BMI scores of Basotho women are still high and they reflect a view of Basotho society which equates plumpness with value and beauty in the body of a woman. Although this view is believed to be declining among the educated, it sadly continues to prevail among the less educated. It is compounded by a lack of knowledge regarding the health disadvantages associated with overweight and obesity.

Several factors could be contributing to the high BMI scores of women. Basotho women's nutritional experiences are taking place in the context of harsh realities of a complex socio-economic and political environment, exposing them to hard work, poverty and emotional strain. The situation of women in Lesotho is articulated in several documents as discussed in Chapter One (BOS, 2006: iii; MAFS, 2005: 10; LDHS, 2004/9; World Bank, 2003: 56). The question arises then as to what causes them to have such high BMI scores? Earlier studies have pointed to several factors that BMI interacts with and is affected by. Firstly, the large muscle mass that is characteristic of Africans (De Koning *et al*., 2010: 1323, 1328) could be a contributory factor to the high BMI. According to the findings of this study, triceps skin fold thicknesses have been found to be too high, over 60% of women in both control and experimental groups being above the 95th percentile. During the measurements in this study, while some women seemed to show true subcutaneous fat which is characteristic of women as compared to men (De Koning *et al.,* 2010: 1328), others displayed more muscle mass. Large muscle mass and subcutaneous fat around the arms could be contributing to the high BMI scores.

Secondly, the study indicated that before and after intervention, the median waist circumference of the women exceeded the recommended cut-off point of 88cm. In women compared to men, this positively indicates the presence of abdominal and visceral fat rather than muscle mass (De Koning *et al*., 2010: 1323, 1328). Lack of, inadequate, or inappropriate exercise contributes to a large waist. Large waist circumference (in addition to other fat area deposits such as of the gynoid type), contribute to high BMI. In addition, large waist circumference such as is evident in women in this study is associated with obesity which is a disease as well as a risk factor for disease. High abdominal fat (particularly visceral fat) is a risk factor for cardiovascular diseases and diabetes, and is on its own a major risk factor for the 'metabolic syndrome' (Gee *et al.*, 2008: 541).

Thirdly, the study found that although the women reported that they engaged in physical activity through manual work, this was either an inappropriate or inadequate type of exercise for weight management. Exercise that achieves weight reduction meets a certain degree of vigorousness (Franz, 2008: 779). Therefore, instead of reducing fat, the small amount of physical activity could perhaps have increased appetite.

Fourthly, food preparation methods contributed to high BMI. Although women indicated that they ate vegetable and fruit, it is important to note preparation methods that may reduce the value of these foods, vegetables in particular. For example, before and after the intervention, the majority of women indicated that in most cases they cooked vegetables until they were well done and that they sometimes fried them. Cooked vegetables are starchy, and overcooked vegetables are even more so, these combined with added fat/oils are sure to increase weight. Cooked and fried vegetables are eaten with *papa* and women indicated that *papa* constitutes the largest part of the meal, with a very small portion of vegetables accompanying it. This way of cooking and eating large portions are a recipe for weight gain.

Fifthly, although this practice improved minimally in the experimental group after the intervention, the majority of women indicated that they did not remove fat from meat or chicken skin before cooking. They ate full cream milk, ate processed meats such as *polony* and sausages, as well as other cheap meat sources such as those discussed below. In addition to the known risk factors of saturated fatty acids and high intake of the other types of fat, high intake of any type of fat contributes to food energy with the consequent weight gain and obesity (Gallagher, 2008: 59).

Sixth, 'cheap food coping strategies' as defined by Kruger *et al*. (2008: 6,10) such as the tendency to eat cheap meat sources such as chicken feet and offal, cow, sheep and pig heads and feet and offal which are high in fat and boiled in their own fat was evident before and after the intervention. These fatty meals borne out of cheap food coping strategies lead to weight gain.

Seventh, before intervention, the women indicated that although they ate breakfast, it was not a question of time or composition, it was dictated by hunger and availability, and sometimes they ate remainders from dinner. They indicated that they ate sorghum soft porridge, breads, and some cereals. According to Timlin and Perreira (2007: 272), eating breakfast before 10.00

am, and eating breakfast composed of grains rather than protein predicted desirable BMI and controlled appetite throughout the day. This means that despite their eating breakfast composed of grains, the women may be eating after 10.00 am, may be consuming large portions, and may be inappropriately combining foods. Although after intervention this pattern of eating seemed to change, it effected a minimal reduction in BMI. The adopted healthier eating habits could have been affected by interaction with the other factors discussed above. It could also have been a consequence of change being gradual and challenged by issues of availability and relapse, as well as gradual bodily changes.

Lastly, based purely on speculation, could it be predisposition? Perhaps overweight and obesity is genetic and runs in families in Lesotho, or perhaps the women were malnourished as children and therefore are predisposed to obesity in later years? Although the study could not establish the size of portions the women ate per meal, they gave an indication in their comments about the large portions of *papa* that they ate. Although BMI on its own cannot distinguish the types of fat and muscle mass, when combined with other anthropometric indices it has been associated with type 2 diabetes, glucose status and cardiovascular disease (De Koning *et al.,* 2010: 1323).

According to the present and other studies the majority of the women were obese and had an unhealthy waist circumference which was possibly due to low physical activity and high energy intake.

5.5 Health status as determined by morbidity

A distinction between acute and chronic illness is still not understood by most Basotho. When reductions in symptoms of chronic illnesses are experienced, people may report such disease as having been cured. However, many women in Lesotho in particular can be described as 'hypochondriacs' (hypochondriasis is defined as a tendency to worry excessively about one's health [Sarafino, 1994: 292]) , they perceive and exaggerate illness even for minor ailments in return for attention of some sort. They describe the pain they are suffering in such a way that it seems an enjoyable experience. This is evident from the long list of ailments that they reported they suffered from, in addition to the pre-provided list (Chapter Four).

After intervention, fewer participants reported acute illnesses in the experimental group. The intervention emphasized the importance of feelings of wellness and this could have impacted on the frequency of the reports.

5.6 Usual food intake according to the FGP and SAFBDG

The study used the FGP and SAFBDG to inform the research on establishing usual food intake of the participants and to inform the nutrition education intervention. This approach provided a framework and reference for the research and the education provided. In addition, six selected theories of health behaviour were used to guide emphasis and to provide an understanding of participants' beliefs and perceptions about food and nutrition.

According to Earl (2004: 263), one of the recommended ways to determine a daily balanced diet is using FGP as a guide. FGP proposes a daily meal pattern using five food groups.

5.6.1 Intake of food from the grains group

According to the United Sates FGP, the breads, cereals, pasta and other grain products should form the largest portion of the meal. This relates to Africans, particularly the Basotho in the way in which their diets are composed, as they usually include more grain based staple foods. In this study before intervention, the women indicated that they traditionally usually included the breads, cereals, rice, pasta and the other grain products in their diet as the main component of their meals. For example, the majority of women indicated that they consumed stiff maize meal (*papa*) every day, others regularly while some consumed it sometimes. The same was true for breads, cereals, rice, pasta, sorghum-soft porridge, sour porridge, samp and cake. Although this eating pattern conforms to the recommendations of the FGP, the study could not determine whether it was excessive or adequate, and it cannot be attributed to the impact of the nutrition education intervention as it prevailed before.

In fact grains in the form of the above foods do make up the bulk of the Basotho diet, and this has been portrayed in the women's comments that they usually ate a large portion of *papa* (stiff maize meal porridge) which is the staple food of the Basotho and makes a big part of most meals for the rural, uneducated, and poor. It is a food of choice for many educated people, urban and affluent alike. *Papa* is commonly made from different types of maize meal as follows: *Chai* and *induna*, which are not so refined and are darker in colour, *Iwiza*, white star and others which are refined and white. All these maize meals are fortified. Home-made maize meal on the other hand, is relatively unrefined, ground in its original form by regular grinding mills, with no fortification or replacement of lost nutrients that may have occurred during the process of grinding). *Papa* is usually eaten with very little *moroho* (boiled or fried green leafy vegetables).This way of eating of the Basotho was documented back in 1993 by Prasad *et al*. (1993: 45), who stated that according to the Lesotho national survey of 1993, 75% of the Basotho diet consisted mainly of the staple food.This eating pattern has also been articulated by Steyn and Temple (2008: 203); MacIntyre *et al*. (1997: 203) and Kruger *et al*. (2008: 6, 10) who stated that African diets are composed of large portions of staple foods accompanied by a small relish in varying amounts.

However, according to the SAFBDG, while still making the grains the main portion of the meal, for the health benefits of this food group to be realized, the degree of refinement is essential. Therefore, in this study, although before intervention the majority of participants were already consuming the more unrefined *papa* made from *chai* and *induna* maize meals, after intervention, the trend of *papa* consumption had shifted even more towards these maize meals (95% CI for the percentage difference [22.2%; 37.0%]). The women were significantly consuming the less refined maize meal options and more brown bread (95% CI for the percentage difference [7.7%; 19.0%]) as well as more oats (95% CI for the percentage difference [13.9%; 28.2%]) and continued to eat the other most commonly consumed grain products such as sorghum-soft porridge (95% CI for the percentage difference [2.9%; 15.4%]). The other breakfast cereals, whole wheat bread, muesli and brown rice although slightly improved, remained uncommon even after the intervention.

In view of the above, after intervention, the women were eating adequate minimally processed as well as fortified grains according to the recommendations of the SAFBDG as proposed by

Vorster & Nell (2001). They no longer felt that the refined group was the ones they should be eating, which means that knowledge of healthy eating had increased, and perhaps perceptions of personal vulnerability to contracting diseases caused by eating only refined food stuffs had increased. This improvement could be attributed to the theory based nutrition education intervention provided by this study.

It seems reasonable therefore, to conclude that the nutrition education intervention was successful in raising awareness regarding the health benefits of consuming the less refined grain products, and although consumption of home-made *papa* remained high, healthier options such as oats were chosen. Oats is one of the less refined breakfast cereals. This positive change means that the nutrition education intervention created awareness of the importance of eating breakfast and its composition, thus also promoting variety in the meals of the day. According to Timlin and Perreira (2007: 269), the healthiest breakfast is that which is composed of grains rather than meats. Consuming breakfast cereals provides variety as well as nutrient density compared to the more traditional dishes such as sorghum-soft porridge that is commonly consumed for breakfast. However, the slight improvement regarding the other breakfast cereals could be due to rigid food habits, and most probably due to poverty. In most cases healthier choices are not easier ones to make as people may not be enabled to make them by circumstances beyond their control. This is consistent with earlier literature on the influence of the complex nutrition environment on people's eating practices as has been alluded to by many studies, including Kruger *et al*. (2008: 6, 10), Lytle (2005: 92) and Steyn and Temple (2008: 323) among others.

Minimally refined grain products provide the body with energy, fibre, antioxidants and fortified products which provide numerous vitamins and trace elements to the body (Beyer, 2008: 676). Fibre is important in prevention and control of diabetes (Franz, 2012: 682, 685) as well as that of gastrointestinal diseases (Beyer, 2008: 676).

It was difficult to establish the portion sizes for the grains food group. Although the women indicated that they ate this food group three times per day, there was no indication of the size of portions or the number of servings per meal. The women who reported that they ate when they were hungry, although insignificant, quite explain the eating habits of the Basotho especially in the rural areas where there are no conscious number of times or designated times for eating. They eat when they are hungry. The portion sizes of these meals can be enormous.

Current recommendations are to spread out meals evenly throughout the day to a maximum of six times a day, composed of breakfast, morning snack, lunch, afternoon snack, dinner, and late night snack (Department of Nutrition and Dietetics, UFS). This would allow the range of 6-11 servings according to the FGP to be accommodated. This may be difficult for Basotho who are used to huge meals composed of big portions of *papa* or any grain that may be available at the time, and small portion(s) of *moroho*/ beans or any relish that is available.

It is not easy, therefore, to decide whether the three times median indicated after intervention was due to people trying to spread out meals, and perhaps reduce the size of portions. It is also not in the culture of Basotho to weigh food or to count how many slices of what size of bread they eat. Therefore, it is difficult to conclude if they ate more or less or adequately according to recommendations of the FGP after the intervention.

5.6.2 Consumption of vegetables

According to the recommendations of the FGP, 2-3 half cups of vegetables should be consumed per day (Whitney & Rolfes, 2006: 44) while the SAFBDG recommend that they should be eaten in abundance and should not be less than five servings per day (Love & Sayed, 2001: 24).

Like grains, vegetables also form an important part of Basotho diet. They eat some of them in their raw form and cook most of them. As has been described above, cooked vegetables, referred to as *moroho* are traditionally consumed with *papa.* The women indicated that they usually ate different types of vegetables every day, regularly, and sometimes as described below.

Before intervention, the majority of women indicated that they most commonly consumed pumpkin, followed by cabbage which was reported to be so eaten by the majority of the women that it was even nicknamed "John 14", *"lebanta la papa* (belt for *papa*)", "Job's head (*hlooho ea Jobo*)", *"nthoamehla*" (daily thing), *"jelemut"* (as a matter of must) showing that they ate it only because they had to. Tomatoes were the next most commonly consumed vegetable, then spinach, potatoes, wild vegetables, carrots, onions and turnip. Pumpkin leaves were also commonly consumed. These vegetables were consumed more 'regularly' and 'sometimes' than 'every day'.

After the intervention, a significant reduction in cabbage consumption was observed whereby instead of 37% of women eating cabbage every day, only 12% were eating it every day. Therefore instead of eating cabbage every day, women were eating it regularly and sometimes (from 36%-51% regularly, and 25% to 36% sometimes). This indicates that the nutrition education intervention created awareness amongst the women that they did not only have to eat cabbage, but rather that they could eat the other vegetables as well. Although cabbage is rich in a number of nutrients including vitamin K which is important for blood clotting and calcium metabolism, as well as folate, which together with vitamin B_{12} are important for red and white blood cells formation in the bone marrow (Gallagher, 2008: 81), it could contribute to the development of goitre if consumed in excess (Smolin & Grosvenor, 2000: 375) and to the exclusion of other vegetables.

Improvements observed in the experimental group after intervention provide evidence that the nutrition education intervention which, although did not cause women to eat the vegetables as they were already eating them, was responsible for the improvements. After intervention, women in the experimental group were reporting vegetable consumption more confidently than before intervention where they seemed to believe that it was an embarrassment to acknowledge consuming vegetables instead of meat. The women in the experimental group improved their everyday and regular consumption of pumpkin, tomatoes, potatoes, carrots, turnip, spinach and wild vegetables consumption. Although affected by seasonality, green beans and green peas still showed a fairly common trend before the intervention. After the intervention, these vegetables were also significantly regularly consumed when they were in season. The same trend was evident with green pepper, which barely made 50% of the sometimes consumption before intervention but improved to 73% of regular consumption after intervention, as well as garlic and lettuce. The lack of change in the consumption of broccoli could be attributed to factors such as familiarity, availability and affordability. Broccoli does not grow easily in Lesotho and it is expensive.

That women were already eating vegetables before and after intervention is established in this study, but whether they were eating adequately according to the recommendations of the FGP and SAFBDG remains a challenge. According to the women's comments, vegetables are scarce in the winter seasons therefore they eat them sparingly with very small servings accompanied by large portions of *papa* in order to fill the stomach. Although according to Stein *et al.* (1999: 17) vegetables were among the most commonly consumed foods by the South Africans, they remained scarce as the other foods became increasingly available, with the consequent low consumption. Therefore, it is difficult to establish how big or how small the serving usually is. The study could not establish whether after the intervention this pattern could have changed. However, the combination of the yellow and green (leafy) vegetables that the women indicated they usually consumed before and after intervention is commensurate with prudent eating. According to the literature, the dark, green leafy and yellow vegetables are rich in fibre (Gallagher, 2012: 38) and in varying amounts and bio-availability of vitamins A, C, K and folate, as well as in trace elements such as calcium and iron. Fruits and vegetables that are rich in antioxidants (e.g., vitamin C, A, E, carotenoids, selenium and zinc) and photochemical have been particularly found to inversely affect cancer causing substances in some foods (Grant, 2008: 965; Grant & Hamilton, 2012: 835), and generally plant-based diet is recommended for management of a variety of women's health challenges such as pre-menstrual tension, menopause, high LDL cholesterol levels and bone mass among others (Dodd, 2012: 435).

Before and after intervention, the women indicated that they ate vegetables three times per day, and there was no change produced by the intervention.

As with the breads, cereals, rice and pasta group, before intervention, although insignificant, there were those women who ate vegetables when hungry while after intervention there were none. This last group again speaks volumes about the eating habits of the Basotho in the rural areas who do not have fixed breakfast, lunch, dinner or snack times. It should be noted that eating vegetables any number of times does not necessarily indicate different types of vegetables or the size of portions. It usually means that participants ate *papa* and *moroho* only, or two types of salad (usually carrots and beetroot, or *moroho* and carrots, or potato salad) in those many number of times. It could not be established if this pattern changed after the intervention as this was not provided for in the questionnaire.

5.6.3 Consumption of fruits

Fruits also form a big part of the Basotho diet, similarly to South Africans (Stein *et al.,* 1999: 17). Like vegetables, they are domestically grown and also grow wild, but they differ from vegetables in that they are sweet and nice to taste, do not need effort and time to prepare as they just fall from trees and are ready to eat. Although seasonality affects fruit consumption, there are several ways in which many Basotho (especially in the rural areas) preserve fruits, particularly peaches (through drying and canning to make jam or desert) so that they are able to eat them throughout the year. However, these may not be enough to ensure meaningful and lasting food security. As with vegetables it was also difficult to note seasonality as this was not provided for in the questionnaire. The women in the study reported that they most commonly domestically grew peaches, apricots and grapes, while apples, plums and strawberries were sparsely grown. Figs and oranges were the less domestically grown fruits, while the rest were exclusively imported.

Before intervention although the women consuming these fruits were less than 50%, the study produced evidence that peaches, oranges and apples were the most popular fruits among the sample. Reported reasons for the high consumption of these fruits were availability. The study found that the majority of Basotho grew peach trees while a few grew wild. Oranges and apples were the most accessible fruits on the market, although very few Basotho grew them in their gardens, they were sold widely and at an affordable price. After intervention, women reporting that they consumed peaches and oranges ‘everyday’ and ‘regularly’ increased significantly, although they indicated that they ate these fruits when they were in season.

After intervention, women in the experimental group significantly increased regular consumption of fruits which they commonly consumed ‘sometimes’. These were bananas, pears, apricots, plums and strawberries. Consumption of some least consumed fruits also improved after intervention. These were guava, mango and pineapple. Consumption of figs and raisins did not change after intervention.

As with vegetables, fruits are low in energy, rich in fibre, contain a variety of vitamins and minerals in varying degrees, are rich in phytochemicals, and may prevent cancer (Grant, 2008: 965). Fruits may also provide some benefits in diabetes management (Franz, 2008: 776). They are fat free (with exceptions, e.g., avocado) and consist of natural sugars, features that are associated with lowered risk of disease. Consumed in consistent proportions to other health promoting foods, fruits can lower the risk of obesity and the consequent associated diseases. In addition to the health benefits of consuming plenty of fruits and vegetables, feelings of wellness and good body posture are associated with reports of self-esteem (Elderman & Mandle 2006: 511, 512).

Normally people do not count how many fruits they eat per day. This also made evaluating the number of fruits eaten, or the number of times fruits were eaten per day difficult. However, before intervention women in this study indicated that they ate many fruits per day when they were in season. While this might be the recommended portions for fruits per day according to the SAFBDG, in most cases it is done over and above the large portions of the other food groups. In this way the benefits of fruit consumption are diffused and no longer realized. According to the FGP two to four servings of fruits should be eaten per day (Whitney & Rolfes, 2006: 43; Dodd & Bayerl, 2008: 345), while according to SAFBDG five servings of fruits and vegetables should be eaten per day (Love & Sayed, 2001: 24). After intervention women in the experimental group indicated that they ate four fruits per day. This is adequate as it exceeds the recommendations of the FGP, and in combination with vegetable servings could meet the SAFBDG recommendations.

5.6.4 Consumption of foods from the meats group

Basotho are a meat-eating society although in recent times meat has become scarce. In South Africa however, meat remains one of the commonly consumed foods (Stein *et al*., 1999: 17). The women in this study disclosed that factors such as drought, stock theft and shear poverty has led to the scarcity of meat. The meats group includes protein giving foods derived from plants and this makes it easier for people to obtain protein even without animals although they would have preferred animal protein.

Before intervention, the women in this study indicated that they most usually consumed eggs in the meats group. After intervention, egg consumption had not improved in the experimental group. This could be due to the nutrition education intervention, which created awareness that eggs should be eaten in moderation. Although they are a good source of protein, and are rich in other nutrients such as vitamin A and vitamin E, eggs are also rich in cholesterol which is detrimental to health if consumed in excess. According to the SAFBDG recommendations (Scholtz & Vorster, 2001) not more than four eggs should be consumed per week.

Results show that before intervention, women in this study also indicated that they most usually consumed chicken. Chicken is easily reared for domestic use as well as for commercial purposes in Lesotho. Chicken imported from South Africa is relatively cheap and available in supermarkets. After intervention, women in the experimental group significantly improved their regular consumption of chicken than the control group. According to the FGP, two or three portions of meat should be eaten per day (Scholtz & Vorster, 2001: 46) and chicken without skin is recommended.

Before intervention, the women in this study indicated that they were traditionally usually consuming dried beans interchangeably with *moroho.* After intervention regular consumption of dried beans had significantly improved from 57% before intervention to 85% (95% CI for the percentage difference [22.7%; 37.5%]). This could be attributed to awareness of benefits derived from beans as created by the nutrition education intervention. In addition to women being familiar with dried beans the intervention re-established their confidence in consuming them. According to FGP, beans belong to the meats group, which provide the body with proteins. The SAFBDG (Venter & Eyssen, 2001: 37) recommend that dried beans should be eaten regularly as they provide the body with fibre are low in saturated fat and therefore are good for weight status and consequently reduced risk of cardiovascular diseases. The same argument can be tabled for dried peas which were also traditionally consumed by the women before intervention although not as popularly as dried beans. After intervention, regular consumption of dried peas also significantly improved (95% CI for the percentage difference [15.6%; 30.9%].

Results further show that before intervention fish consumption was surprisingly high in this study considering that Lesotho does not produce fish because of its landlocked status. Insubstantial fishing is done on lakes and rivers and the Lesotho Highlands Water fishing project is only just starting, and it is foreign controlled with the bulk of the fish being exported. The most available fish is tinned and it is exclusively imported from South Africa. This makes it expensive. After intervention women in the experimental group had significantly improved their regular consumption of fish from 42% before intervention to 70% after intervention (95% CI for the percentage difference [28.3%; 44.0%]). This improvement is attributed to the impact of the nutrition education intervention in this study which emphasized the benefits of fish consumption. According to the recommendations of the SAFBDG fish should be eaten as regularly as two to three servings per week (Scholtz & Vorster, 2001: 46). Fish is a good source of protein which together with its oils provide essential fatty acids particularly omega- 3 (aecosapentaenoic acid [EPA], docosahexaenoic acid [DHA]) and omega- 6 which both taken in the correct ratio, can reduce the risk of cardiovascular disease, is essential for human brain function and can prevent inflammation (Gallagher, 2012: 42).

Beef consumption has declined in Lesotho, and according to comments of the women in this study, it had become expensive due to factors mentioned above. Before intervention, consumption of beef was low and it stayed the same after intervention. A similar trend was observed with mmutton which the women in this study reported to be the most expensive meat in Lesotho although it is also reared by a few Basotho. Consumption of these two types of meat was already low before the intervention and the low consumption after intervention cannot be attributed to the nutrition education intervention.

Results show that before intervention women in this study mostly consumed sausage (w*ors*) 'sometimes'. After intervention, the women in the experimental group increased consumption of sausage 'sometimes' (C = 60.4%; 77.3%) and significantly reduced its regular consumption (95% CI for the percentage difference [-39.7%; -24.2%]). This could be attributed to the nutrition education intervention which increased awareness of the detrimental effects to health of saturated fat. Sausages are high in saturated fat which is a risk factor for cardiovascular disease and the 'metabolic syndrome' (Gallagher, 2008: 59). The same is true for *polony* (processed meat) whose consumption changed significantly after the intervention from 'regular' to 'sometimes' consumption (95% CI for the percentage difference [-27.1%; -13.5%]).

The median number of times the women ate foods in the meat group was two times per day before and after intervention, and the intervention had no effect on this pattern.

If the size of the portions were established, this would have been the recommended allowance for this group according to the FGP. An insignificant but important number ate the meats when they were hungry and when they were available.

5.6.5 Consumption of milk, cheese and yoghurt

Milk is an important part of Basotho diet as it is also commonly consumed in South Africa. It is produced locally and it is also imported from South Africa. However, in recent times milk has become more a luxury than a necessity because of scarcity and affordability. Results reveal that before intervention, the women in this study consumed milk more 'regularly' and 'sometimes' than 'every day', while after intervention the consumption pattern in the experimental group had significantly improved; more women were consuming milk 'every day' and 'regularly' (95% CI for the percentage difference [27.4%; 42.7%]). This positive change was produced by the nutrition education intervention, which emphasized the importance of consuming milk every day. According to the FGP and SAFBDG (Scholtz & Vorster, 2001: 46), two cups/servings of milk should be consumed every day.

Cheese consumption remained relatively unchanged after intervention, while yoghurt, although not so popular, fared better than cheese, despite its consumption not improving significantly in the experimental group after the intervention (95% CI for the percentage difference [1.7%; 11.8%]). Milk and milk products are an important source of calcium. Calcium is important for bone strength and in maintenance of oestrogen levels, thus minimising the risk of osteoporosis and athletic effects in women. Milk and products also provide other vitamins and minerals such as phosphorus, vitamin B_{12} and vitamin B_6 (Gallagher, 2008: 99 – 101, 107). Although FGP separates milk and products with the meats, according to both the FGP and SAFBDG recommendations, milk and products should be eaten daily.

Although the majority of the women in this study consumed the milk group once a day before intervention (C = 39.9%; E = 47.9%) and after intervention (C = 44.2%, E = 64.3%), a number of them (C =35.9%; E = 23.3%) ate milk and milk products when available, once in a while, once a week or month and when they craved them, however, this number reduced considerably after intervention (C = 36.5%; E = 6.5%). This improvement could be attributed to the nutrition education intervention. However, because the portion sizes could not be measured, the intervention was not able to determine whether the recommended number of milk and products were consumed per day. According to the FGP and SAFBDG, in order for the benefits of milk and products to be realized, two servings of milk and products should be consumed per day. In fact after intervention, the majority of the women were still consuming the milk group once per day whatever the portion size.

5.6.6 Consumption of fats, oils and sweets

Results show that before intervention, the women in this study consumed olive oil, canola oil and avocado least. According to the women's comments, reasons for this trend were a lack of awareness about these products and their benefits, they were expensive; and some women reported that they had never seen them in their shops. Although knowledge alone has been proven to lack the drive needed for preventive action, knowledge always lays the foundation for further interventions to take effect (Lin *et al*., 2011: 316). A lack of knowledge of these fats and their benefits; indicates a pre-contemplation stage of use by the women. For those with some awareness of these fats, factors such as cost and inaccessibility indicate barriers to change related to use of these fats. After intervention, the pattern of consumption regarding these oils had not improved, with the exception of canola oil whose consumption improved significantly (95% CI for the percentage difference [5.6%; 16.2%]) in the experimental group. This improvement in canola oil consumption can be ascribed to the contribution of the intervention, and although before intervention it was unfamiliar, it was relatively inexpensive and tasted better as compared to the other fats. The lack of improvement in consumption of the other fats could be due to lack of familiarity in terms of use and taste as well as cost.

Before and after intervention, sunflower oil was the most popular oil consumed by the women in this study. According to these women, reasons for this trend were that it was available and affordable. Despite this high consumption rate before intervention, the experimental group still significantly improved. This improvement can be attributed to the impact of the nutrition education intervention. Sunflower oil is polyunsaturated or linoleic oil which, although like other polyunsaturated oils it is prone to 'oxidative damage' (Gallagher, 2012: 41), it confers a number of health benefits and reduces the risk of cardiovascular diseases.

Results also show that before intervention, butter, hard margarine, soft margarine, mayonnaise, and lard were not so popular among the women in this study and were consumed mostly 'sometimes'. After the intervention, the experimental group's consumption of butter, lard, and hard margarine had declined significantly. Soft margarine 'regular' consumption significantly improved (95% CI for the percentage difference [6.2%; 19.8%] in the experimental group while mayonnaise consumption almost stayed the same. The nutrition education intervention purposefully aimed at reducing consumption of saturated fats; therefore the reduction in consumption of butter, lard and hard margarine as well as the improvement in soft margarine consumption can be directly attributed to the nutrition education intervention. Butter and lard increase the risk of LDL cholesterol which is a major risk factor for cardiovascular diseases and the 'metabolic syndrome' (Krummel, 2008: 855), and hard margarine is a major source of trans-fatty acids which is also a risk factor for cardiovascular diseases, some cancers, diabetes and allergies (Gallagher, 2012: 45). The SAFBDG (Wolmarans & Oosthuizen, 2001: 54) recommend consumption of vegetable oils instead of animal fat.

According to the results of this study, high intake of sugar and sugary foods is evident among women. Consumption of sugar is noted in South Africa as well (Stein *et al*., 1999: 17). Before intervention, sweets in the form of candy, as drink, jam and sugar were usually consumed, with sugar being the most commonly consumed. After the intervention, women in the experimental group significantly reduced their consumption of sweets, sweetened cold drinks, sugar and cookies as compared to the control group in which there was little or no change. These improvements in consumption of sweets can be attributed to the nutrition education intervention which purposefully created awareness of the dangers of excessive consumption of sugary foods. Therefore, while still consuming the sugary foods the participants did so sparingly, as recommended by the FGP. Although sugar is known to be the biggest displacer or 'diluter' of nutrients in the diet (Charlton *et al*., 2005: 1037, 1040); MacIntyre *et al*. (2012: 130) acknowledge the great contribution that this food can have in facilitating fortification with a consequent adequate intake of nutrients. However, moderate intake of sugar and sugary foods is recommended as high intake contributes to high energy intake leading to overweight and obesity (Ludwig *et al*., 2001: 508).

Before and after intervention participants were consuming the fats, oils and sweets group three times a day. As with the preceding groups, portion sizes could not be established therefore it could not be deduced how much the fats, oils and sweets were eaten. However, after intervention the women in this study indicated that they were opting for low fat and unsaturated fats from vegetable oils, which conform to the SAFBDG recommendations (Wolmarans & Oothuizen, 2001: 54).

In view of the above, eating according to the recommendations of the FGP and SAFBDG could ensure variety, maintain optimal and balanced diet, and provide the body with a defensive, protective and health promoting diet. The study has provided consistent evidence that theory based nutrition education provides a framework for planning research questions and analysis, guides the implementation process, provides indicators for evaluation and ensures success of such programmes. The foregoing process and analyses were guided by FGP and SAFBDG, as well as some selected theories of health behaviour used in this study.

5.7 Food intake according to the SAFBDG and other selected foods

5.7.1 Water intake

Results showed that before intervention, over 90% of women in this study indicated that they drank water every day. However, there were many women who also reported drinking water only when they were thirsty. In addition, before intervention, women drank four glasses of water per day as indicated by the median. After intervention the median number of glasses had significantly increased to eight in the experimental group (95% confidence interval for the median difference [-4%; -2%]). This can be attributed to the impact of the nutrition education intervention which emphasized the benefits of drinking water every day even when one is not thirsty and trying to count the number of glasses drank. According to the SAFBDG, the eight glasses of water can be composed of pure water and any non-alcoholic beverages prepared with tap water such as tea/coffee (Bourne & Seager, 2001: 69). This makes it easy to achieve the eight glasses measure. In addition to rehydrating the body, adequate water intake may be preventive of kidney stones and colon and breast cancers among others (Charney, 2008: 149).

5.7.2 Variety of foods

Results of this study reveal that after the intervention a marked improvement in the percentage of women indicating that they ate a variety of foods was evident in the experimental group from 49.8% before intervention to 78.6% (95% CI for the percentage difference [-9.3%; -1.1%]). In this study a variety of foods refers to three different types of foods per day from each of the five food groups as determined by the FGP. According to the SAFBDG (Maunder *et al.*, 2001: 7) a variety of food is defined as the 'calculations' made based on 'where the emphasis is put' as dictated by circumstances. In this case, affordability and availability were considered in the calculations. The intervention encouraged participants to eat different types of foods as variety enables an individual to get different nutrients that the body needs from the different food stuffs as no one food can provide the body with all the nutrients. The nutrition education intervention in this study can therefore be credited with the improvement seen in the experimental group.

5.7.3 Intake of caffeinated tea/coffee

Before intervention, women in this study possessed little knowledge of the fact that caffeinated tea/coffee taken together with meals may displace the nutrients in the food. The decline in the percentages of women who took caffeinated tea/coffee together with meals after the intervention (from 66.7% to 7.8%) can be attributed to the impact of the nutrition education intervention. This decline could mean that the women were drinking Rooibos tea, which is herbal and uncaffeinated. Decaffeinated tea/coffee is very expensive, and is hardly available in shops in Lesotho. The decline could also mean that while the women continued to drink caffeinated tea/coffee, they did not take it with meals. Excessive caffeine can cause reduced 'bone mineral density' (Anderson, 2008: 626); interact negatively with prescriptive drugs (Pronsky & Crowe, 2008: 441); could affect foetus development (Erick, 2008: 161); and may have an inverse relationship with miscarriage (Eric, 2012: 341).

5.7.4 Intake of fat from meat and poultry

Before intervention the practice of removing fat and chicken skin before cooking was not common among the women in this study. After the experimental group received nutrition education, fat removal did not change significantly and neither did chicken skin removal as the women in the experimental group indicated that they only removed excessive fat from meat and chicken skin 'sometimes.' The insignificant change in these practices could be due to the entrenched taste (sensory affective) preferences that date back to the prehistoric times when the diabetes gene enabled people to eat a lot of fat to store energy for times of famine (Katz, 2000: 301), the practice which has unfortunately rendered nutrition education and counselling a huge task. It becomes even more difficult for people to change this particular habit when they are required to do so in the face of scarcity and food insecurity. To produce change in this regard most definitely need repeated nutrition education interventions that are a part of larger comprehensive programmes that address broader environmental factors.

5.7.5 Intake of low fat milk and products

Low fat milk and milk products were also still uncommon among the women in this study. The nutrition education intervention failed to produce a change related to intake of low fat milk and products. Although the study did not establish associations, it was evident during the post-intervention interviews that it was only those women with chronic illnesses such as diabetes and high blood pressure who indicated that they sometimes ate low fat milk and products. Although the nutrition education intervention emphasized the link between full cream milk and development as well as aggravation of cardiovascular diseases and the 'metabolic syndrome', the majority of women who reported eating milk indicated that they liked milk too much to sacrifice the real full cream milk for low fat options which according to them tasted like water. Nutrition-related knowledge could not translate to behaviour change (Pretty & Priester, 1994: 152). According to Krummel (2008: 51), full cream milk and products contain saturated animal fat whose detrimental health effects have already been discussed above.

5.7.6 Salt intake

Salt intake, like fat, sugar and full cream milk intake is a difficult habit to manage and it is usually underreported. In this study, before intervention the women's intake of salt was reportedly high as indicated by the salt used in preparation of food (C = 93.5; E = 90.9). As the amount used could not be determined, it is generally assumed that it was the usual standard salty dishes that characterize Basotho cooking. However, women reporting that they did not add salt at table were already high before intervention (C = 78.9%; E = 98.1%) and the intervention had no impact on this practice and although some improvement is seen in the experimental group after intervention, it could not be significant (95% confidence interval for percentage difference [-2.4%; 2.4%]) as little room was left for improvement. As far as determining the size of food stuffs for cooking is concerned, it is not in the culture of Basotho to weigh and measure these before cooking, or when dishing out. According to the recommendations of the SAFBDG, salt should be eaten sparingly and should not be added at table (Charlton & Jooste, 2001: 63). A high amount of salt is a risk factor for hypertension which is in turn a major risk factor for cardiovascular diseases and stroke (Couch & Krummel, 2008: 872).

5.7.7 Intake of sugary drinks

Before intervention, the women in this study indicated that they consumed sugary drinks in between meals. After intervention the experimental group had not improved as despite some decline in consumption of these drinks (C = 71.4%; E =29.9%), it was not a significant improvement (95% confidence interval for the percentage difference [-2.4%; 2.4%]). This was in contrast to the positive change observed in section 5.6.6 above. This difference could be due to the different compositions of sugary foods involved. This means that the nutrition education intervention was not effective in getting participants to reduce intake of sugary drinks. That sugar contributes to overweight and obesity is a well-established fact (Gee et al., 2008: 545; BHC, Online) although on the other hand, added sugar in fortified foods has been found to enhance adequate energy as well as micronutrient intakes (MacIntyre *et al*., 2012: 130).

5.8 Knowledge, attitudes, beliefs and practices

Nutrition education in Lesotho has never before been informed by theories of health behaviour. In particular, food-related attitudes, beliefs and practices have never been placed within the framework of theory base. This study has used theories/models of health behaviour to understand nutrition-related knowledge, attitudes, beliefs, and practices of Basotho women in urban and rural areas.

5.8.1 Knowledge

Health promotion's starting point is to inform in order to initiate the process of empowerment. Increasing people's knowledge was the first step the nutrition education intervention in this study took, as according to Lin *et al*. (2011: 316), nutrition education must first increase people's nutrition-related knowledge. It is worth noting that increasing knowledge is only the necessary foundation as much more is needed to motivate health behaviour change (Lin *et al.*, 2011: 316; Pretty and Priester, 1994: 136).

In addition to nutrition knowledge informed by the FGP and SAFBDG, other nutrition information considered important was also included in the nutrition education intervention in this study. Before intervention, over 70% of women already possessed high nutrition-related knowledge in most items as indicated in chapter four. After intervention, over 95% of women had improved knowledge in all the items with one exception.

The current study revealed that before intervention, over 80% to 90% of women knew that milk was a good source of calcium; that eating yellow and green vegetables and fruits everyday is good for health; that they get energy from eating *papa*, bread, rice, cereals and pasta; that indigenous food-plants are good for health; that they get the same nutrients from eating beans as they get from eating meat; that physical activity (exercise) is good for health; and that eating less than six slices of bread was not good for health. Moreover, over 70% of women knew that eating five fruits and vegetables everyday protects the body from illness; and about 70% knew that drinking two glasses of water a day is not enough for the body; while over 60% knew that vegetable oils are better for health than animal fats. Over 50% knew that eating fat from animal meat is not good for health. The high nutrition-related knowledge reflected in this study may be linked to the age of the women who participated in this study as discussed in section 5.3.1.This is consistent with findings in other studies in which nutrition knowledge was associated with older adults (Harnarck *et al*., 1988: 137). On the other hand less than 50% knew that caffeinated tea/coffee should not be eaten with meals; less than 40% knew that rice gives the body the same energy as cereal; that drinking a glass of milk once a week is not enough for the body and that eating two eggs everyday is not good for health.

After intervention, the women's knowledge in almost all of these items had improved to over 90%. For example, knowledge that milk was a good source of calcium significantly improved in the experimental group (95% CI for the percentage difference [7.5%; 19.3%]). Other significant improvements in the experimental group included women's knowledge that eating five fruits and vegetables everyday protected the body from illness; that eating fat from animal meat was not good for health; that vegetable oils are better for health than animal fats; and that drinking two glasses of water a day was not enough for the body.

These improvements can be attributed to the nutrition education intervention which among others, sought to increase the women's knowledge in these particular nutrition-related items. Women's knowledge that rice gave the same energy as cereal did not improve significantly in the experimental group after intervention. This could be a case of people comparing their experiences of inadequate feelings of satiety after eating rice to those of eating *papa* which is quite filling.

Nutrition-related knowledge enables individuals to make informed nutrition-related choices (Charlton & Ferreira, 1997: 13) and reduces perception of barriers towards a healthy diet (Harnack *et al*., 1998: 135).

5.8.2 Attitudes

Several nutrition-related attitudes statements were used to assess the women's attitudes towards food and nutrition.

Regarding the attitude towards eating animal fat, the present study revealed that before intervention, 60% of the women indicated that eating animal fat did not make them feel well. After intervention higher percentages of women in the experimental group indicated the same, reflecting an improvement in this attitude. Contrary to the notion that positive attitudes predict desirable behaviour change, in this study the practice of removing fat from meat before cooking only slightly improved after the intervention. This inconsistency could be a consequence of food insecurity which may lead people to devise unhealthy food coping strategies such as those mentioned above. In addition, large families as revealed in the socio-demographic profile of participants in chapter four (median of people living in a home was 4 [range 1- 11]) may make it difficult for the women to remove fat from meat as this practice would decrease the volume of food.

The attitude towards eating a variety of food can be viewed together with section 5.7.2 in which after intervention women indicated that they ate a variety of food. The improvement in the attitude towards eating a variety of food in the experimental group after intervention (95% confidence interval for the percentage difference [-25.1%; -12.2%]) can be said to have been translated into conducive behaviour change. In addition to the nutrition education intervention increasing awareness about the benefits of eating a variety of foods, it sought to create positive attitudes towards eating patterns that were characterized by adventure and variety. Therefore the intervention can be given credence for these improvements.

After intervention the attitude towards fattening foods and a plump body by the women in the experimental group had significantly improved from 50% to 77%. In addition, before intervention, about 14.7% of women reported that their husbands/partner/men liked them when they were fat. This perception is associated with the value for a fat and plump body by most Basotho women and men which undermine health promotion recommendations for a healthy weight. On the contrary, 44% of the women did not believe that their husband or partner liked them when they were fat, while 41% did not know. This attitude significantly improved positively after intervention in which more than 80% of women in the experimental group reported that they did not believe that their husbands or partners liked them when they were fat. Reduction in these perceptions after intervention can be attributed to the nutrition education intervention which promoted appreciation for reduced weight status for maintenance and promotion of good health as well as improving attitudes towards the 'subjective norm' or 'important others' (Sarafino, 1994: 182) such as the husband to reduce social pressures. Although attitudes have been argued to be better predictors of nutrition behaviour than the 'subjective norm' or the influence of 'important others' the latter are important to consider as they can contribute negatively or positively to performance of conducive health behaviour (Montano & Kasprzyk, 2002: 93) such as healthy eating.

Other attitudes that were not so positive among women before intervention also significantly improved in the experimental group after intervention. For example, after the experimental group received nutrition education, women's belief that the food they ate could affect their health in future improved significantly (95% CI for percentage difference [17.6%; 32.2%]); so did the belief that they thought about what they ate and took note of whether it was healthy or not (95 CI for the percentage difference [19.1%; 40.9%]). The nutrition education intervention can be credited with these improvements as it aimed at promoting positive attitudes towards perception of the cumulative effects of unhealthy eating behaviour to health and how positive thoughts about nutrition may motivate formation of an intention to act, and in this case to eat a diet that promotes and protects health.

At baseline, about 80% of women believed that their husbands/partners did not deserve to get better food than the children. The intervention could not have had an impact on this perception as the percentage of women who believed that children deserved better food than the men were already high before intervention, leaving small room for change.

Positive attitudes are associated with reduced barriers to communication and are good predictors of intentions to act. Positive attitudes towards food are also associated with reduced perception of barriers and perception of benefits of healthy eating behaviour. Therefore positive attitudes produced by the intervention in this study could lead to enhanced learning and consequently improved nutrition behaviour. Some positive results have already been reported in the preceding sections.

5.8.3 Beliefs

As indicated in the preceding chapters, women's beliefs were assessed using six selected theories/models of health behaviour as discussed in this section.

5.8.3.1 Nutrition-related beliefs informed by the HBM

(i) Benefits of eating a healthy diet

Before intervention, the present study shows that womenexpressed many perceived benefits of eating a healthy diet. Among these, perceptions that stood out were the perception that a healthy diet could protect the body from disease, expressed by over 80% of women. Women further indicated that eating a healthy diet would give them good nutrition, energy, fitness, good body growth and a good strong body; and that it would give them good physical and mental health as well as a general good feeling of wellness. After intervention these perceptions increased significantly in the experimental group (95% CI for the percentage difference [5.3%; 15.4%].

Furthermore, results show that among the interesting array of perceived benefits reported by the women before intervention, was the perception that if they ate a healthy diet they would be fat, portraying the still lingering definition of beauty and wellness in terms of fatness among women in Lesotho. Although the percentages reporting this perception were low before intervention, an improvement was observed after intervention (from 6.5% to 0.4%) where participants were no longer considering fatness as a benefit.

The intervention sought to increase perception of benefits of eating a healthy diet. Perception of benefits is considered a good predictor of engaging in health protective behaviour and in this case, of eating a healthy diet.

(ii) Vulnerability /cons of not eating a healthy diet

In this study women reported a lot of perceptions related to cons/vulnerability of not eating well, again some more than others. Before intervention between 54% and 66% of women reported that they perceived themselves personally vulnerable to disease and illness if they did not eat a healthy diet. They made examples of diseases such as diabetes, high blood pressure, mental and physical illness and recurrent diseases. A further 80% of women reported that they believed in their personal vulnerability to developing diseases easily if they did not eat a healthy diet, and in particular, diabetes. Although there was small room for improvement, after intervention women in the experimental group significantly improved in their beliefs in general personal vulnerability to disease(95% CI for percentage difference [5.8%; 16.2%]) and to contracting diabetes in particular (95% CI for the percentage difference [37.9%; 53.9%]). The women also perceived a lack of energy, lethargy, fatigue and tiredness (reported by about 35% of participants); and loss of weight (reported by about 38%). These can be considered the major outcomes (cons) of not eating well as perceived by the women in this study. Although these perceptions cannot be said to have been affected by the intervention at baseline, after intervention, the nutrition education intervention had increased perception of personal vulnerability to diseases in the experimental group. It emphasized the importance of perception of personal vulnerability to taking preventive and protective action by eating a healthy diet. According to the HBM, perception of personal vulnerability is one of the most important predicators of taking protective action (Sarafino, 1994: 181). If people consider themselves personally vulnerable to eating patterns that are risky to their health, they are more likely to change to desirable eating habits.

(iii) Perceptions of seriousness or severity of disease

Before intervention, the perception that contracting or developing diabetes was serious was reported by over 80% of women in this study. The intervention had no effect on this trend of beliefs before intervention. Although there was small room left for improvement, after intervention a significant improvement was observed in the experimental group in their belief in severity of diabetes (95% CI for the percentage difference [12.7%; 26.7%]). These improvements can be attributed to the nutrition education intervention which reaffirmed the positive beliefs and reduced the perception of negative ones in those who had them. The intervention specifically created awareness of the link between diabetes mellitus and diet. Studies have also produced evidence that personalization of messages presupposes health protective action. In this case the belief in the possibility of personally contracting diabetes mellitus if a healthy diet is not consumed portrays personalization of the message that diet is directly related to one’s health. Personalization of message is an important predictor of health protective behaviour (Pretty & Priester, 1994: 136). According to the HBM, positive definitions and evaluations of personal vulnerability and severity of diseases if contracted predict desirable intentions and consequent health promoting eating behaviour (Sarafino, 1994: 181). It means defining health in terms of its relationship with diet and moving beyond beliefs in the unknown, to beliefs in the tangibles. Positive beliefs predict that individuals will therefore respond to health by using diet to interpret and address some of their nutrition-related health challenges.

(iv) Barriers to eating a healthy diet

The present study further showed that before intervention, the majority of women in this study (between 75% and 80%) perceived barriers to eating a healthy diet as lack of money, poverty and unemployment (underemployment) and expensive food leading to lack of food to cook. Although after intervention women reported these perceptions less widely both in the control and experimental groups, the intervention considered it a healthy tendency to perceive reduced barriers. After intervention the perception of a lack of knowledge of nutrition and a lack of knowledge of good food preparation methods as barriers to eating a healthy diet increased in the experimental group (C = 5.8%; E = 38.6%). This change can be attributed to the nutrition education intervention which created awareness that a lack of knowledge can be a barrier to healthy eating. Therefore women in the experimental group were better able to report a lack of knowledge as a barrier to eating a healthy diet after the intervention. The other perceived barriers were related to poverty which translates into food insecurity and unavailability of food. The large majority of women reporting these barriers indicate the prevailing unfavourable food environment in which women have to eat and prepare food for their families. Reducing perception of barriers is a major task of nutrition education interventions which the intervention in this study took on board. The enormity of the task calls for innovative strategies involving empowerment of the participants to stop feeling sorry for themselves; to view the poverty situation differently and to be creative about producing and preparing food.

(v) Enablers to eating a healthy diet

Before intervention the majority of women in this study identified many factors that they perceived would enable them to eat a healthy diet. The most reported enablers were having money, being employed and getting better pay (C = 59.3%; E = 54.9%); producing food/vegetables and fruits in the garden and fields (C = 35.7%; E = 29.8%) and having knowledge and getting motivation from other people (C = 13.6%; E = 15.9%). After intervention the latter perception was reported more by women in the experimental group (C = 8.2%; E = 41.5%) while the other perceptions did not change. While the nutrition education intervention cannot do much about factors relating to poverty and unemployment, it can improve people's personal skills to cope with the situation (such as changing the perception of it, and producing food for themselves as they have indicated above). The perception of knowledge and motivation as important enablers to eating a healthy diet could be attributed to the intervention which created awareness that knowledge could enable performance of healthy behaviours such as healthy eating, and therefore women reported this perception much more confidently after the intervention.

In view of the above, it can be concluded that while the nutrition education intervention had no impact on perceptions that were reported before intervention, it succeeded in raising awareness of women regarding the importance of perceiving personal vulnerability if they did not eat a healthy diet. The intervention also succeeded in reiterating the health benefits of eating a healthy diet such as prevention and protection from disease; and also enabling recognition of important barriers and enablers to eating a healthy diet such as knowledge and motivation.

5.8.3.2 Nutrition-related beliefs in locus of control

Before intervention, women in this study reported conflicting beliefs about their personal control regarding nutrition. For example, the majority of women indicated that they believed that illness and health were caused by luck, fate or chance, while on the other hand they indicated that they did not believe that illness and health were caused by witchcraft. The women also indicated that they believed that they could take control of their health and that they could prevent some illnesses by the food they ate which is in conflict with the belief that health was determined by chance.

Results showed that after the women in the experimental group received nutrition education intervention, they reported more consistently. The belief that illness and health were not caused by luck, fate or chance improved significantly in the experimental group after intervention (95% CI for the percentage difference [-59.0%; -42.9%]). Significant improvements were also observed in the belief that illness and health were not caused by witchcraft [-10.1%; -1.1%]) and in that eating healthy food could prevent some illnesses (95% CI for the percentage difference [12.4; 25.0]). These improvements can be attributed to the nutrition education intervention which aimed to improve the women's perceptions of personal control over their health and feelings of self-esteem by reducing beliefs in chance, witchcraft, luck or fate. The latter beliefs denote external locus of control. The intervention also sought to improve beliefs in taking charge of one's health by eating a healthy diet, thus increasing internal locus of control. The intervention therefore increased the women's internal locus of control and decreased external locus of control. Having personal control as defined by internal locus of control is predictive of health protective behaviour (Katz, 2000: 302), for example, eating a healthy diet with a view to prevent illness and protect health, while external locus of control is associated with unhealthy behaviour such as that defined by lack of knowledge that eating a healthy diet could prevent illness. In other words, individuals respond to health challenges in the way in which they belief they mean for them (Ewles & Simnett, 2003: 5; Herselman, 2003: 6).

5.8.3.3 Nutrition-related perceptions of self-efficacy

Results of the study show that before intervention hardly 40% of women indicated that they had confidence that they could eat a healthy diet every day (C = 32.32%; E = 31.97%). After intervention the women in the experimental group improved significantly in this confidence (95% CI for the percentage difference [61.5%; 76.7%]). This improvement can be attributed to the nutrition education intervention, which reaffirmed women's confidence in the foods that they were usually commonly eating in addition to improving their knowledge of eating patterns according to the recommendations of the FGP and SAFBDG.

To corroborate their assertion of self-efficacy in eating a healthy diet, results of this study show that before intervention almost 100% of women reported that they had mealie-meal in their homes, about 90% had vegetables, almost 70% had beans and about 60% had bread flour. After intervention mealie-meal and vegetables were still significantly reported and the nutrition education intervention had no impact on that. On the other hand reports on beans (95% CI for percentage difference [25.5%; 40.7%]); and bread flour (95% CI for percentage difference [28.7%; 45.5%]) significantly improved in the experimental group after the women received nutrition education. The other foods which the women least reported before intervention gained popularity after the experimental group received nutrition education. These were milk, fruits, breakfast cereal, rice, peas; and pasta. These improvements can be attributed to the nutrition education intervention which sought to improve self-efficacy in eating a healthy diet. Having food in the house means availability of food and is an important indicator to ensuring that eating takes place. For any health behaviour to be performed effectively, individuals must believe in their competency to successfully perform the behaviours in question.

Moreover, results of this study revealed that before intervention, over 80% of women reported that they were able to grow vegetables in their gardens. Although the nutrition education intervention had little impact on this activity, after intervention confidence in the capability to produce vegetables was re-cultivated and women in the experimental group continued to report being capable of producing vegetables in their gardens in high percentages (80.4%). Producing vegetables ensures food security, and in addition it means a transition from pre-contemplation to eating a healthy diet to taking action. It indicates capability and therefore self-efficacy in eating a healthy diet.

Furthermore, results showed that at baseline, less than 40% of women had self-efficacy in removing fat from meat every time before cooking; in engaging in physical activity for 30 minutes or longer at least three times a week and in reducing the amount of salt they used in food. After intervention, women's self-efficacy had shown a tendency to increase in all these items in the experimental group, some more significantly than others. For example, they reported ability to remove fat from meat every time before cooking (95% CI for percentage difference [21.0%; 39.0%]); to engage in physical activity for 30 minutes or longer at least three times a week (95% CI for percentage difference [29.5%; 46.6%]); and ability to reduce the amount of salt in food (95% CI for percentage difference [2.1%; 14.0%]); while in the control group there were no significant improvements. These improvements in the experimental group can be attributed to the nutrition education intervention which sought to increase self-efficacy in performing activities that ensure healthy eating and health promoting life styles.

5.8.3.4 Nutrition-related beliefs informed by TRA/TPB

Results of this study showed that before intervention, over 80% of women indicated that they believed in their own power to make decisions about the food they ate, and that they had an intention to eat a healthy diet. On the other hand about 70% indicated being under the influence of their husbands regarding the food they ate and believing everything that the radio or television said about food. The evident conflicting beliefs among the women in this study is indicative of beliefs in the powerful others in what they say about food which provides proof of powerlessness. Results of the study further show that women in the experimental group significantly improved in these beliefs after the intervention, exhibiting more positive than negative beliefs. For example, the women in this study were no longer under the influence of their husband/partner or their culture in the decisions they made about food. However, the belief in everything that the radio or television said about food still lingered; the women indicated that they believed that people who hosted food talk shows would be qualified to do so. Although percentages of women reporting positive intentions to eat a healthy diet were already high before intervention, significant improvements were still observed in the experimental group (95% CI for the percentage difference [12.4%; 25.0%]) after intervention. According to the TRA (Ajzen & Fishbein, 1980) people form intentions before most of their voluntary actions. The women in this study evidently had positive intentions to eat a healthy diet before intervention but could have been prevented from doing so by the barriers that they mentioned above, particularly a lack of knowledge. Improvements were also observed in the belief of women in their own power to make decisions about the food they ate (95% CI for the percentage difference [7.9%; 19.2%]). These improvements in the experimental group can be attributed to the nutrition education intervention which aimed to reduce misconceptions resulting from pre-existing negative attitudes as defined by Downie *et al.* (1995: 102); Edelman and Mandle (2006: 92) and Lin *et al.* (2011); to reduce beliefs in social norms and peer pressure regarding food actions; encouraged formation of positive intentions to eat a healthy diet, and inculcated positive beliefs in own power to make decisions about food and to perceive more facilitating factors such as the enablers they mentioned above (Montano & Kasprzyk, 2002: 93).

5.8.3.5 Nutrition-related beliefs in social support

Results revealed that before intervention the women in this study believed in their husbands/partners' and their children's support in the decisions they made about food (over 80%). Although the nutrition education intervention caused significant improvements (95% CI for the percentage difference [4.5%; 16.8%]), women already had positive believes regarding the social support they were receiving from their families. However, results of the study show that before intervention, women were not so confident about the support that they were receiving from their friends. After intervention, women in the experimental group significantly improved in their confidence (95% CI for the percentage difference [27.9%; 45.2%]) in the social support they could receive from their friends in the decisions they made about food. Making adjustments related to eating patterns can be a stressful experience and can affect relationships with family and friends. Perceived positive feelings of empathy (Sarafino, 1994: 103) from these groups regarding decisions about food is necessary to ensure perseverance, prevent relapse and ensure maintenance of the adopted food patterns. When family and friends are involved, they can provide encouragement and give reminders.

In summary, these positive beliefs created by the nutrition education intervention seem to have translated into nutritional practices that are conducive to health in some areas despite the fact that in this study the nutrition education intervention was one-off. For nutrition education interventions to take effect and to change attitudes and beliefs related to health, such messages need to be repeated over a period of time as suggested by Charlton and Ferreira (1997: 12).

5.9 Food practices

This section discusses food practices as defined by food choices, food preparation methods and food habits.

5.9.1 Actions related to food choices

In this study, food choices are enabled by women performing all or some of the activities as outlined below. Before intervention, low percentages of women in this study were compiling a budget; drawing a list of foods to buy each week, and each month; indicating a pre-contemplation stage related to making healthy food choices. After intervention, women in the experimental group had significantly improved in these activities, indicating a transition from pre-contemplation to contemplation and action in making food choices. In addition, results show that before intervention, more than 50% of women did not buy anything that came into their minds while grocery shopping with the women in the experimental group significantly improving after intervention. These improvements can be attributed to the nutrition education intervention, which created awareness of the importance of budgeting and planning a diet to enable transition from pre-contemplation to contemplation with regards to making healthy food choices.

Furthermore, results of this study show that before intervention, more than 50% of women were only buying food that they could afford, denoting scarcity of money to buy food. Results further show that after intervention, the majority of women (79%) in the experimental group were no longer only buying food that they could afford, meaning that participants might have sacrificed some other less basic items in order to have more food, as the intervention encouraged.

Moreover, results show that before intervention, more than 60% of participants had a garden; did not grow only cabbage in their gardens; did not buy food every day after work and grew different kinds of vegetables in their gardens. Although percentages of women reporting these positive behaviours were already high before intervention, the experimental group still improved significantly after intervention. More women did not grow only cabbage; and grew different kinds of vegetables in their gardens. Women were no longer buying food every day after work; indicating that they planned what food to buy therefore enabled healthy food choices. These improvements give credit to the nutrition education intervention for improving awareness of the importance of planning through implementing home gardens and growing different types of vegetables to make food available in the home. Availability of food in the home assures readiness to move from contemplation to eat a healthy diet to action.

5.9.2 Actions related to food preparation

Results revealed that before intervention, almost 70% to 90% of women in this study in both control and experimental groups were positively performing all the healthy practices put to them. Although the intervention cannot be totally credited for initiating these hygienic practices as they already prevailed before intervention, it produced the significant improvements that were evident in the experimental group after intervention. For example, after intervention women in the experimental group washed their hands with water and soap every time before touching food; washed cooking utensils with warm water and soap every time after use; washed vegetables every time before cutting; washed vegetables every time before eating raw; washed fruit every time before cutting; and washed fruit every time before eating.

Unhygienic practices in handling food are harmful to health. Communicable diseases can be transmitted through dirty cooking and eating utensils and improper washing of hands when handling food. Germs can also be transmitted through fruit and vegetable handling from harvest and from the market to the home. Germs can also be present on fruits and vegetables from the environment.

Moreover, results have revealed that before intervention, instead of boiling food, the women fried it. After intervention the experimental group had significantly improved in boiling food instead of frying. This improvement can be attributed to the nutrition education intervention which created awareness of the unhealthy effects of fried food on health. Fried food is fatty and frying food transforms the otherwise good fats to form unhealthy substances that are harmful to health. Although results also reveal that before intervention over 60% of participants never threw away water with which they cooked vegetables (participants indicated that the practice was normally to add a little water to the vegetables or fry the *moroho* so that they never have to throw away excess water) after intervention, there was a significant improvement in the experimental group in which 99% reported never throwing away water with which they cooked vegetables. Although the pre-intervention positive practices were already high, the nutrition education intervention can be attributed with the additional improvements as it created awareness against throwing away water with which vegetables were boiled as this practice depletes the vegetables of nutrients.

Furthermore, results revealed that before intervention, about 50% of women cooked vegetables until they were well done. After intervention, an interesting majority (96%) of women in the experimental group were sometimes cooking vegetables until they were well done, indicating that the type of *moroho* dictated the method of cooking. The nutrition education intervention was not effective in changing the women's minds about not overcooking vegetables. Overcooking vegetables depletes them of important nutrients and makes them starchy.

5.9.3 Food habits

Traditionally, Basotho eat when they are hungry; it is not a question of whether it is breakfast, lunch or dinner. However, modernisation has instilled the concept of eating three meals per day even though in the rural areas the times may not be observed. These eating patterns are discussed below.

5.9.3.1 Breakfast

Breakfast in the form of food that is cooked in the morning has always been consumed before undertaking the activities of the day. With the rush life of modern times where children are going to school very early in the morning and mothers and fathers are going to work, getting everybody to eat breakfast is a daunting task.

Although women in this study hinted that they did not really call the food they ate in the morning breakfast, over 80% ate in the morning before and after intervention, therefore getting people to eat breakfast was not an issue in this study. An interesting array of foods that individuals ate in the morning defies the notion of homogeneity of Basotho in terms of eating habits. This changed trend could be attributed to introduction of the western style of eating which has destroyed the confidence of people in their own type of food which is known to be highly nutritious. For example, Sebotsa *et al.* (2003: 36) found that plant foods that grow wild are more nutritious than the domesticated plants. Some of these have even been found to have medicinal properties as documented by among others Maliehe (1997) and Jonathan (2004).

This study has produced evidence that before intervention, the most popular foods that women ate for breakfast were sorghum-soft porridge as well as bread (with margarine) and tea/coffee. Few women usually ate *papa* (stiff maize meal) with *moroho* (cooked green leafy vegetables) and cereals/bread with milk for breakfast.

After intervention the pattern was still the same as before intervention with slight differences. For example, more women in the experimental group ate sorghum-soft porridge and bread (with margarine) with tea/coffee; and cereals/bread with milk became popular as well, improving from 9% before intervention to 58% after intervention. Oats was the most consumed cereal. Breakfast has been argued to be the most important meal of the day and the nutrition education intervention in this study created awareness of the benefits of eating breakfast and improved women's confidence in what they were already usually eating, which was composed mainly of grains. Recommended to be eaten before 10.00am every day (Timlin & Pereira, 2007: 272), breakfast provides important nutrients to the body for the day, particularly energy which the body needs to kick start the day after a long night fast. Studies worldwide have produced evidence that breakfast eating confers a number of benefits. Breakfast eating behaviour has been found to regulate appetite, hence contribute to weight management (Timlin & Perreira 2007: 269). In this way healthy breakfast eating can be related to lowered risk for CVD related disease (Timlin & Perreira 2007: 275).

5.9.3.2 Lunch and dinner

This study has also revealed that before intervention, the women most popularly ate *papa* with *moroho* for lunch and dinner (C = 77.2%; E = 65.3%). They also ate bread/*papa*/samp with beans (C = 28.8%; E = 30.7%); *papa* with milk (C = 14.7%; E = 17.8%); and *papa* with eggs (with *moroho* or tomato) (C = 20.7%; E = 24.0%). This indicates that Basotho women's diet is traditionally largely composed of grains, vegetables and beans and to a lesser extent includes milk and eggs. This is consistent with the assertion by Steyn and Temple (2008: 203) and MacIntyre *et al*. (1997: 203) that African diets are composed mainly of large amounts of carbohydrate and varying amounts of vegetables and protein.

After intervention, results show that while the women in both the control and experimental groups continued to consume *papa* with *moroho* (C = 81.4%; E = 78.6%) more women in the experimental group were consuming more of some dishes that they were commonly consuming before intervention. For example, bread/*papa*/samp with beans or peas (C = 30.9%; E = 76.6%),*papa* with eggs (with *moroho* or tomato) (C = 20.6%; E = 42.2%), *papa*/samp/rice with meat (stewed, barbecue), *wors*, chicken and salads (cooked and raw green, red, cabbages, pumpkin, green beans) (C = 6.2%; E = 18.8%), and *papa* with milk (C = 19.6%; E = 57.8%). These results reveal that while still increasing confidence in what the women were already usually consuming (grains, vegetables and protein); it succeeded in making them include some variety.

5.9.3.3 Other food habits

The present study showed that before intervention the women most usually ate *simba* chips (crisps) as snacks. After intervention, the women most usually ate fruits as a snack; and they reduced consumption of *simba* chips, sweets, cookies and biscuits as snacks. These latter snacks are considered unhealthy because most of them contain trans-fatty acids (Gallagher, 2008) and they can lead to overweight and obesity. The women also mostly favoured chicken (with papa) which is a healthier option as it is white meat although they mostly disliked pork which is also a healthier option than red meat. Results also reveal that before intervention the women bought take away foods once in a while consisting of Russian sausage, fat cakes (*makoenya*), potato chips, a plate of *papa* with *moroho* and meat, barbecue meat (with [rice, samp, pasta] and sometimes with salads, including pumpkin]) reflecting intake of street food consistent with MAFS (2005) statement that urban based people mostly consume these foods. The decline that became evident in the experimental group after intervention in the rate at which women bought take away foods (97% in the control group to 31% in the experimental group) and the rate at which they bought Russian sausage and soda can be attributed to the intervention. Take away foods can be high in fat, salt and sugar, and usually lack fresh foods (Dodd, 2012: 436). Russian sausage and fat cakes are high in fat and salt, and sodas are not recommended as most of them may contain substances that are carcinogenic, and may displace calcium.

In summary, the positive gain in knowledge portrayed by the women after the intervention is consistent with many studies worldwide and in South Africa in particular where the study by Walsh (1995) and Mushaphi (2012) produced evidence that nutrition education improved knowledge. The nutrition education in this study was designed and delivered effectively, which ensured its success in improving knowledge and changing attitudes, beliefs and some practices.

In particular, the intervention was successful in getting women to budget and plan for their meals, enabling transition from pre-contemplation with regards to making healthy food choices. The women were also making food a priority by not only buying food they could afford, demonstrating increased self-efficacy through keeping home gardens and growing a variety of vegetables in their gardens. Moreover, the women were handling food hygienically although they were still cooking vegetables until they were well done.

According to the discussion above, it has been established that *papa* with *moroho* were the most usually traditionally eaten foods for lunch and dinner, with negligible variety. In addition, fatty, salty and sugary snacks were usually consumed with some reductions after intervention.

5.10 Lifestyle

Lifestyle factors such as physical activity, alcohol intake and smoking were included in this study as these were considered to interact positively or negatively with nutrition behaviour and they are discussed below.

5.10.1 Participants' involvement in physical activity

Physical activity forms part of the SAFBDG (Lambert *et al*, 2001: 12) which forms part of the theoretical basis of this study. The nutrition education intervention in this study included educating women about the absolute necessity of engaging in physical activity for health.

Women who participated in this study were already active before intervention, as results show that they cleaned house (over 80%), gardened (40%) and walked (70%) as they went about their daily duties. However, it cannot be concluded whether or not the physical activity was adequate. According to the median BMI of women in this study which indicates that the women were overweight and obese, it is reasonable to assume that the physical activity was inadequate. Results reveal that after intervention the experimental group had significantly improved in engaging in physical activity including cleaning house; gardening; and walking; jogging; and exercise (stretching). Although the other less popular types of physical activity such as cycling, aerobics, netball and swimming remained unpopular and the other traditional physical activities remained unchanged (cleaning surroundings, hoeing and harvesting the fields, pushing the wheel barrow, climbing mountains to collect wood/berries, washing clothes, playing volley ball, squash and tennis, *mokhibo* [traditional dance], dance sport and rearing poultry), it is evident that the nutrition education intervention was successful in encouraging people to enhance their physical activity through the traditionally popular activities with the inclusion of jogging and exercise. The health benefits for these women accruing from these physical activities are numerous. In addition to reducing the risk of developing cardiovascular diseases and some cancers, the hormonal secrections that physical activity promotes contribute to improved mood and feelings of self esteem (Hoeger & Hoeger, 2011: 383; Edelman & Mandle, 2006: 272). However, the minimal changes in BMI, waist circumference and triceps skin fold thickness could be due to individual differences in the amount and type of physical activity as well as differences in muscle mass. Physical activity done for the purposes of weight management conforms to certain types of exercise (Dodd, 2008: 273) and to a degree of vigorousness (Franz, 2012: 689).

The purposeful encouragement of physical activity in this study was borne out of evidence produced by studies worldwide that healthy eating must always go together with physical activity for weight management and other health benefits (Dodd, 2012: 434) such as those related to hormonal balance and bone mass in adult women (Dodd, 2008: 273).

5.10.2 Alcohol intake

According to the recommendations of the SAFBDG, alcohol should be drunk moderately, which means taking 0-2 units per day for women, and avoiding binge alcohol intake of three or more standard drinks on a weekly basis (Van Heerden & Parry, 2001: 73).

Results of this study reveal that while not many women drank alcohol before and after intervention; those who did, usually binge drank on weekends before and after intervention and with friends, drinking up to a maximum of fifteen units in the control group and twelve units in the experimental group. This practice could be harmful to health as it diffuses the beneficial effects of moderate alcohol intake (cardiovascular diseases) and increases the chances of developing these diseases as well as some cancers (Hoeger & Hoeger, 2011: 383). It also creates the risk of developing some deficiency diseases as heavy alcohol intake can deplete the body of nutrients such as folate and vitamin C (Dodd, 2008). In addition, when abused, alcohol promotes anti-social behaviour, causes accidents and encourages violence.

Results also show that there was no difference between the control and the experimental group in the type of alcohol that the women drank, and that beer seemed to be the most popular alcohol that they drank before and after intervention.

The intervention did not succeed in getting the women who drank to change their drinking habits. The lack of success could be due to a number of reasons. Alcohol is addictive (a well-established fact); it is a behaviour that one does not usually do in isolation but with friends as supported by the results, which makes it subject to peer pressure; and is perceived to relieve stress and boredom. However, research has produced evidence that excessive alcohol intake is harmful to health as indicated above.

5.10.3 Smoking/ taking snuff habits

Smoking or taking snuff is one of the behaviours that are harmful to health. Results show that before and after intervention few women in this study were cigarette smokers (3%) and few took snuff (20%). The intervention had no impact in getting the women not to smoke or take snuff before intervention, or to stop after intervention. The majority of women who smoked or took snuff continued to smoke twenty cigarettes per day and took snuff two times per day after intervention. Studies have produced evidence that smoking is one of the behaviours that are most difficult to get people to quit (Sarafino, 1994: 218). In addition to being an environmental hazard, cigarrete smoking in particular has been classified as anti-social behaviour especially through passive smoking. Among the most important reasons contributing to this difficulty is the fact that smoking is addictive. Like alcohol it is performed with associations such as that people will smoke because they are bored, sad, angry etc. Similar to attitudes, behaviours that are integrated with other behaviours are harder to change. The women in this study reported many and varied reasons that caused them to smoke or take snuff. Results reveal that depressive symptoms were mostly responsible for making the women smoke and take snuff (Chapter Four).

Although the study established that the women were usually traditionally physically active as they went about their daily activities, the intervention was not successful in getting people to engage in meaningful different types and intensity of physical activity. It was also unable to reduce the women's alcohol drinking or smoking/taking snuff habits.

Chapter Six: Conclusion and Recommendations

6.1 Conclusion

In this chapter conclusions that were drawn from the study are discussed and recommendations for nutrition education programmes and future research are made.

6.1.1 Socio-demographic profile

The socio-demographic data which were only collected at baseline is consistent with the national data and portrays the poverty situation in Lesotho indicated by factors including low level of education, rural residence, unemployment, low access to running water, use of a pit latrine and the velt, lack of electricity, use of open fire for cooking and low income. On the other hand, although the extended family fabric in Lesotho is disintegrating, according to the results of this study the nuclear family structure is still strong, indicated by high ownership of a house, low divorce and separation rates, and low single-parenthood. A stable family predicts a favourable atmosphere for desirable nutritional practices.

6.1.2 Anthropometric measures and health status

Despite the seemingly improved food intake according to the recommendations of the FGP and the SAFBDG, the anthropometric indices of the women showed insignificant improvement after intervention. In particular, median BMI remained in the overweight and obese category, waist circumference was still above the healthy cut off point of 88cm, and the triceps skin fold thickness stayed above the 95th percentile. These indices indicate that the majority of women were overweight and obese, had an unhealthy waist circumference and high fat percentage which were possibly due to low levels of physical activity and high energy intake. However, after the intervention, the women perceived better quality of life by reporting less acute illnesses.

6.1.3 Food intake according to recommendations of FGP and SAFBDG

While the nutrition education intervention in this study seemed unable to effect positive changes in weight status of the women, it certainly was effective in improving consumption of some foods considered healthy and reducing consumption of some foods considered unhealthy. The study established the pre-existing usual intake of the relatively unrefined grain products suggesting the plant-based diet that is characteristic of African diets as postulated by MacIntyre *et al*. (1997: 203) and Stein and Temple (2008: 203). After intervention consumption rates of these foods improved significantly, indicating re-established confidence in intake of the healthy usual traditional foods.

In particular, after intervention, improvements were observed in intake of *papa* made from the less refined mealie-meal, brown bread, sorghum-soft porridge, samp and oats. However, consumption of whole wheat bread, brown rice and most breakfast cereals remained low after the intervention, denoting unfamiliarity with these foods and non-affordability by the majority of the women. Improvement in intake of oats however, suggests a chance for success with the other breakfast cereals should the poverty situation improve.

The pre-existing consumption of fruits and vegetables was also established by this study, and the improvement in consumption of most of these foods after the intervention means that the intervention was successful in reiterating and re-cultivating esteem in the traditionally usually consumed fruits and vegetables. However, until portion sizes of these foods are determined, it will remain uncertain whether the women in this sample were eating sufficient amounts of fruits and vegetables according to the recommendations of the FGP and SAFBDG. Although fruits were consumed adequately when they were in season, accessibility, availability and affordability may have prevented the women in the sample from eating adequate fruits throughout the year. In addition, until the portion sizes of the other food groups are determined in relation to the number of fruits and portion sizes of the vegetables consumed, the benefits of eating adequate fruits and vegetables will not be recognizable. The study could also not determine whether only one type or different types of fruits and vegetables were consumed per day.

The very low consumption of broccoli, figs and raisins before and after intervention again denotes issues of familiarity, accessibility and affordability.

In the meat group, it was established in this study that consumption of beef, goat meat, mutton, and other red meats was low among the women before and after the intervention. On the other hand the women were already consuming the better meat options such as chicken, fish and the other protein giving foods including eggs, and legumes (dry beans and peas), the latter consistently portraying the plant-based Basotho diet. After intervention red meat consumption rates remained low while consumption rates of chicken and legumes significantly improved. While the intervention cannot be credited for low consumption of red meat (which could be due to non-affordability), the improvement observed in moderate consumption of eggs and high intake of chicken, fish and legumes can certainly be attributed to the impact of the intervention. Re-establishing and re-cultivating confidence in the already usually consumed healthy foods was the mainstay of the intervention in this study. However, the unknown portion sizes of these foods will remain a challenge as to whether their intake was adequate.

Regarding consumption of lentils, nuts, and soya beans, no improvements were observed as these foods remained as unpopular after intervention as they were before intervention. This trend again suggests unfamiliarity, accessibility and affordability as factors.

Although milk consumption improved significantly after intervention, adequacy of intake according to recommendations of the FGP and SAFBDG could not be determined. Milk forms part of the traditional Basotho diet, however due to shortage of milk cows and lack of money that was reported, a decline in milk consumption in this culture has been observed.

Improvement was also observed in intake of canola oil, one of the ‘good’ fats, but not in olive oil, suggesting affordability and perhaps ‘taste’ as a factor. Reduction in consumption of butter, lard and hard margarine cannot be attributed to the impact of the intervention as they were already unpopular at baseline. However, the intervention was responsible for reduction in consumption of sausage, polony, and sugary drinks and snacks as it emphasized the detrimental effects to health of saturated fats in these foods, and overweight and obesity that might be aggravated by consumption of excess sugary foods and drinks.

Despite the improvement observed in nutrition-related knowledge, attitudes, beliefs and practices, the intervention could not effect a change in the habit of removing fat from meat or chicken skin before cooking. In addition, the women continued to consume full cream milk instead of low fat options suggesting entrenched habits and taste which may be hard to shed, as well as accessibility.

The study further established that the women most usually ate sorghum-soft porridge, as well as bread (with margarine) with tea for breakfast before and after the intervention. It also established that the women most traditionally usually ate *papa* with *moroho* for lunch and dinner, with some variety realized after intervention. They mostly ate *simba* chips (crisps) as a snack before intervention, while fruits became more popular after the intervention. They mostly favoured chicken before and after intervention. In addition, they mostly bought Russian sausage and *makoenya* (fat cakes) as take away foods although this habit had reduced after the intervention.

In view of the above, although the portion sizes were not determined, this study has produced evidence that eating patterns of Basotho women are characterized by large portion sizes of staple foods including any grain product available, particularly *papa*; and a small portion of relish including *moroho* in particular; and beans, poultry, some meat, sausage, eggs and fish (mostly tinned). The study has also established that women consume a lot of added sugar through sweets (candy), as hot and cold drinks, jam and sugar. They prepare their meals with salt, do not remove fat from meat or poultry before cooking, and they take full cream milk. Basotho women’s diet is therefore composed of high energy from starchy foods and added sugar. It is also composed of high fat from cooking oils, meat, poultry (and cheap meat and poultry sources) and full cream milk.

The study has also provided consistent evidence that nutrition education interventions that are systematically designed, informed and framed on established guidelines and theory are successful. This study was particularly successful in:

- Re-cultivating esteem and confidence in the healthy traditionally consumed foods such as less refined grains, fruit and vegetable, milk, legumes, poultry and fish;
- Increasing consumption of the less often consumed foods such as oats in the grain group; green pepper, garlic and lettuce in the vegetable group; bananas, apricots, plums, strawberries, guava, mango, and pineapple (at least when they were in season and when they were available from the local markets) in the fruit group; and canola oil in the fats group;
- Increasing perception of the contribution of these foods to overweight and obesity by reducing consumption of sugary foods and snacks; and
- Increasing perception of personal vulnerability to disease if healthy diets were not consumed by reducing consumption of processed meats, sugary foods and snacks.

These successes are an indication that implemented more intensely in terms of staff involved, availability of funds, periodic follow-up and broad coverage, these types of interventions stand a better chance of overall success, and can assure behaviour change.

6.1.4 Nutrition-related knowledge, attitudes, beliefs and practices

The improvement observed in most of the nutrition-related knowledge and some eating patterns could be attributed to the inclusion of purposeful improvement in knowledge, attitudes and beliefs related to nutrition in the intervention. A lack of knowledge, and negative nutrition-related attitudes and beliefs are converse to adoption of desirable health behaviour in general and to adoption of nutrition-related behaviour in particular.

The study revealed that the majority of women already possessed nutrition-related knowledge before intervention, as indicated by correctly answering statements put to them. The significant improvements after intervention reflect that the intervention had an impact in increasing knowledge. Most of the knowledge gained could be said to have been translated into desirable eating behaviour indicated by the positive changes in intake of foods described above.

In addition to improved knowledge, nutrition-related attitudes and beliefs were also improved by the intervention. These improvements were reflected by for example, the women reporting more positive attitudes towards the relationship between the food they were currently eating and the effect it could have on their health in future, indicating an understanding of the link between diet and disease. The women's attitudes became more positive towards eating a variety of foods, reflecting appreciation of benefits of this behaviour. The women were also no longer favouring fattening foods with related consequences including fatness, indicating changed perceptions regarding influences of the subjective norm (e.g., the husband/partner, society); therefore predicting positive performance of healthy behaviour. The women were also reporting positive thoughts about nutrition, indicating motivation to form an intention to eat a healthy diet. However, the women still held on to the belief that all what was said on radio and television about food and nutrition was true. The change in nutrition-related attitudes reflects reduced barriers to communication; reduced perception of barriers; improved perception of benefits and enablers to eating a healthy diet; therefore enhanced learning which was evident in this study as described above.

Moreover, the women perceived themselves vulnerable to contracting disease if they did not eat a healthy diet; and believed that a disease such as diabetes could be serious if contracted. These beliefs predict intention to engage in health protective behaviour such as eating a healthy diet. Of significant importance was the perception that knowledge and motivation were important enablers to eating a healthy diet, predicting preparation to seek more information on food and nutrition, which would lead to action.

In addition to direct markers that were developed in this study, improved attitudes and beliefs presuppose increased internal locus of control and reduced external locus of control reflecting that the women no longer believed in external forces influencing their lives. Nutrition-related internal locus of control predicts positive readiness to seek and respond to information about healthy eating and to respond to it by eating a healthy diet with a view to preventing illness and protecting health.

In the same way the intervention also succeeded in raising nutrition-related self-efficacy of the women in this study. This was indicated by the women's belief in their own capability to produce vegetables in their gardens, storing the usually consumed foods and adding a few new ones for ease of meal preparation. Improved self-efficacy in this case reflects that the women had positive beliefs in their own capability to secure food in the home as well as readiness to move through the stages of change from pre-contemplation to action such as eating a healthy diet. The intervention was also able to increase the women's beliefs in their own power to make decisions about food, reducing reliance on social norms and peer pressure and increasing perceptions of more enablers to eating a healthy diet, such as improved nutrition-related knowledge.

Moreover, the intervention established that women in this study did not usually plan or budget for food. However, the intervention was successful in improving this practice. In addition, the intervention also produced evidence that although these practices improved significantly after intervention, the women in this study were usually handling food hygienically before intervention. After intervention, significantly more women were boiling food rather than frying it although they continued to overcook *moroho.*

6.1.5 Lifestyle (physical activity, alcohol and smoking)

The study produced evidence that although they were mostly overweight and obese, before intervention the women in this study were physically active as they went about their daily activities. After intervention, the women continued to engage with some intensity in the traditional activities that were popular before intervention with improvements in jogging and exercise as well. However, the amount of physical activity undertaken seems to have been inadequate as it could not effect reductions in BMI and other weight status indicators.

Although the study had no impact on reducing alcohol consumption, smoking or taking snuff, it did establish that not many women drank alcohol, smoked or took snuff.

6.2 Recommendations

In order to overcome limitations evident in this study, the following recommendations are made.

6.2.1 Recommendations for nutrition education programmes

Nutrition education interventions must always be framed on a sound theory base to provide it with structure and purpose; and to include improvement of attitudes and beliefs which when negative are important barriers to communication and adoption of desirable health behaviour.

The theory-based approach in this study lays a framework for successful nutrition-education interventions in Lesotho. It is recommended that national nutrition education guidelines that embrace the traditionally usually consumed foods be developed and modified to conform to recommendations of the FGP and the SAFBDG to ensure adequacy of diets.

Researchers, particularly those delivering the education such as of the type used here must be well trained and conversant with the tools used in this study.

The post-measurements in this study were carried out six months after the initial survey. Four to six months interval between baseline and post-measurements are a reasonable period for evaluation of nutrition education interventions. However, it is recommended that periodic interventions should be planned and implemented after every post-measurement as follow-up and to keep the momentum.

Although this was not a limitation for this study, it could be more systematic to conduct an empirical data-based needs assessment before implementation of a study. It is advisable to conduct studies following a systematic design according to the following model (Figure 1):

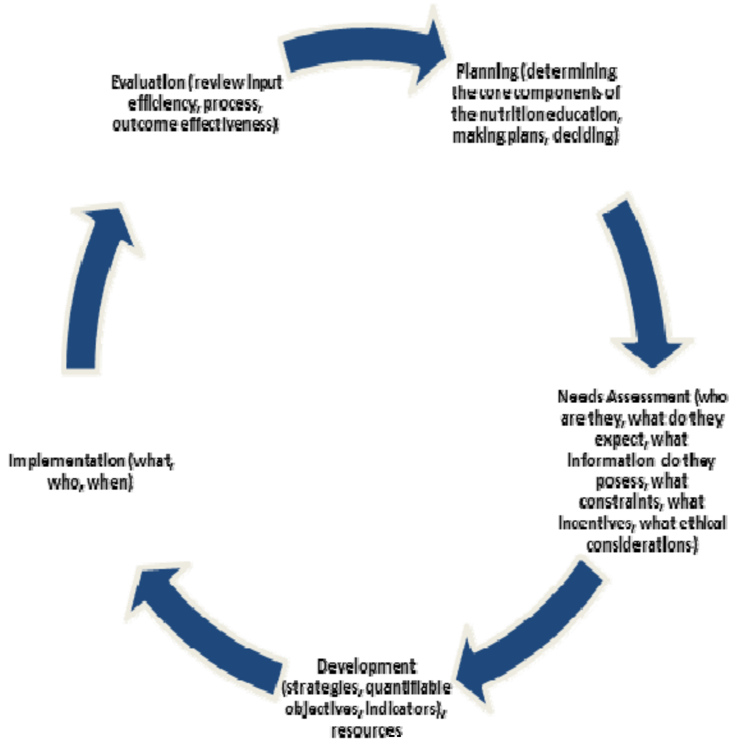

Figure: 1 Nutrition education design model

More specifically nutrition education interventions should follow a step process as follows (for more information refer to the intervention of this study in Chapter Three (Adapted from Contento [2007):

Step 1: Needs assessment and analysis;

Step 2: Identify relevant psychosocial determinants of the core nutrition-related behaviours using theory as framework;

Step 3: Set educational goals of the intervention;

Step 4: Set aims and objectives based on theory as framework;

Step 5: Decide the best strategies and methods for achieving the aims and objectives;

Step 6: Identify resources;

Step 7: Plan evaluation methods;

Step 8: Set action plan; and

Step 9: Action (implementation).

6.2.2 Recommendations for further research

According to the results of this study, undetermined portion sizes were a glaring obstacle for meaningful conclusions to be made. It is recommended that studies of this type must determine portion sizes in order to establish adequacy of intake of particular foods.

It would be beneficial if this type of study could be in-built within an established programme in an institution to include more researchers and enable easy access to assistant researchers.

Although funding may seem simplistic to mention, it plays a major role deciding the success of the study as a whole and the implementation and evaluation of the intervention in particular. Although not advisable, funding could provide incentives in the form of snacks which enhanced the response rate and reduced the drop-out rate in this study. However, a fully-fledged meal, or money (according to the participants comments) could greatly enhance the response rate particularly at post-measurements.

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Summary

Lesotho is a small country with unique physical, socio-political and economic characteristics. The intricate relationship between the patriarchal system that exists in this country and its women, as well as the poverty situation that bears heavily on the latter, places women in a marginalized position regarding decisions they make about certain aspects of their lives, including food and nutrition.

The aim of this study was to evaluate the impact of a nutrition education intervention on nutritional status and nutrition-related knowledge, attitudes, beliefs and practices of women in Lesotho.

A randomized pre-test-post-test control group design was adopted. Villages (32 in total) in the Maseru and Berea districts were assigned to control and experimental groups. Socio-economic profiles were determined only at baseline. Anthropometric measures; health and nutrition information; food intake; and knowledge, attitudes, beliefs and practices (KABP) were determined in each participant at baseline and after intervention.

The nutrition education intervention was based on content of the Food Guide Pyramid (FGP) and South African Food Based Dietary guidelines (SAFBDG) and was informed by constructs from selected theories of health behaviour including the health belief model; self-efficacy; locus of control; theory of reasoned action/theory of planned behaviour; social support; and the stages of change model.

A total of 444 women, 206 in the control group and 245 in the experimental group participated in the study. Median age was 41 years in the control group and 45 years in the experimental group. During the post-intervention survey, 105 women were available to be assessed for a second time in the control group and 154 in the experimental group.

As far as socio-demographic information was concerned, the majority of women had only gone through primary school education (54% in control and 48% in experimental), were mostly unemployed (55% in control and 48% in experimental), had low income and relied on the most basic facilities for water and cooking.

Recognised anthropometric measurements were used to calculate body mass index (BMI), waist circumference and triceps skin fold. According to BMI, a large percentage of women were overweight (24.8% and 18.8%) in experimental group and obese (15.0% and 20.8%) in experimental group at baseline. Most women also had an unhealthy waist circumference above 88cm (52.4% and 57.6% in experimental) and triceps skin fold measurement above the 95th

percentile (66% and 70% in experimental). No significant changes in any anthropometric parameters occurred after the intervention, probably as a result of the short period of time that lapsed between the two assessments.

Health information evaluated the common illnesses suffered by participants, as well as use of nutritional supplements and medications that participants commonly used. At baseline, a large percentage of participants reported experiencing acute illnesses such as lack of appetite, and chest pain. After intervention a smaller percentage of women in the experimental group reported experiencing acute illnesses, while no improvement was seen in the control group. Hypertension was the most commonly suffered chronic illness (39.1% in control and 42.2% in experimental).

Usual food intake was assessed using a short food frequency questionnaire (FFQ). At baseline, a large majority of participants were most commonly eating the relatively unrefined *papa* made from maize-meal, brown bread, sorghum-soft porridge and samp. Despite this, an even larger percentage of women in the experimental group ate these healthy foods after the intervention. No improvements were observed after intervention in consumption of whole wheat bread, brown rice and most breakfast cereals. Even though the majority of participants also commonly consumed *moroho* (cooked green leafy vegetables), legumes (beans and peas), eggs, chicken, tinned fish and milk before intervention, the percentage of women in the experimental group that ate these healthy foods improved even further after intervention, with no change in the control group. Significant improvements in the consumption of fruits and milk also occurred as a result of the intervention.

Red meat consumption was low before and after intervention although participants commonly consumed processed meat sources including *polony* and sausage, as well as other sources such as sheep and cow feet and heads. Fewer participants that had undergone the nutrition intervention ate these unhealthy meat sources after intervention.

Consumption of canola oil improved significantly in the experimental group after intervention, while consumption of unfamiliar foods such as soya beans, lentils, olive oil and avocado did not change.

Meals were often fatty, salty and sugary, consisting of, for example, chicken with skin, fatty meat, full cream milk, salty food and sugary snacks and drinks. Although some improvements were observed in these eating patterns after the intervention in the experimental group, the majority of them persisted.

One of the limitations of the study was that portion sizes of foods were not determined, making it difficult to determine whether participants were eating adequately according to the FGP and the SAFBDG.

KABP was assessed by a questionnaire. Even before intervention, the large majority of participants exhibited relatively high nutrition-related knowledge by answering a number of statements correctly. The significant improvements seen in the experimental group could be attributed to the intervention. Improvements in parameters of nutrition-related attitudes and beliefs were also seen in the experimental group. These improvements were reflected by more women in the experimental group reporting positive attitudes towards the relationship between the food they were currently eating and the effect it could have on their health in future (from 67.8 % to 98.7% in experimental group). The women's attitudes became more positive towards eating a variety of foods (from 60.8% to 99.4% in experimental group), they were no longer favouring fattening foods with consequences for health (from 53.3% to 77.4% in experimental group), and had changed perceptions regarding influences of the subjective norm (e.g., the husband/partner, society).

A higher percentage of participants in the experimental group were also reporting positive thoughts about nutrition, indicating motivation to form an intention to eat a healthy diet (from 62.4% to 100% in experimental group). More participants in the experimental group expressed fewer barriers to change in nutrition-related behaviour; and had improved perceptions of benefits and enablers to eating a healthy diet.

Moreover, more women in the experimental group realised that they could contract disease if they did not eat a healthy diet; and believed that lifestyle diseases such as diabetes could be serious if contracted. Most importantly, women who had undergone the intervention realised that good knowledge and motivation were important enablers to eating a healthy diet.

Improved attitudes and beliefs resulted in women no longer believing that external forces influenced their lives (from 66.6% to 98.7% in experimental group). In the same way the intervention also succeeded in raising nutrition-related self-efficacy of the women, indicated by significant improvements in the capability to produce vegetables in their gardens (from 64.1% to 89.0% in experimental group), storing the usually consumed foods and adding a few new ones in their houses for ease of meal preparation. Improved self-efficacy in this case reflects that more women had positive beliefs in their own capability to secure food in the home as well as readiness to move through the stages of change from pre-contemplation to action (such as eating a healthy diet). The intervention was also able to increase the women's beliefs in their own power to make decisions about food, reducing reliance on social norms and peer pressure and increasing perceptions of more enablers to eating a healthy diet.

Significant improvements were also seen in the percentage of women who planned and budgeted for food, handled food hygienically, and boiled food rather than fried it, although they continued to overcook *moroho.* None of these improvements were seen in the control group.

Despite high levels of overweight, women in this study were physically active as they went about their daily activities. After intervention, the women continued to engage in the traditional activities that were popular before intervention with improvements in jogging and exercise observed as well. No significant improvements were observed in the percentage of women that drank alcohol, smoked or used snuff.

The nutrition intervention programme was successful in addressing a number of health and nutrition-related issues among participants in the experimental group. It established that the FGP and FBDGs, as well as the theory-based nutrition education approach to nutrition education, can be used successfully in Lesotho.

Key words: Nutrition education intervention, nutrition status, nutrition-related knowledge, nutrition-related attitudes, nutrition-related beliefs, nutrition-related practices, health belief model, locus of control, theory of reasoned action/theory of planned behaviour, social support, stages of change

Opsomming

Lesotho is ‘n klein land met unieke fisiese, sosio-politieke en ekonomiese eienskappe. Die ingewikkelde verhouding tussen die patriargiese stelsel in die land en die vroue, sowel as armoede wat vroue tot ‘n groot mate beïnvloed, plaas vroue in ‘n gemarginaliseerdeposisie, veral ten opsigte van besluite wat hul lewens raak, insluitend voedsel en voeding.

Die doel van die studie was om die impak van ‘n voedingsvoorligtingsprogram op voedingstatus en voedingverwante kennis, houdings, gelowe en praktyke van vroue in Lesotho te bepaal.

‘n Gerandomiseerde voor-toets-na-toets kontrolegroep ontwerp is gebruik. Dorpe (32 in totaal) in die Maseru en Berea distrikte is in kontrole- en ‘n eksperimentele groepe verdeel. Sosio-ekonomiese profiel is slegs tydens die basislyn opname bepaal. Antropometriese metings, gesondheid- en voedinginligting; voedselinname; en kennis, houding, gelowe en praktyke (KABP) is by elke deelnemer tydens basislyn opname en na die intervensie bepaal.

Die voedingvoorligtingsprogram is gebaseer op die inhoud van die Voedselpiramiede (FGP) endie Suid-Afrikaanse Voedselgebaseerde riglyne (SAFBDG). Die benadering wat gebruik is, is gebaseer op geselekteerde teorieë van gesondheidsgedrag wat die gesondheidsgeloof (health belief), selfwerksaamheid (self-efficacy), lokus van kontrole (locus of control), teorie van beplande aksie (theory of reasoned action/theory of planned behaviour), sosiale ondersteuning en die stadiums van verandering (stages of change) modelleinsluit.

‘n Totaal van 444 vroue, 206 in die kontrolegroepen 245 in die eksperimentele groep, het aan die studie deelgeneem. Die mediaan ouderdom was 41 jaar in die kontrolegroep en 45 jaar in die eksperimentele groep. In die opname na implementering (6 maande na die eerste opname), was daar 105 vroue in die kontrolegroep en 154 in die eksperimentele groep.

Wat sosiodemografiese inligting betref, het die meerderheid vroue slegs laerskoolopleiding voltooi (54% in kontrole en48% in eksperimentele groep), was meestal werkloos (55% in kontrole en 48% in eksperimentele groep), het ‘n lae inkomste gehad en het staat gemaak op die mees basiese fasiliteite vir watervoorsiening en voedselbereiding.

Standaard antropometriese metings is gebruik om liggaamsmassaindeks (LMI), middelomtrek, en trisepsvelvoue te bepaal. Volgens LMI, was ‘n groot persentasie vroue tydens basislynopnameoormassa (24.8% en 18.8% in die eksperimentele groep)en vetsugtig(15.0% % en 20.8% in die eksperimentele groep).Die meeste vroue het ook ‘n ongesonde middelomtrek bo 88cm gehad (52.4% in kontrole en 57.6% in eksperimentele groep) en trisepsvelvoumate bo die 95ste persentiel (70% in kontrole en 61% in eksperimentele groep).

Geen betekenisvolle veranderinge in enige van die antropometriese parameters het na intervensie voorgekom nie, waarskynlik as gevolg van die relatiewe kort periode wat verloop het tussen die twee opnames.

Gesondheidsinligting het algemene siektes, sowel as die gebruik van voedingsupplemente en medikasie wat algemeen gebruik is,evalueer. Tydens die basislynopname het 'n groot persentasie van die deelnemers akute simptome soos gebrek aan aptyt en borskaspyn ervaar. Na die intervensie, het 'n kleiner persentasie vroue in die eksperimentele groep hierdie simptome ervaar, terwyl geen verbetering in die kontrolegroep voorgekom het nie. Hipertensie was die mees algemene chroniese siekte wat voorgekom het (39.1% in kontrolegroep en 42.2% in eksperimentele groep).

Gewoontelike voedselinname is deur middel van 'n kort voedselfrekwensievraelys (FFQ) bepaal. Tydens die basislynopname het die meerderheid vroue die relatiewe onverfynde *papa (*gemaak van mieliemeel), brood, sorgumsagte papen stampmielies geëet. Ten spyte hiervan, het 'n verbetering in die inname van hierdie voedselsteeds na die intervensie in die eksperimentele groep voorgekom. Geen verbetering in die inname van volgraanbrood, bruinrys en ontbytgrane is egter na die intervensie gevind nie. Al het die meerderheid vroue ook algemeen *moroho* (gekookte groen blaargroentes), peule (bone en erte), eiers, hoender en geblikte vis geëet, het die inname van hierdie gesonde voedsel na die intervensie nog verder in die eksperimentele groep toegeneem, met geen verandering in die kontrolegroep nie. Betekenisvolle verbeteringe in die inname van vrugte en melk het ook as gevolg van die intervensievoorgekom.

Rooivleis inname was voor en na die intervensie laag, alhoewel deelnemers algemeen geprosesseerde vleis soos polonie en wors, sowel as ander proteïenbronne soos skaap- en beespote en –koppe geëet het. Minder deelnemers in die intervensiegroep het na die intervensie hierdie ongesonde vleisbronne ingeneem.

Na die intervensie het deelnemers in die eksperimentele groep se inname van kanola olie betekenisvol verbeter, terwyl die inname van onbekende voedsel soos sojabone, lensies, olyfolie en avokadopeer nie verander het nie.

Maaltye was algemeen vetterig, sout- en suikerryk, en het dikwels hoender met die vel, vetterige vleis, volroommelk, voedselmet 'n hoë soutinhoud en suikerryke versnaperinge en –drankies ingesluit. Alhoewel minderdeelnemers wat hierdie voedsel geëet het in die eksperimentele groep voorgekom het, het die meerderheid nie verbeter nie.

Een van die beperkinge van die studie was dat porsiegroottes van voedsel nie bepaal is nie, wat dit moeilik maak om te bepaal of deelnemers na die intervensiewerklik hul dieetinname verander het om volgens die riglyne van die FGP en die SAFBDGte eet.

KABP is deur middel van ‘n vraelys bepaal. Selfs voor die intervensie, was daar ‘n groot persentasie vroue wat ‘n relatiewe goeie voedingkennis getoon het deur ‘n aantal stellings korrek te beantwoord. Die betekenisvolle verbeteringe wat in die eksperimentele groep voorgekom het, kan aan die voedingintervensie toegeskryf word. Verbeteringe in houdings en gelowe wat met voeding verband hou, is ook in die eksperimentele groep gevind. Hierdie verbeteringe word gereflekteer deur ‘n groter persentasie vroue in die eksperimentele groep wat ‘n positiewe houding getoon het teenoor die verband tussen die voedsel wat hulle eet en die effek wat dit op hul gesondheid in die toekoms het(67.8% voor die intervensie en 98.7% na die intervensie in die eksperimentele groep). Die vroue se houding was meer positief oor die eet van ‘n verskeidenheid voedsel (van 60.8% tot 99.4% in eksperimentele groep), hul het minder vetterige voedsel met die gepaardgaande gesondheidsimplikasies verkies(van 53.3% tot 77.4 % in eksperimentele groep)en het hul persepsies omtrent die invloed van die subjektiewe norm (bv eggenoot /maat, samelewing) was ook meer positief.

‘n Groter persentasie deelnemers in die eksperimentele groep het positiewe gedagtes oor voeding gerapporteer, wat aandui dat hulle na die intervensie meer gemotiveerd was om ‘n gesonde dieet te volg (van 62.4% tot 100% in eksperimentele groep). Meer deelnemers in die eksperimentele groep het minder hindernisse tot veranderinge in gedrag wat met voeding verband hou ervaar, en het beter persepsies oor die voordele van’n gesond eeet getoon.

Meer vroue in die eksperimentele groep het voorts besef dat hul siektes kan ontwikkel as hul nie gesond eet nie; en dat leefstyl siektes soos diabetes ernstige gevolge kan hê. Meer belangrik het vroue wat aan die intervensie deelgeneem het besef dat goeie kennis en motivering belangrik is om jou in staat te stel om gesond te eet.

Verbeterde houdings en gelowe het bygedra daartoe dat vroue in die eksperimentele groep nie meer geglo het dat invloede van buite hulle beheer nie (van 66.6% tot 98.7% in eksperimentele groep). Die intervensie het ook daarin geslaag om voeding verwante selfwerksaamheid (self-efficacy) te verbeter, wat aangedui is deur die groter persentasie vroue in die eksperimentele groep wat geglo het dat hul wel groente kan kweek (van 64.1% tot 89.0% in eksperimentele groep), voedsel vir latere gebruik kan berg, en ander voedsel in die huis kan aanhou om voedselvoorbereiding te vergemaklik. Verbeterde selfwerksaamheid is gereflekteer in die positiewe geloof in hulself om voedsel te bekom, sowel as ‘n gereedheid om deur die stadiums van verandering te beweeg vanaf voor-oorweging tot by aksie (soos om ‘n gesonde dieet te volg). Die intervensie het ook vroue se geloof in hul eie vermoë om besluite oor voedsel te neem verbeter, wat afhanklikheid van sosiale norme en groepsdruk verminder het.

Betekenisvolle verbeteringe is waargeneem in die persentasie vroue in die eksperimentele groep wat beplan en begroot het vir voedsel, wat voedsel higiënies hanteer en wat voedsel eerder kook as om dit te braai, alhoewel hulle steeds *moroho* oorgaar gemaak het. Hierdie verbeteringe is nie in die kontrolegroep waargeneem nie.

Ten spyte van die hoë voorkoms van oormassa, was vroue in die studie fisiek aktief deur die uitvoer van hul daaglikse take. Na intervensie, het vroue volgehou met tradisioneel gewilde aktiwiteite soos voor intervensie met 'n toename in die persentasie vroue in die eksperimentele groep wat gedraf en geoefen het. Geen betekenisvolle verbetering in die persentasie vroue wat alkohol gebruik, gerook of gesnuif het, is egter waargeneem nie.

Die voedingvoorligtingprogram het daarin geslaag om 'n verskeidenheid gesondheid- en voedingverwante kwessies by deelnemers van die eksperimentele groep aan te spreek. Die intervensie het ook bevestig dat die FGP en die FBDGs, sowel as 'n teoriegebaseerde benadering tot voeding voorligting, wel met sukses in Lesotho gebruik kan word.