# DIETARY INTAKE OF ADULT WOMEN IN SOUTH AFRICA AND NIGERIA WITH A FOCUS ON THE USE OF SPREADS

Report by: Dr NP Steyn* & Dr JH Nel**

* Chronic Diseases of Lifestyle Unit
Medical Research Council, P O Box 19075
Tygerberg, 7505, South Africa
Email: nelia.steyn@mrc.ac.za

** Department of Logistics, University of Stellenbosch
P/Bag X1, Matieland, 7602, South Africa
Email: jhnel@sun.ac.za

Researchers:

Dr N P Steyn (MRC, Cape Town, South Africa)

Ms Whadiah Talip (MRC, Cape Town, South Africa)

Dr J Nel (Statistician, University of Stellenbosch, South Africa)

Prof. Prof Judith Waudo (Kenyatta University, Kenya)

Dr Judith Kimiywe (Kenyatta University, Kenya)

Dr R Ayah (Unilever, Kenya)

Ms Dorcus Mbithe (Kenyatta University, Kenya)

February 2006

## Contents Page

Executive summary ....3
1. Introduction ....5
2. Literature Review ....6
3. Motivation for the Study .... 8
4. Objectives .... 9
5. Methods .... 10
5.1 Study design .... 10
5.2 Study population and sampling .... 10
5.3 Data collection questionnaires .... 11
5.3.1 Socio-demographic questionnaire .... 11
5.3.2 Bread and spreads questionnaire .... 12
5.3.3 24-Hour recall questionnaires .... 12
6. Measurements .... 14
6.1 Anthropometry .... 14
6.2 Data collection .... 14
6.3 Pilot studies .... 14
6.4 Ethical and legal considerations .... 14
6.5 Validity and reliability of the data .... 14
7. Data Management and Analyses .... 15
8. Results .... 16
8.1 Socio-demographic results .... 13
8.2 Anthropometric results .... 24
8.2.1 South Africa .... 24
8.2.2 Kenya .... 25
8.2.3 Nigeria .... 25
8.2.4 Comparison of countries .... 29
8.3 Dietary results .... 31
8.3.1 South Africa .... 31
8.3.2 Kenya .... 54
8.3.3 Nigeria .... 79
8.3.4 Comparison of countries .... 80
8.4 Repeatability of results .... 84
9. Discussion and Recommendations .... 86
10. References ....88

**Abbreviations:**

| | | | |
|---|---|---|---|
| NFCS | National Food Consumption Survey | MUFA | Monounsaturated fatty acids |
| SANDHS | SA National Demographic & Health Survey | PUFA | Polyunsaturated fatty acids |
| NFCNS | Nigerian Food & Consumption Survey | SFA | Saturated fatty acids |
| LDL | Low density lipoprotein | BMI | Body mass index |
| HDL | High density lipoprotein | LA | Linoleic acid |
| RNI | Recommended Nutrient Intakes | ALA | &-linolenic acid |
| HPIQ | Household procurement & inventory quest | WHO | World Health Organization |
| WHR | Waist Hip Ratio | FAO | Food & Agriculture Organ. |
| KAW | Kenyan Adult Women's Study | SE | Standard error |
| 24-HRQ | 24-Hour recall questionnaire | CI | Confidence interval |
| BASQ | Bread & spreads questionnaire | CHD | Coronary heart disease |

## Executive Summary

This study examined nutrient intake, dietary habits, and the weight status of adult women in South Africa, Kenya, and Nigeria, with a focus on breakfast intake and the use of spreads on bread. Dietary intake from South African women was based on secondary data analysis of dietary studies which were already undertaken previously (n=992), and those from the National Food Consumption Survey and the South African Demographic and Health Study. A sample of 1008 women was randomly selected from all adult women in Kenya, as a representative sample of four districts. Data from Nigeria came from a national survey undertaken in 2003.[a] In all three studies, fieldworkers were trained to do personal interviews using specific questionnaires with each participant at their homes, namely a socio-demographic questionnaire, and a 24-hour recall questionnaire. Furthermore, each participant was weighed and waist and hip circumferences were measured. Reliability of the 24-hour recalls in Kenya were checked by means of repeated interviews on a sub-sample of 10% of the participants (n=104).

Overall, South African women had an energy intake of 7239 kJ, carbohydrate intake of 244.5 g, protein intake of 61.6 g and a fat intake of 46.6 g while this was 6967 kJ, 231.1 g, 42.4 g and 62.3 g, respectively, in Kenyans. Generally, South African macronutrient and mineral intakes were higher than those of Kenyans were, with the exception of fat, saturated fat and iron intake. Fat intake as a percentage of total energy intake was greater in Kenya (33.1%) compared to that in South Africa (22.9%). Dietary data for South Africa showed that calcium, iron, folate, vitamin B6, and vitamin D were the most deficient in the diet. In Kenya, the most deficient nutrients were also calcium, vitamin B6, niacin, vitamin D, and folate; additionally niacin, thiamine and riboflavin intakes were low.

In both countries, distinct significant urban-rural trends were noticed with regard to macronutrient and mineral intakes. Urban women had higher animal protein, fat, saturated fat, added sugar, cholesterol, sodium, selenium, potassium, and zinc intakes, while rural women had higher carbohydrate, plant protein, fibre and magnesium intakes. With regard to the vitamins in both countries, the intakes were generally higher in urban areas.

In South Africa the most commonly consumed foods were sugar, tea, maize porridge, brown bread, coffee, white bread, potatoes, hard (brick)[b] margarine and milk. In Kenya, these were tea, sugar, milk, cooking fat, maize porridge, kale, white bread, and hard margarine. In both countries, more than a third of the women had consumed hard margarine on the previous day. Cooking fat was only used by 6% of the South African women compared with 74% of the Kenyan women. This may have contributed to the higher fat and saturated fat intakes of Kenyan women.

Dietary data indicate that in both countries the nutrition transition is underway. This is illustrated by the high prevalence of overweight and obesity and the urban and rural changes in the diet. The finding that more than 30% of energy intake comes from fat in Kenyan women is rather surprising, since traditionally, African diets are not high in fat. Furthermore, the fact that more than 10% of energy comes from saturated fat is not desirable. Both countries illustrate the worst of the developed and the developing world in that their diet is deficient in many micronutrients yet high in fat and saturated fats. However, this is an ideal opportunity to consider improving the fat and nutrient content of the margarines that are produced by Unilever Health Institute, since it can address the issues of over nutrition, under nutrition and micronutrient deficiencies.

The most efficient ways to do this would be: 1) to improve the micronutrient content of margarine by adding vitamin B6, niacin, folate, riboflavin and thiamine to high/higher levels of the recommended intakes; 2) to reduce the total fat and saturated fat content of margarines, and to eliminate as much trans fats as possible; 3) to reduce the sodium intake of the margarines to maintain low salt intakes in Kenyan woman and to reduce levels in South African women, and; 4) to increase the omega-3 fat content of the margarines (if feasible). From a social responsibility point of view Unilever Health Institute could ensure that its advertising includes certain essential messages regarding its spreads: 1) the fact that it includes added micronutrients; a low (or zero) trans fat content; 2) has a reduced fat and saturated fat content; 3) has the added benefit of omega-3 fats, and; 4) can be used more liberally in the diets of children under age 5 years, while adults should not increase their levels above 30% of energy intake. These messages should also be used in brochures and other health promotion materials.

---

[a] Nigerian data not yet available
[b] Hard margarine in South Africa contains 82.2g total fat and 18.9g saturated fat per 100g

# 1. Introduction

Any company that produces food items for sale needs to have a deeper understanding of the value of these products to the consumers in terms of the pleasure of eating it and in terms of the nutritional value it, provides. Hence, the manufacturers and suppliers need to know the nutrient content of the product as well as its benefits and/or disadvantages if there are any associated with its use.[c] Additionally, the manufacturer needs to know how this item is placed in the market, how much is used by consumers and their patterns of usage. Once the company has this information it is ideally placed to add maximum value to the product both in terms of the producer/manufacturer and in terms of the consumer. In the three countries where the study was undertaken, namely South Africa, Kenya and Nigeria, little data are available on the dietary intake of adults, specifically women.[d] Since women are generally responsible for buying and food preparation, they represent an ideal target group who have information on household dietary consumption patterns. The three countries selected for study by Unilever Health Institute represent their most important and largest markets for spreads in the sub-Saharan region.[e]

# 2. Literature review

It is generally accepted that the prevalence of malnutrition and of stunting among children in particular are reflective of the prevailing socio-economic status in a given country. Because malnutrition is well documented to adversely affect mental development, scholastic achievement, productivity, morbidity and mortality rates in children and women, and the risk for infection, it is not surprising that nutritional status is one of the key millennium development goals (1). In sub-Saharan Africa (SSA), stunting among children younger than 5 years varies from 20-40% (2). Furthermore, micronutrient deficiencies are common, particularly among pregnant women and children (3). Estimates from 2000 indicate that 31 and 45 million children younger than 5 years were underweight and stunted, respectively, in Africa (4). There is, however, a paucity of data on adults in SSA in terms of both dietary intake and nutritional status. Poverty and food insecurity are universally accepted as being the main contributory factors to malnutrition in both children and women who are the most vulnerable to dietary deficits. Two major outcomes of food

[c] Dr Ayah's call for proposals
[d] Dr Ayah's call for proposals
[e] Dr Ayah, personal communication

insecurity are a chronic energy deficit and micronutrient deficiencies. These result in stunting and a range of micronutrient deficiency symptoms (4).

One of the major dietary constituents contributing to an energy deficit in SSA countries is due to the low fat intake in these countries (5). For example, food balance sheets for 2002 show that Kenya had a fat intake of only 46.8 g per capita per day (5). Nigeria had a slightly higher intake of 62 g per day. South Africa had a fat intake of 77.5 g, which represented 23.6% of total energy intake. While it is potentially harmful to health to have a high fat intake (particularly saturated fats), an intake of less than 15% of daily energy intake can be regarded as being too low in terms of meeting an adequate energy intake (6). This is particularly true for children who are unable to eat large quantities of carbohydrate and require more fat in the diet. Furthermore, fat soluble vitamins require an adequate fat intake to be absorbed in sufficient quantities. Hence a moderate fat intake which is low in saturated fats and fortified with essential micronutrients can contribute significantly to the health of vulnerable women and children in SSA (6).

Nutritionists and socially responsible food manufacturers have a difficult task in terms of health promotion in Africa. On the one hand, there is the continuing burden of under nutrition, micronutrient deficiencies and infectious diseases and, on the other hand, there is the growing burden of chronic diseases of lifestyle, including obesity, hypertension, cardiovascular diseases and type 2 diabetes (7). It is necessary to walk a fine line between promoting fat as an important source of energy and on the other hand preventing a high fat intake as a risk factor for chronic diseases in adults. More important still is the type of fat used in food products, particularly in developing countries (8).

Many saturated fatty acids raise total and low-density lipoprotein (LDL) cholesterol (are hypocholesterolaemic) particularly palmitic and myristic acids which are abundant in meat and dairy products and lauric acid which is found in coconut and palm kernel oil. Trans fatty acids, which are created by partial hydrogenation of polyunsaturated fatty acids to increase shelf life, adopt a saturated fatty acid-like configuration and result in removal of critical double bonds which are necessary for action of essential fatty acids. Trans fatty acids raise total cholesterol, triglycerides and LDL cholesterol and decrease high-density lipoprotein (HDL) cholesterol values, hence they are associated with an increased risk for coronary heart disease and other chronic diseases (9).Trans fatty acids are still found in

many industrial products, particularly in deep-fried products, shortening and high-fat baked products (6, 9).

Polyunsaturated and monounsaturated fatty acids can lower total and LDL-cholesterol. In this regard polyunsaturated fats are the most effective, particularly linoleic acid (C18:2 w-6) which is the parent fatty acid of the omega:6 fatty acids and &-linolenic acid (C;18 w-3) which is the parent fatty acid of the omega-3 fatty acids. Linoleic acid is abundant in most vegetable oils, including corn (maize), soybean, and sunflower oil. Omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA) are found in fatty fish while some &-linolenic acids are also found in plant foods (soybean and canola oil). These fatty acids have important biological effects, which are beneficial for cardiac health. Ideally, a ratio of not more than 8:1 of omega-6 to omega-3 fatty acids is recommended (8).

Fruit and vegetables promote cardiovascular health by virtue of the potassium, fibre and phyto-nutrients which they contain. Amounts of 400-500g per day are recommended to reduce the risk of stroke, coronary heart disease, and high blood pressure. Fibre is protective against coronary heart disease and ischemic stroke and may contribute to lowering of blood pressure (8).

Currently, the World Health Organisation (WHO) recommends that adults should have a dietary fat intake of between 15-30% of total energy intake. Saturated fats should be less than 10% and polyunsaturated fats 6-10% of energy intake. It is recommended that linoleic acid levels should be between 4 to 10% of energy intake (6).Trans fats should be less than 1% of energy intake and cholesterol intake should be less than 300 mg per day. Furthermore, it is recommended that total carbohydrate provide 55-75% of energy intake, protein 10-15% and free sugars not more than 10%. Fruit and vegetables should provide at least 400g per day, dietary fibre 25 g per day (10) and sodium should not exceed 2 g or 5 g sodium chloride (salt) per day (8).

# 3. Motivation for the study

The continued poor nutritional status of many Kenyans, South Africans and Nigerians, particularly in terms of energy, micronutrient intake and weight status provided Unilever Health Institute, as part of its mission in Africa, the wish to better understand the

nutritional relevance of its spread portfolio in these countries.[f] Current research indicates that in most of Africa, margarine is primarily used as a spread on bread and consumed at breakfast within the home environment (11,12). By far the majority of bread consumed in Africa is eaten dry. Unilever Health Institute wishes to develop and explore the opportunity to increase the spreading habit as a means to increase fat intake (and with it essential nutrients) among young children and families.[g] On the other hand it recognizes that the burden of chronic diseases is increasing in developing countries, including SSA and this cautions manufacturers to develop dietary products which are not contributing to this increasing burden. In this regard, a high fat intake together with a high saturated and high trans fat intake, are major contributors (8). Since obesity is associated with nearly all of the chronic diseases it was also deemed necessary to measure the weight status of consumers in the present study in order to ascertain how many of them are at risk of chronic diseases, since obesity is one of the main risk factors for most chronic diseases.

Information on nutrient intakes and weight status of African consumers (adult women) will provide a better understanding of the role that margarine plays in the African diet with respect to nutrient delivery and may highlight areas for future innovation for this market. It will also strengthen its case in communicating the nutritional benefits of its spread offerings in the African region. To this effect Unilever Health Institute initiated and financed the current surveys to obtain data on energy, fats, proteins, carbohydrates and essential micronutrient (vitamins A, D, E, B1, B2, B6, B12, iron, zinc, potassium, magnesium and sodium) intake and weight status of Kenyan, Nigerian and South African women[h]. The data from the present study would hopefully also add to the Kenyan dietary study reported in 2004 (11, 12).

# 4. Objectives

The main purpose of this study was to assess the food and nutrient intake and weight status of adult women in South Africa, Kenya, and Nigeria.

**Specific objectives**

For each country specific objectives of the study were:

[f] Dr Ayah's call for proposals
[g] Dr Ayah personal communication
[h] Dr Ayah's call for proposals

To determine the energy, macronutrient and micronutrient intake of the diet of adult women.

To determine the contribution of macronutrients toward total dietary energy intake.

To assess how the nutrient intakes of adult women compare with the recommended dietary intakes (RDIs) of the WHO/FAO.

To determine the average daily intake of the most commonly consumed foods in the countries studied.

To determine the most commonly eaten foods at breakfast, lunch, dinner and as snacks.

To determine the average intake of margarine, butter, cooking fat, oil and jam per household and per adult woman.

To determine the average intake of margarine of adult women by socio-economic status.

To determine the weight status (BMI) and waist-hip ratio of adult women.

To compare dietary and anthropometric data of the three countries.

# 5. Methods

## 5.1 Study design

The studies in each country used a cross-sectional descriptive survey design.

## 5.2 Study population and sampling

The study population in all three countries were adult women aged 15 to 60 years old. The South African database comprised 1726 women and dietary data were obtained by pooling the results of regional studies (13-20) into a combined database and then doing secondary dietary analysis to generate a composite "average" South African intake for females. The studies that were selected included different ethnic groups and all used the 24hour-recall methodology to collect dietary data. The combined database used in this study was generated by statistical procedures, and weighting to give proportional representation of South Africans aged 15 years and over. Comprehensive detail of the methodology is presented in two publications on the *Report on Food Consumption Studies Undertaken Amongst Different Population Groups (1983-2000). Average Intakes of Foods Most Commonly Consumed* (21,22). However, it needs to be recognised that data generated from this combined database is not based on a national representative sample. Furthermore, the studies that were included were done over different times and

some studies were undertaken many years ago. However, there is no national data on adult South Africans and the present data fills a gap and provides some trends.

In Kenya, 1008 women were randomly selected from the 4 primary regions- Meru, Kisumu, Nakuru and Nairobi by the Kenya Central Bureau of Statistics (CBS) personnel. The regions were stratified proportionally according to urban/rural classifications. Those sub-regions were then stratified according to socio-economic classes. Enumerator areas (EAs) were then randomly selected from the different sub-regions. Fifteen households (HH) were randomly selected from each EA by the CBS. The primary female responsible for food preparation was interviewed at her home. In Nigeria 2000, women were selected based on stratified sampling according to urban/rural area and socio-economic class.

**Exclusion criteria:**

The following were excluded from the study:

* Mentally handicapped women;
* Women under the influence of alcohol;
* Women absent from home at the time of the survey;
* Very sick or bed-ridden women.
* Women younger than 15 years.

Women of the Muslim faith who were fasting at the time of the Kenyan study were interviewed after Ramada and not excluded from the study.

## 5.3 Data collection questionnaires

In all the studies, fieldworkers were trained on completing the questionnaires and in doing the anthropometric measurements before they entered the field. The actual data collection took place at different times in the three countries. Socio-demographic data were collected in all the studies and dietary data were obtained by means of a 24-hour recall questionnaire (24-HRQ). Additionally, a bread and spreads questionnaire was completed in Kenya. In South Africa, a household inventory used in the National Food Consumption Survey (NFCS) (23) was analysed for data on bread and spreads. In Nigeria, data on bread and spreads was collected by means of a 24-HRQ.

### 5.3.1. Socio-demographic questionnaires (SDQs)

South African data on socio-demographic status were obtained from the South African Demographic and Health Survey (SADHS) undertaken in 1998 (24). The Kenyan socio-demographic data were collected by means of a questionnaire which was adapted from the one used in the in 1999 NFCS (23). Nigerian data were obtained in the Nigerian Food Consumption and Nutrition Survey (NFCNS), 2001-2003 (25). Addenda 1-3[i] comprise the questionnaires used in each country to determine socio-economic status of households included in these studies. The following information was elicited from the participants:

- Type of housing;
- Household size and composition;
- Type of fuel used for cooking;
- Source of drinking water;
- Level of education;
- Household equipment/appliances;
- Assets such as cattle or land.

### 5.3.2. Bread and spreads questionnaire (BASQ)

This questionnaire (BASQ) was specifically developed for the Kenyan study (see Addendum 4). In addition to the use of bread and spreads, it also included questions on dietary habits such as snacking and eating breakfast. In the South African study most of this data was derived from the 24-HRQ and a household procurement and inventory questionnaire (HPIQ) (Addendum 5) used in the NFCS (23). The Nigerian data on spreads came from the NFCNS (25).

### 5.3.3. The 24-hour recall questionnaire (24-HRQ)

The 24-HRQs used in the different studies are shown in Addendums 6-8[i]. Each participant was required to report on all the foods and drinks consumed during the previous 24 hours. Probing allowed the interviewer to obtain information on forgotten foods. In order to facilitate the estimation of portion sizes, various dietary aides were used. Most of the South African studies used household utensils and food models. In Kenya, the fieldworkers used a dietary assessment kit comprising life-size drawings and

---

[i] Nigeria addendums not included i.e. Addendum 3 is not available

generic food models (Figures 1 & 2). The generic drawings and 3 dimensional models had previously been tested against real food portions (26). The Nigerian study used generic food models.

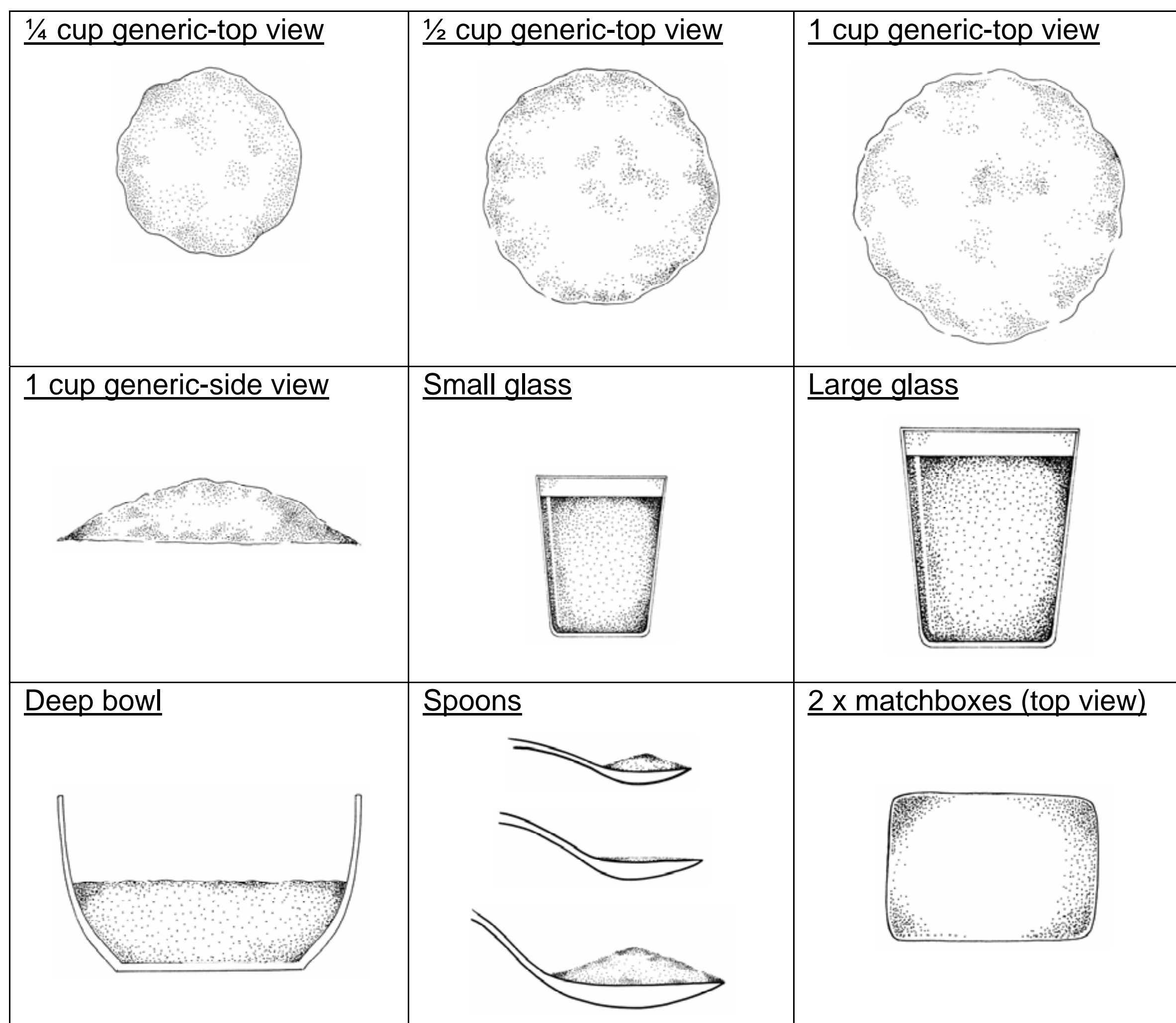


Figure 1: Examples of the 2-dimensional life-size drawings used in the Kenyan study

[j] Addendum 8 not available (Nigerian)

Figure 2: Examples of the 3-dimensional food models used in the South African and Kenyan studies

# 6. Measurements

## 6.1 Anthropometry

Each participant was weighed and measured by a trained fieldworker, according to a field manual prepared for this purpose (Addendum 9). Weight was measured with a foot scale which was calibrated every day before measurements were taken. Height was measured using a steel tape which was anchored to a flat wall. A wooden headrest allowed the measurement to be taken at the point perpendicular to the top of the head. Waist was taken at the narrowest point of the middle and hip measurement was taken at the widest point around the hips. An average of 2 measurements was taken of each measure.

## 6.2 Data collection

Fieldwork was undertaken in all studies after a reasonable amount of time (3-5 days) had been spent on training of the fieldworkers.

## 6.3 Pilot studies

All the questionnaires were tested on at least 10 adults in each country immediately prior to the survey.

### 6.4 Ethical and legal considerations

Signed informed consent was obtained from each participant in each country. Before consent was obtained the fieldworker explained the purpose of the study to the participant reading it from an information sheet if the participant was not able to read herself. Each participant was provided with a small gift as a gesture of thanks at the end of the interview.

### 6.5 Validity and reliability of the data collected

Data obtained on breakfast foods and spreads were corroborated by data from the 24-hour recalls. Additionally, 100 repeated interviews were undertaken in Kenya in order to evaluate the reliability of data collected. These repeated interviews were done by the supervisors of the teams. No one knew in advance which homes would be randomly selected for the repeats. Furthermore, quality of the data were ensured by a rigorous training programme of 3 days, use of dietary life-size portion sizes and photographs; supervisors doing quality checks on the fieldworkers throughout the study and stringent data cleaning.

## 7. Data management and analyses

An experienced Kenyan nutritionist was responsible for entering the data and data analysis was undertaken by an experienced statistician. Basic measures of central tendency and dispersion were determined using the SAS programme. Dietary data was analysed using FoodFinder, a software product developed By the MRC. The most commonly eaten Kenyan foods (about 45) were added to the South African tables from Kenyan National Food Composition Tables (27).

The evaluation of dietary adequacy used in this study is based on the method described by Hatloy *et al*. in Mali (28). The *dietary diversity score (*DDS) is defined as: the number of food groups consumed over a period of 24 hours. The diet was classified according to 9 food groups as recommended by Food and Agricultural Organisation (FAO). These include: (1) cereals, roots and tubers; (2) vitamin A rich fruits and vegetables; (3) other fruit; (4) other vegetables; (5) legumes and nuts; (6) meat, poultry and fish; (7) fats and oils; (8) dairy; and (9) eggs. Other remaining items, such as tea, sugar and sweets were

not used in DDS or in the *food variety score* (FVS) calculations. The FVS was defined as the number of food items consumed over a 24-hour period, from a possible 163 items.

In order to determine the *nutrient adequacy* of the diet a *nutrient adequacy ratio* (NAR) was calculated for 11 micronutrients (vitamins A, B6, B12, C, niacin, thiamine, riboflavin, vitamin B6 and minerals calcium, iron and zinc) and energy and protein. NAR was calculated as the ratio of the intake of a nutrient divided by the recommended intake for that nutrient (RNI), using WHO/FAO recommended intakes (29), which are set at 2 standard deviations above the average requirements. The *mean adequacy ratio* (MAR) was calculated as the measure of adequacy of the overall diet. MAR = sum of each NAR (truncated at 1) / number of nutrients (excluding energy and protein) (28).

# 8. Results

## 8.1 Socio-demographic results

The South African DHS study comprised 11 735 adult women respondents of which more than 7000 were urban (Table 8.1.1). In the South Africa sample, the highest age group was 45-49. The Kenyan study included 1008 adult women from the provinces of Nakuru, Meru, Kisumu and Nairobi. Of these 28.9% were rural and 71% were urban. The sample age groups were fairly even distributed except in the youngest and oldest groups found in Kenya. In both countries, males were generally regarded as the head of the household although this was higher in Kenya (Table 8.1.2).

Table 8.1.1: Percent women participating in the three countries by age and residence

| Age (years) | South Africa[1] | Kenya[2] | Nigeria[3] |
|---|---|---|---|
| 15-19 | 19.2 | 4.7 | |
| 20-24 | 17.7 | 18.6 | |
| 25-29 | 15.8 | 24.9 | |
| 30-34 | 14.1 | 14.3 | |
| 35-39 | 13.9 | 15.4 | |
| 40-44 | 11.0 | 7.2 | |
| 45-49 | 8.3 | 6.9 | |
| 50-54 | NA | 3.5 | |
| 55-60 | NA | 3.3 | |
| 60+ | NA | 1.3 | |
| Total N | 11 735 | 1008 | |
| Urban N | 7 095 | 716 | |
| Rural N | 4 640 | 292 | |

1: South African Demographic & Health Survey (SADHS) 1998 (24); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption and Nutrition Survey (NFCNS) 2002(25)

Table 8.1.2: Gender distribution of household headship in the three countries

| | South Africa[1] | | | Kenya[2] | | | Nigeria[3] | | |
|---|---|---|---|---|---|---|---|---|---|
| **Head** | **Urban** | **Rural** | **Total** | **Urban** | **Rural** | **Total** | **Urban** | **Rural** | **Total** |
| Male | 63.8 | 50 | 58.1 | 71.9 | 73.6 | 72.4 | | | |
| Female | 36.2 | 50 | 41.9 | 27.8 | 26.4 | 27.4 | | | |
| | 100 | 100 | 100 | 100 | 100 | 100 | | | |

1: South African Demographic & Health Survey (SADHS) 1998(24); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption & Nutrition Survey (NFCNS) 2002 (25).

There is a large difference between South Africa and Kenya with regard to marital status of the participants (Table 8.1.3 & Figure 8.1.1). In Kenya 62% were married but only 33% in South Africa. In South Africa, the majority of women were single (48%). No schooling of participants was less than 10% in both countries (Table 8.1.4 & Figure 8.1.2). A very large percentage of Kenyan women only had primary school education (41%) compared with South Africa (25%). However, in Kenya the number of women who had completed high school and had a tertiary education was higher. In both countries, poor schooling was highest in rural areas. Sixty-three percent of South African women were unemployed compared with 38% of Kenyan subjects (Table 8.1.5 & Figure 8.1.3).

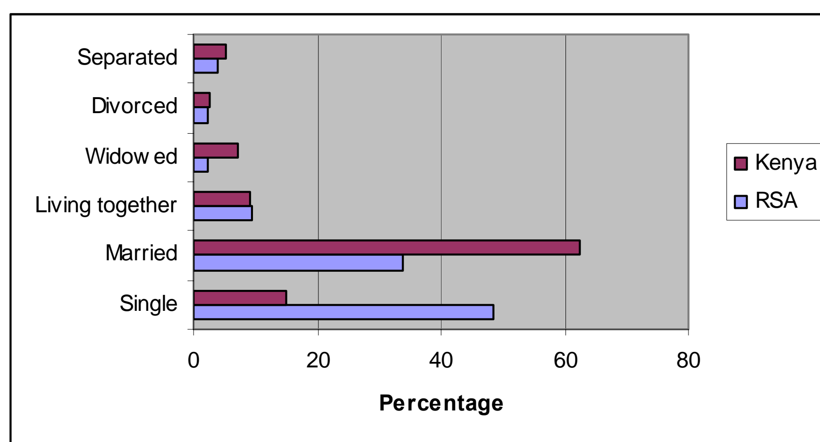


Figure 8.1.1: Marital status of participants in South Africa (RSA) and Kenya

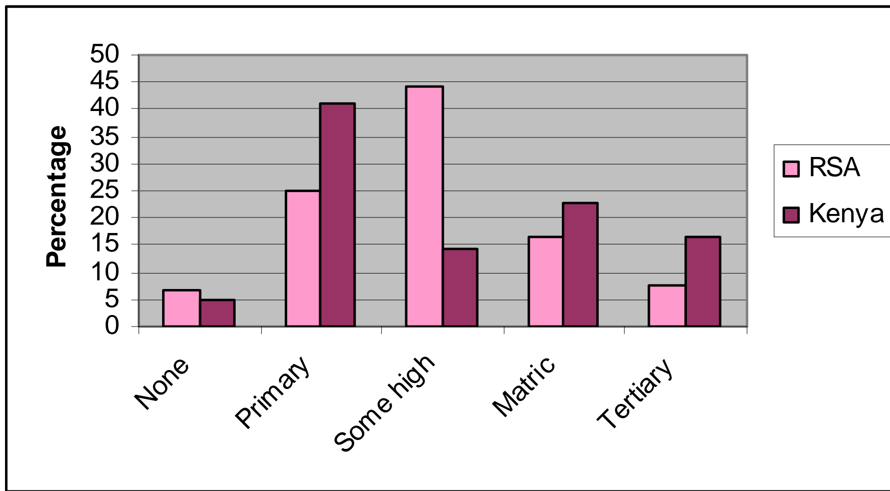


Figure 8.1.2: Education levels of the participants in South Africa (RSA) and Kenya

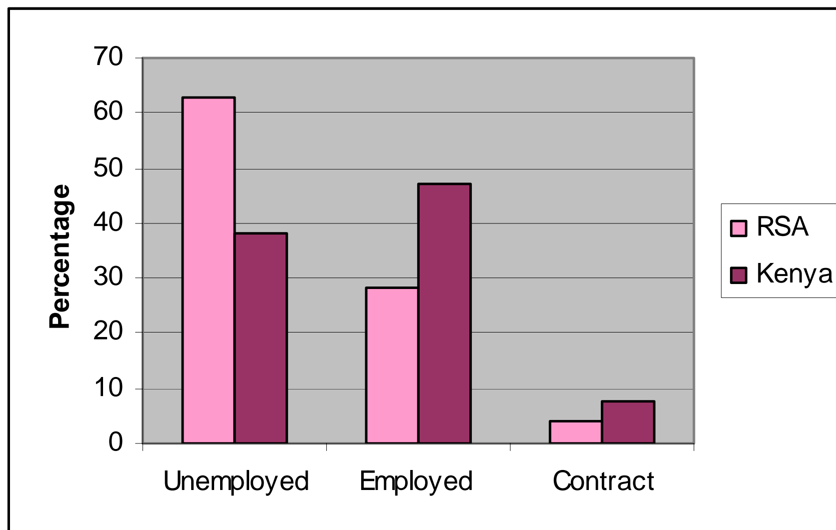


Figure 8.1.3: Employment status of the participants in South Africa (RSA) and Kenya

Table 8.1.3: Percent distribution of women by current marital status of the respondents

| | Single/ never married | Married | Living together | Widow | Divorced | Separated | % | N |
|---|---|---|---|---|---|---|---|---|
| South Africa | 48.3 | 33.7 | 9.5 | 2.4 | 2.2 | 3.9 | 100 | 11 735 |
| Kenya | 14.8 | 62.4 | 9.0 | 7.2 | 1.5 | 5.1 | 100 | 1008 |
| Nigeria | | | | | | | | |

1: South African Demographic & Health Survey (SADHS) 1998(24); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption & Nutrition Survey (NFCNS) 2002 (25)

Table 8.1.4: Prevalence of the highest level of education of the participants

| **Level of education** | **South Africa[1]** | | | **Kenya[2]** | | | **Nigeria[3]** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Urban** | **Rural** | **Total** | **Urban** | **Rural** | **Total** | | | |
| None | 3.3 | 12.2 | 6.8 | 2.7 | 10.9 | 5.1 | | | |
| Primary school | 19.0 | 33.8 | 24.8 | 33.6 | 59.6 | 41.1 | | | |
| Some high school | 46.4 | 40.7 | 44.2 | 16.2 | 10.3 | 14.5 | | | |
| Completed high school | 20.6 | 10.0 | 16.4 | 27.1 | 12.7 | 22.9 | | | |
| Tertiary | 10.7 | 3.3 | 7.8 | 20.4 | 6.5 | 16.4 | | | |

1: South African Demographic & Health Survey (SADHS) 1998 (24); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption & Nutrition Survey (NFCNS) 2002 (25)

Table 8.1.5: The employment status of the women participating in the three studies

| **Employment** | **South Africa[1]** | | | **Kenya[2]** | | | **Nigeria[3]** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Urban** | **Rural** | **Total** | **Urban** | **Rural** | **Total** | | | |
| Unemployed | 55.6 | 73.5 | 62.7 | 32.3 | 52.6 | 38.1 | | | |
| Employed | 35.0 | 18.2 | 28.4 | 55.2 | 27.8 | 47.3 | | | |
| Seasonal/ contract | 4.0 | 3.8 | 3.9 | 6.7 | 10.0 | 7.7 | | | |
| Other | 5.4 | 4.5 | 5.0 | 5.8 | 5.9 | 7.0 | | | |

1: South African Demographic & Health Survey (SADHS) 1998 (24); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption & Nutrition Survey (NFCNS) 2002 (25)

Table 8.1.6 presents findings on the housing conditions of the subjects. The majority of South African and Kenyan subjects have houses with concrete/brick walls, 62%, and 64%, respectively. The South African participants however, frequently do not have concrete floors compared with the Kenyans (33% and 74%). The majority of houses in both countries sleep 1-2 persons per room (75% in South Africa and 65% in Kenya). A

large percentage in Kenya has 3-4 persons sleeping per room (29%) compared with 18% in South Africa.

Table 8.1.6 further shows that 52% of South African subjects have electricity as a source of fuel for cooking compared with only 5% of Kenyans, the majority of whom use paraffin (38%) and wood (28%). A large percentage of South African subjects use the latter as well (33% and 26%, respectively). Less than 40% of households have their own tap in both South Africa and Kenya (39% and 31%, respectively) and most use communal taps (43% and 43%, respectively) (Figure 8.1.4).

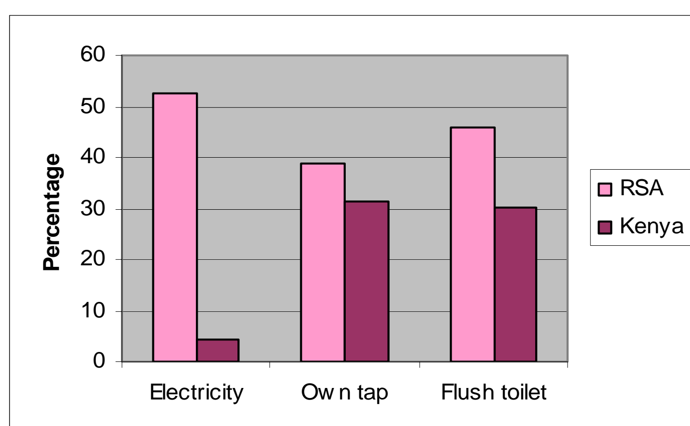


Figure 8.1.4: Housing characteristics of the participants in South Africa (RSA) and Kenya

Household assets found in both countries are presented in Table 8.1.7. These show that the countries are generally similar with a few exceptions. One out of two households (50%) studied in South Africa had a refrigerator compared with only 9% in Kenya (Figure 8.1.5). Furthermore, 25% of South African households possessed a car compared with 12% in Kenya. Possession of a telephone was however much higher in Kenya (52% versus 28%). Of note was the finding that 61% of women studied in Kenya owned land. Since we do not know the South African figure for this, it is difficult to make a comparison. However it is known that because of many years of the “Apartheid” regime few black South Africans own land. This will obviously have an outcome on the food security of households without land.

Table 8.1.6: Housing characteristics of the participants in the three countries studied

| | South Africa[1] | | | Kenya[2] | | | Nigeria[3] | | |
|---|---|---|---|---|---|---|---|---|---|
| **Characteristics** | **Urban** | **Rural** | **Total** | **Urban** | **Rural** | **Total** | | | |
| **House walls** | | | | | | | | | |
| Brick/concrete | 74.4 | 49.5 | 62.8 | 73.9 | 40.8 | 64.3 | | | |
| Mud/dung/sand | 2.3 | 31.5 | 14.4 | 5.7 | 35.6 | 14.4 | | | |
| Tin/corrugated | 11.4 | 3.2 | 8.0 | 6.3 | 1.7 | 5.0 | | | |
| Wood/planks | NA | NA | NA | 14.0 | 21.6 | 16.2 | | | |
| Other | | | | 0.1 | .34 | 0.2 | | | |
| **Floors** | | | | | | | | | |
| Brick/concrete | 89.0 | 65.7 | 79.5 | 85.9 | 45.6 | 74.2 | | | |
| Mud | 4.8 | 32.1 | 16.0 | 11.5 | 52.7 | 23.4 | | | |
| Wood/planks | 1.7 | 0.7 | 1.3 | 2.1 | 1.4 | 1.9 | | | |
| Other | | | | 0.6 | .34 | 0.5 | | | |
| **Persons/room** | | | | | | | | | |
| 1-2 | 78.5 | 70.9 | 75.4 | 66.3 | 61.3 | 64.9 | | | |
| 3-4 | 16.2 | 20.5 | 18.0 | 28.3 | 29.1 | 28.5 | | | |
| 5-6 | 3.3 | 5.4 | 4.2 | 4.3 | 8.6 | 5.6 | | | |
| 7+ | 1.0 | 1.8 | 1.3 | 1.1 | 1.0 | 1.1 | | | |
| Other | 0.9 | 1.5 | 1.1 | - | - | - | | | |
| **Electricity** | | | | | | | | | |
| Yes | 84.2 | 37.1 | 64.9 | NA | NA | | | | |
| No | 15.4 | 62.3 | 34.6 | NA | NA | | | | |
| **Fuel in cooking** | | | | | | | | | |
| Electricity | 73.1 | 22.6 | 52.4 | 6.2 | 0.3 | 4.5 | | | |
| Gas | 8.4 | 6.0 | 7.4 | 23.8 | 5.5 | 18.5 | | | |
| Paraffin | 29.0 | 39.5 | 33.3 | 45.9 | 20.3 | 38.5 | | | |
| Wood | 4.9 | 55.6 | 25.7 | 13.0 | 64.6 | 27.9 | | | |
| Coal/charcoal | 8.9 | 8.5 | 8.7 | 11.2 | 9.3 | 10.6 | | | |
| Dung | 0.1 | 2.1 | 0.9 | - | - | - | | | |
| Other | 0.8 | 0.1 | 0.5 | - | - | - | | | |
| **Water source** | | | | | | | | | |
| Own tap | 59.0 | 10.0 | 38.9 | 36.0 | 19.9 | 31.3 | | | |
| Communal tap | 38.9 | 47.8 | 42.5 | 51.7 | 19.9 | 42.5 | | | |
| River/dam | 0.2 | 28.5 | 11.8 | 1.0 | 25.0 | 8.0 | | | |
| Well/borehole | 0.2 | 7.0 | 3.0 | 6.0 | 27.7 | 12.3 | | | |
| Other | 2.0 | 7.1 | 4.2 | 5.3 | 7.5 | 6.0 | | | |
| **Toilet** | | | | | | | | | |
| Flush toilet | 79.6 | 7.6 | 46 | 39.2 | 8.3 | 30.3 | | | |
| Pit/VIP | 17.5 | 65.6 | 37.2 | 56.4 | 87.2 | 65.3 | | | |
| None | 2.0 | 25.6 | 11.6 | 1.0 | 1.0 | 1.0 | | | |
| Other e.g. pot | 1.0 | 1.1 | 1.1 | 3.4 | 3.5 | 3.4 | | | |

1: South African Demographic & Health Survey (SADHS) 1998 (24); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption & Nutrition Survey (NFCNS) 2002 (25); NA=not asked

It appears that 86% of Kenyan women decide on the type of foods bought by the household while 56% decide on the amount spent (Table 8.1.8). With regard to the latter, 33% of partners were also decision makers in this regard. A similar trend was followed in South African households except that the grandmothers also frequently planned and decided on food bought.

Table 8.1.7: Household durable goods and assets of the participants' households

| | South Africa[1] | | | Kenya[2] | | | Nigeria[3] | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Urban** | **Rural** | **Total** | **Urban** | **Rural** | **Total** | | | |
| Refrigerator | 68.5 | 24.4 | 50.4 | 7.9 | 0.6 | 8.5 | | | |
| Stove + oven | NA | NA | NA | 12.6 | 0.7 | 13.3 | | | |
| Paraffin stove | NA | NA | NA | 52.0 | 12.7 | 64.7 | | | |
| Hot plates | NA | NA | NA | 9.7 | 0.9 | 10.6 | | | |
| Computer | 9.7 | 1.5 | 6.3 | 5.4 | 0.2 | 5.6 | | | |
| Radio | 84.5 | 73.5 | 80.0 | 63.9 | 23.1 | 87.0 | | | |
| Television | 73.2 | 35.0 | 57.6 | 44.3 | 8.6 | 52.9 | | | |
| Telephone | 43.3 | 6.1 | 28.0 | 43.4 | 9.0 | 52.3 | | | |
| Car | 34.3 | 11.8 | 25.1 | 10.9 | 1.2 | 12.2 | | | |
| Motor cycle | 2.2 | 1.3 | 1.8 | 1.3 | 0.3 | 1.6 | | | |
| Bicycle | 19.3 | 13.4 | 16.9 | 19.4 | 10.8 | 30.3 | | | |
| Own home | NA | NA | NA | 33.5 | 20.8 | 54.4 | | | |
| Donkey/horse | 0.3 | 5.3 | 2.4 | 1.1 | 0.7 | 1.8 | | | |
| Cattle | 0.9 | 23.1 | 10.0 | 21.7 | 15.1 | 36.8 | | | |
| Sheep | NA | NA | NA | 7.6 | 6.1 | 13.7 | | | |
| Poultry | NA | NA | NA | 27.7 | 20.3 | 48.0 | | | |
| Land | NA | NA | NA | 40.5 | 20.9 | 61.4 | | | |

1: South African Demographic & Health Survey (SADHS) 1998 (24); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption & Nutrition Survey (NFCNS) 2002 (25); NA =not asked

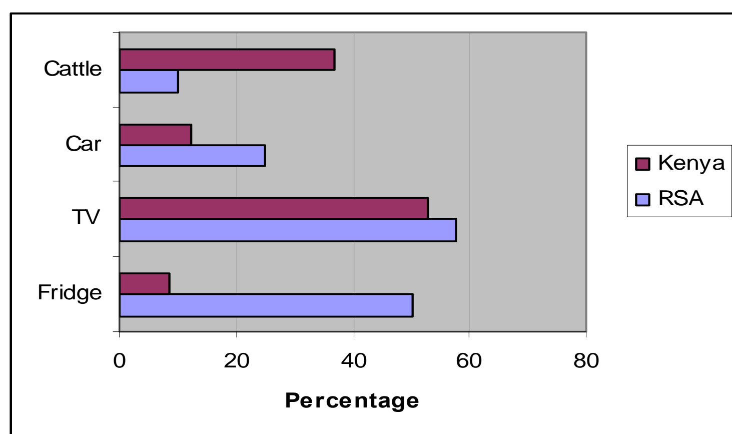


Figure 8.1.5: Assets owned by the participants in Kenya and South Africa (RSA)

Table 8.1.8: The household member who decides on the type of food and amount of money spent on food for the household

| **Person who decides on type of food bought** | **South Africa[1]** | **Kenya[2]** | **Nigeria[3]** |
|---|---|---|---|
| Mother | 28 | 2.4 | |
| Father | 2 | 0.9 | |
| Self | 55 | 85.9 | |
| Partner | 7 | 7.8 | |
| Sibling | 1 | 0.9 | |
| Grand mother | - | 0.1 | |
| Grand father | - | 0 | |
| Aunt | 5 | 0.2 | |
| Uncle | 3.3 | 1.9 | |
| **Person who decides on amount money spent** | | | |
| Mother | 30 | 3.1 | |
| Father | 5 | 0.9 | |
| Self | 40 | 56.2 | |
| Partner | 17 | 33.1 | |
| Sibling | 0.5 | 1.4 | |
| Grand mother | - | 0.1 | |
| Grand father | - | 0 | |
| Aunt | 4 | 0 | |
| Other | 3.2 | 5.3 | |

1: National Food Consumption Survey (NFCS) 2002 (23); 2: Kenyan Adult Women Study (KAW) 2005; 3: Nigerian Food Consumption & Nutrition Survey (NFCNS) 2002(25)

## 8.2 Anthropometric results

### 8.2.1 South African

Mean BMI of South African women increases with age from 23.7 $kg/m^2$ at 15 years to 27.7 $kg/m^2$ at 64 years (Table 8.2.1). This trend is also followed with overweight and

obesity. At 15-24 years, 20% of women are overweight and 9.6% are obese. This increases to 25.6% and 46.1%, respectively at age 55-64 years. The prevalence of obesity is higher in urban (33.2%) than in rural areas (25.1%). The highest prevalence of obesity is found in women with the lowest three levels of education. The overall prevalence of overweight in women is 26.1% and of obesity is 30.1%. The prevalence of underweight is low (5.6%) and less than 10% in all age groups.

For South Africa overall 40.5% of black women have a waist measurement greater than 88 cm and 32% have a WHR greater than 0.85 (Table 8.2.2). Mean waist, and mean hip measurements increase with age from 15 to 64 years. By 64 years 64% have a waist measurement greater than 88 cm and 49.8% have a WHR greater than 0.85.

Table 8.2.1: Body mass index of women in the South African Demographic and Health Survey 1998 (24)

| | **BMI Mean Kg/m$^2$** | **Standard Error** | **Under BMI < 18.5 Kg/m$^2$** | **Normal BMI 18.5-24.9 Kg/m$^2$** | **Overweight BMI 25-29.9 Kg/m$^2$** | **Obese BMI ≥ 30 Kg/m$^2$** |
|---|---|---|---|---|---|---|
| **Age (yrs)** | | | | | | |
| 15-24 | 23.7 | 0.13 | 9.5 | 60.7 | 20.0 | 9.6 |
| 25-34 | 27.2 | 0.18 | 5.1 | 38.4 | 29.2 | 27.0 |
| 35-44 | 29.2 | 0.21 | 2.7 | 27.2 | 30.7 | 39.3 |
| 45-54 | 29.9 | 0.27 | 3.7 | 23.9 | 26.5 | 45.5 |
| 55-64 | 29.8 | 0.32 | 2.7 | 25.6 | 25.6 | 46.1 |
| 65+ | 27.7 | 0.32 | 7.4 | 32.5 | 26.5 | 33.3 |
| **Residence** | | | | | | |
| Urban | 27.8 | 0.14 | 5.0 | 35.6 | 26.0 | 33.2 |
| Rural | 26.6 | 0.15 | 6.5 | 41.9 | 26.2 | 25.1 |
| **Education** | | | | | | |
| None | 27.6 | 0.26 | 5.8 | 34.4 | 27.2 | 32.6 |
| Primary -3 | 27.9 | 0.27 | 6.4 | 32.3 | 25.2 | 36.0 |
| Std 4-5 | 28.4 | 0.26 | 4.8 | 33.4 | 28.1 | 33.2 |
| Some high | 27.1 | 0.17 | 5.6 | 41.2 | 24.3 | 28.7 |
| Matric | 26.5 | 0.22 | 6.3 | 38.8 | 30.0 | 24.8 |
| Tertiary | 26.2 | 0.32 | 4.1 | 49.1 | 23.3 | 23.3 |
| Total | 27.3 | 0.10 | 5.6 | 38.1 | 26.1 | 30.1 |

Table 8.2.2: Waist and hip circumference measurements of adult South African women in the South African Demographic and Health Survey 1998 (24)

| | Waist circum. (cm) | | | Hip circum. (cm) | | Waist-hip ratio | | |
|---|---|---|---|---|---|---|---|---|
| **Age (yrs)** | Mean | SE | % ≥ 88cm | Mean | SE | Mean | SE | % ≥ 0.85 |
| 15-24 | 74.9 | 0.31 | 11.3 | 97.8 | 0.30 | 0.77 | 0.0027 | 13.1 |
| 25-34 | 84.1 | 0.41 | 33.5 | 105.1 | 0.42 | 0.80 | 0.0027 | 22.4 |
| 35-44 | 89.4 | 0.46 | 50.5 | 108.5 | 0.46 | 0.83 | 0.0034 | 33.4 |
| 45-54 | 92.5 | 0.54 | 61.3 | 109.3 | 0.55 | 0.85 | 0.0033 | 45.6 |
| 55-64 | 93.8 | 0.63 | 64.0 | 109.4 | 0.67 | 0.86 | 0.0042 | 49.8 |
| 65+ | 91.7 | 0.67 | 56.4 | 104.7 | 0.66 | 0.88 | 0.0048 | 58.1 |
| **Resides** | | | | | | | | |
| Urban | 86.4 | 0.30 | 42.6 | 106.6 | 0.28 | 0.81 | 0.0020 | 29.1 |
| Rural | 84.9 | 0.35 | 37.2 | 102.2 | 0.36 | 0.83 | 0.0023 | 63.6 |
| **Education** | | | | | | | | |
| None | 89.1 | 0.55 | 50.0 | 103.7 | 0.58 | 0.86 | 0.0033 | 51.8 |
| Prim.- Std 3 | 88.8 | 0.63 | 47.8 | 105.2 | 0.57 | 0.85 | 0.0044 | 42.4 |
| Std 4-5 | 87.8 | 0.58 | 47.0 | 106.2 | 0.61 | 0.83 | 0.0031 | 34.4 |
| Some high | 84.4 | 0.39 | 36.7 | 104.5 | 0.35 | 0.81 | 0.0025 | 27.9 |
| Matric | 82.5 | 0.53 | 32.9 | 105.7 | 0.51 | 0.78 | 0.0032 | 17.3 |
| Tertiary | 80.9 | 0.72 | 72.8 | 104.0 | 0.65 | 0.78 | 0.0045 | 15.3 |
| **Total** | 85.8 | 0.23 | 40.5 | 105.0 | 0.22 | 0.82 | 0.0016 | 32.0 |

### 8.2.2 Kenyan results

Table 8.2.3 presents data on mean anthropometric measurements of Kenyan women. It is shown that mean weight, waist, hip and BMI measurements increase from the lower to the upper class levels. In this study, class and income were used interchangeably. Mean weight increases from 61.7 kg in the lower class to 69.5 kg in the upper class. Similarly, BMI increases from 23.9 $kg/m^2$ to 27.3 $kg/m^2$ in the two classes respectively. These differences are significant at p=0.05.

In the Kenyan sample, 29.1% and 14.2% of women were overweight and obese, respectively, while 4.6% were underweight (Table 8.2.4). Mean BMI increases with age from 23.2 $kg/m^2$ in 15-24 years to 26.7 $kg/m^2$ in 55-64-year-olds. The prevalence of overweight increases from 19.2% to 34.9%, and obesity from 4.7% to 18.6% from the youngest to oldest age groups. There are large differences between the social classes (Figure 8.2.1). Underweight is highest in the lower class (8.2%) and in the youngest age group (5.6%). The prevalence of overweight increases from 23.7% to 50.9% in the lower and upper classes respectively, while obesity increases from 8.2% to 16.4%.

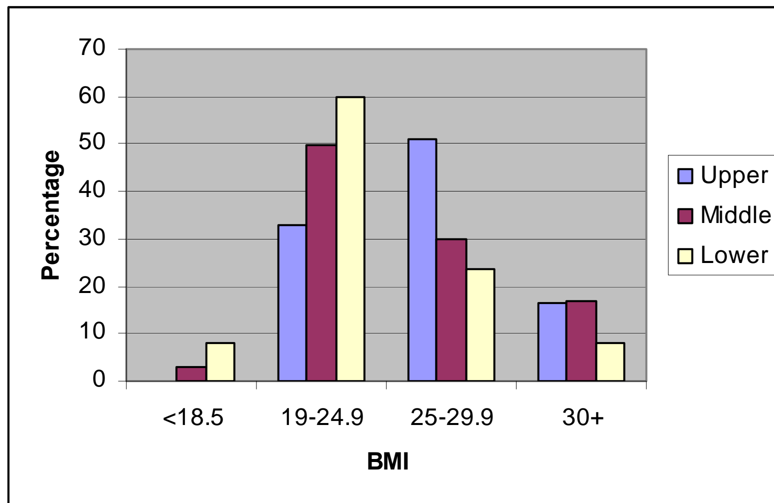


Figure 8.2.1: Distribution of BMI (kg/m$^2$) by social (economic) class in Kenyan women

Similar trends are found in waist and hip measurements of women (Table 8.2.5). Mean waist and hip measurements are highest in the upper class with mean waist measurements increasing from 78.8 cm to 82 cm in low and upper classes respectively; mean hip measurements increase from 98.1 cm to 105 cm, respectively. The prevalence of a waist measurement above 88 cm increase from the youngest age to that of 45-54-year-olds from 9.3% to 37.1% respectively, while WHR increases from 10.3% to 27.6% across age groups.

Table 8.2.3 Mean anthropometric measurements of Kenyan women (n=1008)

| | **Upper Income(n=55)** | **Middle Income (n=636)** | **Low Income n=317)** |
|---|---|---|---|
| Mean height (cm) | 159.6 | 160.9 | 160.8 |
| Standard error | 0.25 | 0.29 | 0.39 |
| 95% CI | 159.1 - 160.1 | 160.3 - 161.4 | 160.0 - 161.5 |
| Mean weight (kg) | 69.5 | 66.2 | 61.7 |
| Standard error | 2.45 | 0.75 | 0.96 |
| 95% CI | 64.6 - 74.5 | 64.6 – 67.7 | 59.8 - 63.7 |
| Mean waist (cm) | 82.7 | 80.8 | 78.8 |
| Standard error | 2.67 | 0.62 | 0.90 |
| 95% CI | 77.3 - 88.1 | 79.5 - 82.0 | 76.9 - 80.6 |
| Mean hip (cm) | 105.0 | 102.3 | 98.1 |
| Standard error | 1.29 | 0.66 | 0.94 |
| 95% CI | 102.5 - 107.6 | 100.9 - 103.6 | 96.2 - 100.0 |
| Mean BMI kg/m$^2$ | 27.3 | 25.6 | 23.9 |
| Standard error | 0.90 | 0.31 | 0.35 |
| 95% CI | 25.5 - 29.1 | 25.0 - 26.2 | 23.2 - 24.6 |
| Mean WHR | 0.79 | 0.79 | 0.80 |
| Standard error | 0.03 | 0.003 | 0.004 |
| 95% CI | 0.74 - 0.84 | 0.78 - 0.80 | 0.79 - 0.81 |

CI=confidence interval

Table 8.2.4: Body mass index (kg/m$^{2)}$ of Kenyan women participating in the Kenyan study (n=1008)

| **Age** | **BMI kg/m$^2$ Mean** | **SE** | **Under BMI <18.5** | **Normal BMI 18.5-24.9** | **Overweight BMI 25-29.9** | **Obese BMI ≥30** |
|---|---|---|---|---|---|---|
| 15-24 | 23.2 | 0.30 | 5.6 | 70.5 | 19.2 | 4.7 |
| 25-34 | 25.2 | 0.29 | 3.1 | 55.2 | 28.7 | 12.9 |
| 35-44 | 26.3 | 0.38 | 5.7 | 38.2 | 33.3 | 22.8 |
| 45-54 | 26.6 | 0.65 | 4.7 | 33.3 | 41.9 | 20.0 |
| 55-64 | 26.7 | 1.27 | 4.6 | 41.9 | 34.9 | 18.6 |
| **Residence** | | | | | | |
| Urban | 25.6 | 0.26 | 3.2 | 48.9 | 32.0 | 15.8 |
| Rural | 24.2 | 0.43 | 7.9 | 59.7 | 22.0 | 10.3 |
| **Education** | | | | | | |
| None | 25.2 | 0.72 | 3.9 | 47.1 | 35.3 | 13.7 |
| Prim- Std 3 | 24.4 | 0.24 | 8.0 | 55.8 | 25.1 | 11.1 |
| Some high | 24.8 | 0.45 | 1.4 | 63.4 | 25.5 | 9.7 |
| Matric | 25.6 | 0.31 | 3.0 | 47.4 | 30.0 | 19.6 |
| Tertiary | 26.8 | 0.61 | 1.2 | 40.6 | 39.4 | 18.8 |
| **Class** | | | | | | |
| Upper | 27.3 | 0.90 | - | 32.7 | 50.9 | 16.4 |
| Middle | 25.6 | 0.31 | 3.1 | 49.9 | 29.9 | 17.0 |
| Low | 23.9 | 0.35 | 8.2 | 59.8 | 23.7 | 8.2 |
| **Total** | 25.2 | 0.22 | 4.6 | 52.1 | 29.1 | 14.2 |

SE=standard error

Table 8.2.5: Waist and hip circumference measurements of adult Kenyan women in the Kenyan adult women study

| | Waist circum. (cm) | | | Hip circum. (cm) | | Waist Hip Ratio | | |
|---|---|---|---|---|---|---|---|---|
| **Age** | **Mean** | **SE** | **% ≥ 88cm** | **Mean** | **SE** | **Mean** | **SE** | **% ≥ 0.85** |
| 15-24 | 75.0 | 0.60 | 9.3 | 96.3 | 0.59 | 0.8 | 0.004 | 10.3 |
| 25-34 | 79.5 | 0.69 | 19.2 | 101.9 | 0.60 | 0.8 | 0.004 | 14.9 |
| 35-44 | 83.2 | 0.66 | 31.8 | 103.7 | 0.94 | 0.80 | 0.004 | 22.0 |
| 45-54 | 84.7 | 1.21 | 37.1 | 103.8 | 1.27 | 0.8 | 0.01 | 27.6 |
| 55-64 | 87.5 | 1.31 | 58.1 | 100.7 | 1.78 | 0.9 | 0.01 | 51.2 |
| **Resides** | | | | | | | | |
| Urban | 80.8 | 0.53 | 26.5 | 102.1 | 0.54 | 0.8 | 0.003 | 17.7 |
| Rural | 78.9 | 0.84 | 16.4 | 98.6 | 1.02 | 0.8 | 0.004 | 20.4 |
| **Education** | | | | | | | | |
| None | 83.7 | 1.64 | 33.3 | 98.9 | 1.57 | 0.8 | 0.01 | 39.2 |
| Primary | 79.0 | 0.48 | 18.9 | 99.2 | 0.56 | 0.8 | 0.003 | 18.9 |
| Some high | 79.2 | 0.86 | 18.2 | 100.6 | 0.83 | 0.8 | 0.01 | 14.6 |
| Matric | 80.8 | 0.80 | 27.7 | 103.0 | 0.75 | 0.8 | 0.004 | 15.0 |
| Tertiary | 82.5 | 1.18 | 30.9 | 104.4 | 1.19 | 0.8 | 0.01 | 19.1 |
| **Class** | | | | | | | | |
| Upper | 82.7 | 2.67 | 25.9 | 105.0 | 1.29 | 0.8 | 0.03 | 24.1 |
| Middle | 80.8 | 0.62 | 26.0 | 102.3 | 0.66 | 0.8 | 0.003 | 16.4 |
| Low | 78.8 | 0.90 | 18.4 | 98.1 | 0.94 | 0.8 | 0.01 | 21.7 |
| **Total** | 80.2 | 0.4 | 23.6 | 101.1 | 0.4 | 0.8 | 0.003 | 18.5 |

SE=standard error

### 8.2.3 Comparison of South African and Kenyan women's anthropometry

Figure 8.2.2 shows that BMI is very similar in the two countries with regard to under nutrition and normal weight. However, Kenya has considerably more overweight subjects and South Africa has more subjects that are obese. In both countries, mean BMI, waist and hip measurements increased steadily with age. The prevalence of underweight was less than 10% in the 15 to 24-year-olds, while waist (> 88 cm) and WHR (> 0.85) were between 10-12%. These trends follow through in the urban and rural areas of the two countries (Figures 8.2.3 & 8.2.4). Furthermore, it should be noted that in both countries there are more overweight and obese subjects in the urban compared with the rural areas. There is a higher prevalence of subjects with high waist measurements (> 88 cm) and high WHR (> 0.85) in South Africa than in Kenya (Figure 8.2.5).

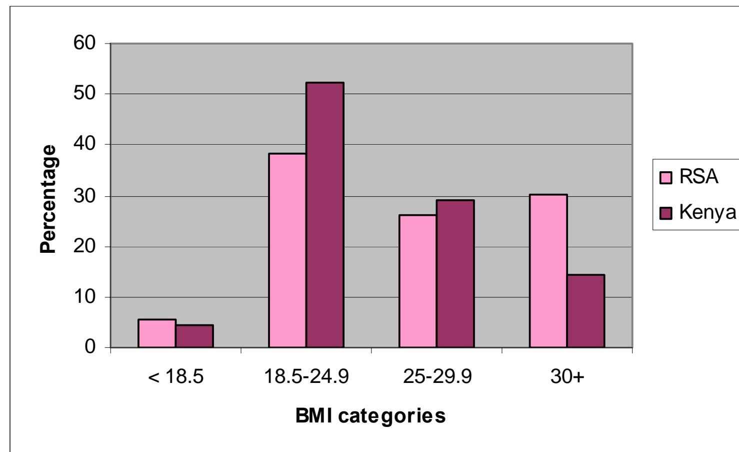


Figure 8.2.2: BMI data of participants in South Africa (RSA) and Kenya studies

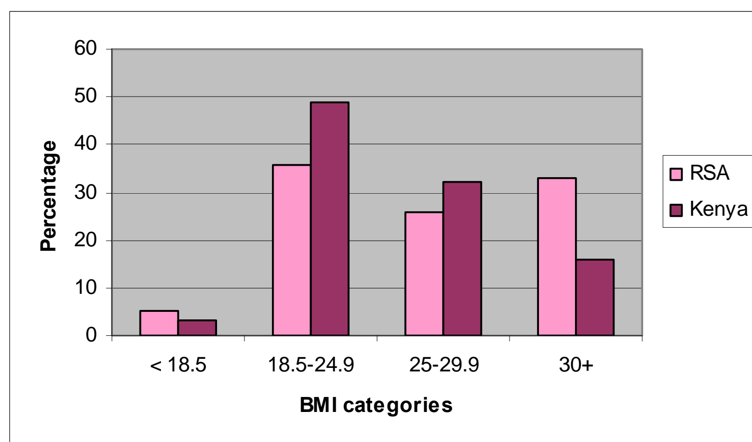


Figure 8.2.3: BMI data of participants in urban areas of South Africa (RSA) and Kenya

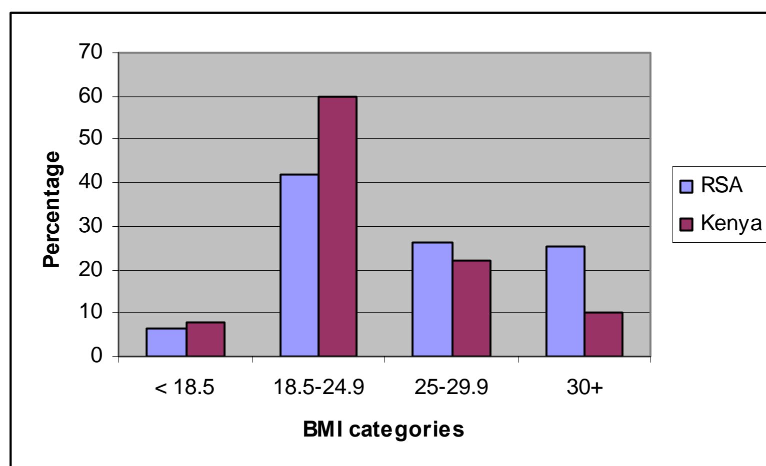


Figure 8.2.4: BMI data of participants in rural areas of South Africa (RSA) and Kenya

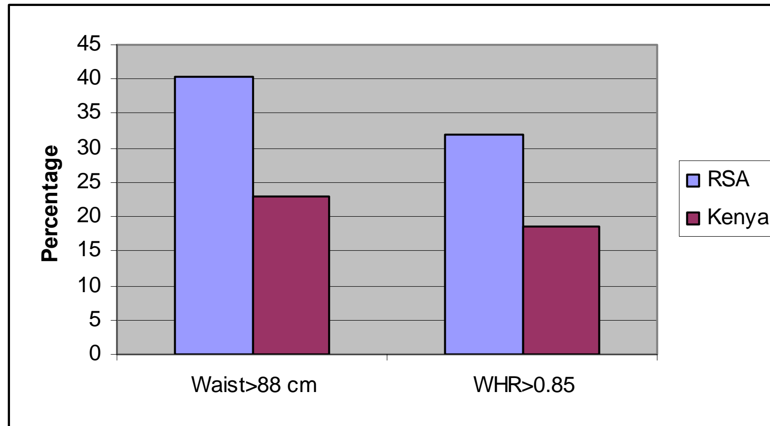


Figure 8.2.5: Percent of women having a high waist and a high waist-hip ratio (WHR) in the South African (RSA) and Kenyan studies

## 8.3 Dietary results

### 8.3.1 South African women

South African participants aged 15-29 years had a mean energy intake of 7764 kJ, carbohydrate intake of 258.3 g, fat intake of 53.5 g and a protein intake of 63.4 g (Table 8.3.1). Most of the protein was in the form of animal protein (34.8 g) although a fair amount was of a plant nature (28.2 g). Mean added sugar was highest in this age group at 48.2 g. Cholesterol intake was relatively low at 220.4 mg. Mean calcium intakes were extremely low at 448.5 mg and iron at 8.4 mg. Sodium intake was moderate (1.4 g) considering that this mean value only captures sodium in food items and not salt added at the table. Mean potassium and magnesium values fell above the requirements for health. The majority of nutrient adequacy ratios (NAR) fell below 100% with the exception of protein, zinc and magnesium. With regard to micronutrients (Table 8.3.2) vitamin D, folate and vitamin B6 had NARs less than 90%. The mean adequacy ratio (MAR) for this age group was 60.7%. The FFS was 7.4 and the DDS 4.5.

Table 8.3.3 presents data on the nutrient intakes of the 30-44-year-old group. They had a mean energy intake of 7224 kJ, carbohydrate intake of 243.6 g, fat intake of 45.9 g and a protein intake of 61.9 g. Calcium and iron intakes were very low (419.9 mg and 9.3 mg, respectively). As for the 15-29-year-old group, NARs indicated that energy, calcium and iron were deficient. Sodium intake (1.3 g) was similar to the youngest group. Mean potassium and magnesium values were above the requirements for health. The mean w6:w-3 ratio was lower than that in the 15-29-year-old group. Folate, vitamin D and vitamin B6 were the most deficient micronutrients (Table 8.3.4). Both FFS and DDS were lower than in the younger group at 6.8 and 4.1, respectively.

Women in the 45-59-year-old group had a mean kJ intake of 6808, carbohydrate intake of 232 g, fat intake of 41.9 g and a protein intake 59.3 g (Table 8.3.5). Cholesterol values were very low (183 mg) as were calcium (388.4 mg) and iron (8.9 mg). These were reflected by the low NARs for energy, calcium, and iron. Furthermore, many micronutrients appeared to be deficient in this age group, specifically, vitamin D, folate, niacin, riboflavin, and vitamin B6 which had less than optimal NARs (Table 8.3.6). A similar trend was observed in the 60+ age group (Table 8.3.7). They had a mean kJ intake of 6770, carbohydrate intake of 233.1 g, fat intake of 40.7 g and a protein intake of 57.9 g. Mean added sugar and sodium was lowest in this age group at 35.4 g and 957.4 mg respectively. Folate, vitamin E, and B6 were the most deficient micronutrients (Table 8.3.8).

Figures 8.3.1 and 8.3.2 and Tables 8.3.9 and 8.3.10 show the mean values of nutrients in South Africa for the overall sample. Mean energy intake is 7239 kJ, which provides a NAR of 78.9%. The confidence interval is low, indicating that there is not much variation around the mean value. Mean carbohydrate and protein intakes are 244.5 g and 61.1 g, respectively. A large proportion of the protein is in the form of animal protein. Mean fat intake is 46.6 g. Mean calcium and iron intakes are very low with NARs of 36.8% and 45.7% respectively. The w6:w3 ratio is high (26:1) due to the high intake of 18:2w-6 and the low intake of w-3 fatty acids. Mean cholesterol levels lie below 300 mg and the P:S ratio is 1.2. Vitamin D, folate, and vitamin B6 are the micronutrients having the lowest NAR values, namely 52.7%, 57.8% and 68.3% respectively. The MAR for the overall group is 59.9%. Food variety score is low at 7.0 and the mean DDS is 4.2. The latter

means that the average woman daily consumes 7 different items from 4 different food groups. Items such as tea, coffee, sugar, sweets are not counted.

There were many significant differences in macronutrient and micronutrient intakes between urban and rural areas of South Africa (Tables 8.3.11 & 8.3.12 and Figures 8.3.1 & 8.3.2). Rural women had a significantly higher mean carbohydrate intake (275.9 g vs. 217.4 g); plant protein intake (35.7 g vs. 22.5 g), fibre intake (20.9 g vs. 16.8 g), and magnesium intake (348.6 g vs. 229.4 mg). On the other hand, urban women had a significantly higher animal protein intake (40.1 g vs. 22.9 g), fat intake (59.8 g vs. 31.3 g), cholesterol intake (243.5 mg vs. 145.3 mg), added sugar (53.8 g vs. 26.4 g), sodium (1288.2 mg vs. 1084.5 mg) calcium (489.9 mg vs. 318.6 mg) and selenium intake (27.1 ug vs. 16.7 ug). With respect to vitamins, rural women had significantly higher folate, thiamine, and vitamin K intakes while urban women had significantly higher niacin, riboflavin, vitamin B6, vitamin C, vitamin D and vitamin E intakes.

The overall poor nutrient quality of the diet is also illustrated by Table 8.3.13. Folate, iron and calcium were the three nutrients which appeared to be the most deficient in the diet, with 71%, 81% and 83.8% women, respectively, having less than 67% of the RNIs. A large percentage (41.4%) also had a low energy intake.

Overall, the mean sodium intake of the subjects was moderate yet approaching the recommended maximum. For South Africa this amounted to 3200 mg salt plus 45% = 4669 mg salt) in urban areas and 2713 mg salt plus 45% = 4441 mg salt) in rural areas, adding 45% discretionary salt as recommended and calculated according to the method described in Charlton (30,31). This involves multiplying Na in mg by 2.5 and adding 45% for discretionary salt. The recommended salt intake is 5 g salt per day (8). Potassium intakes met the minimum requirement of 2000 mg for adult health, as did magnesium.

There were few significant differences in contribution of macronutrients to total energy intake when comparing women by age groups (Table 8.3.14; Figure 8.3.3). However, there were some significant urban-rural differences in this regard (Table 8.3.15; Figure 8.3.4). In urban areas the mean fat (29.1% vs. 15.6%), saturated fat (8.6% vs. 4.0%g), animal protein (9.2% vs. 5.1%) and sugar (12.6% vs. 6.7%) contributions were significantly higher than those in the rural areas. By contrast, carbohydrate (69.7% vs. 55.6%) and plant protein intake (8.4% vs. 5.3%) were significantly higher in rural areas.

Foods and beverages commonly consumed by South African women at different intervals of the day are presented in Tables 8.3.16-20. A number of items appear on most of the meal lists: tea, sugar, brown bread, maize porridge, full cream milk, potatoes, white bread, brick margarine, coffee, and rice. Meat (chicken) was eaten by only 20% of the group and mutton and beef by 15% and 13%, respectively, on the day of recall. Per capita consumption of fruit and vegetables amounted to 205 g per day. The snacks eaten between meals are similar to those of the meals except for the addition of cold drink. Table 8.3.21 provides the spreads commonly consumed as measured by 24-hour recalls. Hard (brick) margarine is by far the most common spread and was consumed by a third of the participants on the day of the recall. The daily portion of this margarine was 21.1 g, which is equivalent to about 4 teaspoons. This is supported by the data from the food procurement and inventory of the NFCS in Table 8.3.22 (Figure 8.3.5) which shows that 72% of subjects bought hard (brick) margarine (high saturated fat content) and 55% had it in their home larder. The 500 g brick margarine was most commonly purchased (Table 8.3.23).

Table 8.3.1: Mean energy, macronutrient and mineral intake of South African adult women (n=563) aged 15-29 years

| Nutrients | Mean | SD | 95% LCI | 95% UCI | WHO/FAO(29) |
|---|---|---|---|---|---|
| Energy (kJ) | 7764 | 3763 | 7452 | 8075 | 10 093 |
| CHO (g) | 258.3 | 112.3 | 249.0 | 267.6 | |
| Total protein(g) | 63.4 | 36.5 | 60.4 | 66.5 | 46 |
| Animal protein (g) | 34.8 | 32.1 | 32.2 | 37.5 | |
| Plant protein-(g) | 28.2 | 13.8 | 27.1 | 29.4 | |
| Total fat (g) | 53.5 | 44.7 | 49.8 | 57.2 | |
| MUFA (g) | 17.7 | 16.4 | 16.3 | 19.0 | |
| PUFA (g) | 13.7 | 10.8 | 12.8 | 14.6 | |
| SFA (g) | 15.1 | 13.8 | 14.0 | 16.2 | |
| P:S ratio | 1.3 | 1.0 | 1.2 | 1.4 | |
| Cholesterol-(mg) | 220.4 | 232.8 | 201.1 | 239.7 | <300 |
| Added sugar (g) | 48.2 | 51.6 | 43.9 | 52.5 | - |
| Fibre (g) | 18.2 | 10.2 | 17.3 | 19.0 | 25# |
| Calcium (mg) | 448.5 | 404.8 | 414.9 | 481.9 | 1000 |
| Iron (mg) | 8.4 | 5.0 | 8.0 | 8.9 | 29 |
| Zinc (mg) | 8.2 | 5.8 | 7.7 | 8.6 | 4.9 |
| Mg (mg) | 273.4 | 133.4 | 262.3 | 284.4 | 220 |
| Na (mg) | 1357.6 | 991.7 | 1275.5 | 1439.7 | 2000 (2g) |
| K (mg) | 2051.9 | 1186.3 | 1953.7 | 2150.1 | 2000& |
| Se (ug) | 24.5 | 27.1 | 22.2 | 26.7 | 26 |
| 18:3w3 (ALA) (g) | 0.4 | 0.3 | 0.4 | 0.4 | 1.6 |
| 20:5 w3 (EPA) (g) | 0.1 | 0.2 | 0.1 | 0.1 | |
| 22:6 w3 (DHA) (g) | 0.2 | 0.4 | 0.2 | 0.2 | |
| 18:2 w6 (LA) (g) | 12.6 | 10.5 | 11.7 | 13.5 | 10-12 |
| 20:4 w6 (AA) (g) | 0.1 | 0.1 | 0.1 | 0.1 | |
| W6:w3 ratio | 30.3 | 30.8 | 27.7 | 31.8 | |
| **NAR %** | | | | | |
| Energy | 86.4 | 42.5 | 82.9 | 89.9 | 100% |
| Total protein | 117.5 | 69.9 | 111.7 | 123.2 | 100% |
| Calcium | 40.0 | 35.0 | 37.1 | 42.9 | 100% |
| Iron | 28.3 | 16.9 | 26.9 | 29.7 | 100% |
| Zinc | 139.8 | 107.6 | 130.9 | 148.7 | 100% |
| Mg | 124.3 | 60.6 | 118.7 | 129.3 | 100% |
| Se | 94.1 | 104.2 | 85.5 | 102.8 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid); # Reference 10; & Reference 32

Table 8.3.2: Mean micronutrient intake and nutrient adequacy ratios of South African adult women (n=563) aged 15-29 years

| **Nutrients** | **Mean** | **SD** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Folate (ug) | 211.6 | 144.7 | 199.6 | 223.6 | 400 |
| Niacin (mg) | 13.4 | 8.5 | 12.7 | 14.1 | 14 |
| Riboflavin (mg) | 1.0 | 0.9 | 0.9 | 1.1 | 1.1 |
| Thiamine (mg) | 1.0 | 0.5 | 0.9 | 1.1 | 1.1 |
| Vitamin A (RE) | 561.9 | 1188.5 | 463.5 | 660.3 | 50 |
| Vitamin B6 (mg) | 1.0 | 0.7 | 0.9 | 1.1 | 1.3 |
| Vitamin C (mg) | 74.4 | 169.9 | 60.4 | 88.5 | 45 |
| Vitamin B12 (ug) | 5.1 | 10.0 | 4.2 | 5.9 | 2.4 |
| Vitamin E (mg) | 9.0 | 7.4 | 8.4 | 9.6 | 7.5 |
| Vitamin K (ug) | 143.5 | 478.6 | 103.9 | 183.1 | 55 |
| Vitamin D (ug) | 3.7 | 5.8 | 3.2 | 4.2 | 5.0 |
| **NAR values** | | | | | |
| Folate | 52.9 | 36.2 | 49.9 | 55.9 | 100% |
| Niacin | 90.7 | 58.4 | 85.8 | 95.5 | 100% |
| Riboflavin | 93.6 | 89.2 | 86.2 | 100.9 | 100% |
| Thiamine | 93.5 | 47.0 | 89.6 | 97.4 | 100% |
| Vitamin A | 103.1 | 215.2 | 85.3 | 120.9 | 100% |
| Vitamin B6 | 78.9 | 58.0 | 74.2 | 83.8 | 100% |
| Vitamin C | 175.1 | 401.6 | 141.8 | 208.3 | 100% |
| Vitamin B12 | 211.1 | 415.6 | 176.7 | 245.5 | 100% |
| Vitamin E | 120.0 | 98.6 | 111.8 | 128.1 | 100% |
| Vitamin K | 260.9 | 870.1 | 188.8 | 332.9 | 100% |
| Vitamin D (ug) | 74.4 | 116.3 | 64.8 | 84.0 | 100% |
| **MAR** | 60.7 | 19.5 | 59.2 | 62.4 | 100% |
| **FVS** | 7.4 | 3.9 | 7.1 | 7.7 | |
| **DDS** | 4.5 | 1.6 | 4.4 | 4.6 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score

Table 8.3.3: Mean energy, macronutrient and mineral intake of South African adult women (n=513) aged 30-44 years

| **Nutrients** | **Mean** | **SD** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Energy (kJ) | 7224 | 3558 | 6915 | 7533 | 10 093 |
| CHO (g) | 243.6 | 131.9 | 232.2 | 255.1 | |
| Total protein(g) | 61.9 | 36.0 | 58.8 | 65.0 | 46 |
| Animal protein (g) | 31.8 | 33.6 | 28.8 | 34.7 | |
| Plant protein-(g) | 29.8 | 20.7 | 28.0 | 31.6 | |
| Total fat (g) | 45.9 | 40.0 | 42.5 | 49.4 | |
| MUFA (g) | 15.9 | 15.1 | 14.6 | 17.2 | |
| PUFA (g) | 10.2 | 8.5 | 9.5 | 10.9 | |
| SFA (g) | 13.1 | 13.0 | 12.0 | 14.2 | |
| P:S ratio | 1.1 | 0.7 | 1.1 | 1.2 | |
| Cholesterol-(mg) | 204.1 | 233.8 | 257.1 | 316.5 | < 300 |
| Added sugar (g) | 39.0 | 39.3 | 35.6 | 42.5 | - |
| Fibre (g) | 19.5 | 12.4 | 18.4 | 20.5 | 25# |
| Calcium (mg) | 419.9 | 404.7 | 384.8 | 455.1 | 1000 |
| Iron (mg) | 9.3 | 6.5 | 8.8 | 9.9 | 29 |
| Zinc (mg) | 8.9 | 6.8 | 8.3 | 9.5 | 4.9 |
| Mg (mg) | 300.8 | 197.4 | 283.7 | 318.0 | 220 |
| Na (mg) | 1256.5 | 1106.4 | 1160.5 | 1352.5 | 2000 (2g) |
| K (mg) | 2067.1 | 1193.8 | 1963.5 | 2170.6 | 2000& |
| Se (ug) | 24.8 | 44.8 | 21.0 | 28.7 | 26 |
| 18:3 w3 (ALA)(g) | 0.4 | 0.3 | 0.4 | 0.4 | 1.6 |
| 20:5 w3 (EPA)(g) | 0.04 | 0.1 | 0.03 | 0.1 | |
| 22:6 w3 (DHA)(g) | 0.1 | 0.3 | 0.01 | 0.1 | |
| 18:2 w6 (LA)(g) | 9.3 | 8.2 | 8.6 | 10.0 | 10-12 |
| 20:4 w6 (AA)(g) | 0.1 | 0.1 | 0.01 | 0.1 | |
| W6:w3 ratio | 23.6 | 23.4 | 21.5 | 25.6 | |
| **NAR %** | | | | | |
| Energy | 77.8 | 38.3 | 74.5 | 81.2 | 100% |
| Total protein | 126.3 | 73.5 | 119.9 | 132.7 | 100% |
| Calcium | 42.0 | 40.5 | 38.5 | 45.5 | 100% |
| Iron | 32.3 | 22.5 | 30.3 | 34.2 | 100% |
| Zinc | 181.5 | 138.1 | 169.5 | 193.4 | 100% |
| Mg | 136.7 | 89.7 | 128.9 | 144.5 | 100% |
| Se | 95.6 | 172.4 | 80.5 | 110.5 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid);# Reference 10; & Reference 32

Table 8.3.4: Mean micronutrient intake and nutrient adequacy ratios of South African adult women (n=513) aged 30-44 years

| **Nutrients** | **Mean** | **SD** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Folate (ug) | 262.6 | 218.1 | 243.7 | 281.5 | 400 |
| Niacin (mg) | 12.6 | 8.5 | 11.9 | 13.3 | 14 |
| Riboflavin (mg) | 0.9 | 0.8 | 0.8 | 0.9` | 1.1 |
| Thiamine (mg) | 1.0 | 0.6 | 0.9 | 1.0 | 1.1 |
| Vitamin A (RE) | 803.8 | 1368.2 | 685.1 | 922.5 | 500 |
| Vitamin B6 (mg) | 0.9 | 0.5 | 0.8 | 0.9 | 1.3 |
| Vitamin C (mg) | 53.5 | 89.9 | 45.7 | 61.3 | 45 |
| Vitamin B12 (ug) | 4.1 | 10.0 | 3.2 | 5.0 | 2.4 |
| Vitamin E (mg) | 6.5 | 6.6 | 5.9 | 7.0 | 7.5 |
| Vitamin K (ug) | 312.0 | 1487.2 | 182.9 | 440.9 | 55 |
| Vitamin D (ug) | 2.5 | 3.9 | 2.1 | 2.8 | 5.0 |
| **NAR values** | | | | | |
| Folate | 65.6 | 54.5 | 60.9 | 70.4 | 100% |
| Niacin | 90.1 | 60.5 | 84.8 | 95.4 | 100% |
| Riboflavin | 81.9 | 70.0 | 75.8 | 87.9 | 100% |
| Thiamine | 90.7 | 52.3 | 86.1 | 95.2 | 100% |
| Vitamin A | 160.7 | 273.6 | 137.0 | 184.5 | 100% |
| Vitamin B6 | 66.6 | 42.1 | 62.9 | 70.3 | 100% |
| Vitamin C | 118.9 | 199.9 | 101.5 | 136.2 | 100% |
| Vitamin B12 | 171.8 | 418.1 | 135.5 | 208.1 | 100% |
| Vitamin E | 86.3 | 87.5 | 78.7 | 93.8 | 100% |
| Vitamin K | 567.1 | 2704.1 | 332.5 | 801.7 | 100% |
| Vitamin D | 49.5 | 77.9 | 42.8 | 56.3 | 100% |
| **MAR** | 60.5 | 20.5 | 58.7 | 62.2 | 100% |
| **FVS** | 6.8 | 3.9 | 6.4 | 7.1 | |
| **DDS** | 4.1 | 1.8 | 3.9 | 4.2 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score

Table 8.3.5: Mean energy, macronutrient and mineral intake of South African adult women (n=404) aged 45-59 years

| Nutrients | Mean | SD | 95%LCI | 95%UCI | WHO/FAO (29) |
|---|---|---|---|---|---|
| Energy (kJ) | 6808 | 3771 | 6439 | 7177 | 10 093 |
| CHO (g) | 232.0 | 150.7 | 217.0 | 247.0 | |
| Total protein(g) | 59.3 | 32.9 | 56.2 | 63.4 | 46 |
| Animal protein (g) | 31.0 | 27.4 | 28.2 | 34.5 | |
| Plant protein-(g) | 28.1 | 23.2 | 26.4 | 30.6 | |
| Total fat (g) | 41.9 | 34.0 | 39.3 | 45.3 | |
| MUFA (g) | 14.3 | 13.3 | 13.1 | 16.6 | |
| PUFA (g) | 9.3 | 8.0 | 9.0 | 10.6 | |
| SFA (g) | 12.3 | 11.3 | 11.0 | 13.3 | |
| P:S ratio | 1.0 | 0.8 | 0.9 | 1.1 | |
| Cholesterol-(mg) | 183.0 | 174.4 | 165.9 | 200.0 | < 300 |
| Added sugar (g) | 38.9 | 50.6 | 34.0 | 43.9 | - |
| Fibre (g) | 18.0 | 15.2 | 16.5 | 19.5 | 25# |
| Calcium (mg) | 388.4 | 363.5 | 353.2 | 424 | 1000 |
| Iron (mg) | 8.9 | 6.6 | 8.2 | 9.5 | 29 |
| Zinc (mg) | 8.4 | 5.7 | 7.8 | 8.9 | 4.9 |
| Mg (mg) | 274.6 | 191.9 | 255.8 | 293.3 | 220 |
| Na (mg) | 1069.1 | 915.5 | 979.5 | 1158.7 | 2000 (2 g) |
| K (mg) | 1961.2 | 1208.3 | 1843.0 | 2079.4 | 2000& |
| Se (ug) | 20.3 | 26.6 | 17.7 | 22.9 | 26 |
| 18:3 w3 (ALA)(g) | 0.4 | 0.3 | 0.3 | 0.4 | 1.6 |
| 20:5 w3 (EPA))(g) | 0.03 | 0.1 | 0.02 | 0.03 | |
| 22:6 w3 (DHA)(g) | 0.1 | 0.2 | 0.1 | 0.1 | |
| 18:2 w6 (LA)(g) | 8.6 | 7.8 | 7.8 | 9.3 | 10-12 |
| 20:4 w6 (AA)(g) | 0.1 | 0.1 | 0.1 | 0.1 | |
| W6:w3 ratio | 24.1 | 18.7 | 22.2 | 25.9 | |
| **NAR %** | | | | | |
| Energy | 73.3 | 40.6 | 69.4 | 77.3 | 100% |
| Total protein | 120.9 | 67.2 | 114.3 | 127.5 | 100% |
| Calcium | 32.9 | 30.8 | 29.9 | 35.9 | 100% |
| Iron | 63.7 | 53.6 | 58.5 | 68.9 | 100% |
| Zinc | 170.6 | 116.2 | 159.2 | 181.9 | 100% |
| Mg | 124.7 | 87.2 | 116.2 | 133.3 | 100% |
| Se | 78.0 | 102.5 | 68.0 | 88.0 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid); # Reference 10; & Reference 32

Table 8.3.6: Mean micronutrient intake and nutrient adequacy ratios of South African adult women (n=404) aged 45-59 years

| **Nutrients** | **Mean** | **SD** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Folate (ug) | 230.8 | 251.8 | 206.2 | 255.4 | 400 |
| Niacin (mg) | 10.8 | 7.8 | 10.1 | 11.6 | 14 |
| Riboflavin (mg) | 0.8 | 0.7 | 0.1 | 0.9 | 1.1 |
| Thiamine (mg) | 1.0 | 0.7 | 0.9 | 1.0 | 1.1 |
| Vitamin A (RE) | 630.8 | 1336.9 | 500.0 | 761.6 | 500 |
| Vitamin B6 (mg) | 0.8 | 0.6 | 0.8 | 0.9 | 1.3 |
| Vitamin C (mg) | 47.0 | 98.8 | 37.4 | 56.7 | 45 |
| Vitamin B12 (ug) | 3.5 | 10.3 | 2.5 | 4.5 | 2.4 |
| Vitamin E (mg) | 6.2 | 6.5 | 5.5 | 6.8 | 7.5 |
| Vitamin K (ug) | 173.5 | 700.8 | 104.9 | 242.1 | 55 |
| Vitamin D (ug) | 1.8 | 3.2 | 1.5 | 2.1 | 5.0 |
| **NAR values** | | | | | |
| Folate | 57.7 | 62.9 | 51.5 | 63.9 | 100% |
| Niacin | 77.3 | 55.4 | 71.9 | 82.7 | 100% |
| Riboflavin | 76.8 | 68.0 | 70.2 | 83.5 | 100% |
| Thiamine | 86.9 | 59.2 | 81.1 | 92.7 | 100% |
| Vitamin A | 126.2 | 267.4 | 100.0 | 152.3 | 100% |
| Vitamin B6 | 58.9 | 42.3 | 54.8 | 63.1 | 100% |
| Vitamin C | 104.5 | 219.5 | 83.0 | 125.9 | 100% |
| Vitamin B12 | 146.4 | 430.9 | 104.2 | 188.5 | 100% |
| Vitamin E | 82.4 | 86.4 | 73.9 | 90.8 | 100% |
| Vitamin K | 315.5 | 1274.1 | 190.8 | 440.1 | 100% |
| Vitamin D | 36.4 | 63.6 | 30.1 | 42.6 | 100% |
| **MAR** | 57.8 | 20.7 | 55.8 | 59.8 | 100% |
| **FVS** | 6.7 | 3.9 | 6.3 | 7.1 | |
| **DDS** | 4.1 | 1.9 | 3.9 | 4.2 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score

Table 8.3.7: Mean energy, macronutrient and mineral intake of South African adult women (n=246) aged 60+ years

| Nutrients | Mean | SD | 95%LCI | 95%UCI | WHO/FAO (29) |
|---|---|---|---|---|---|
| Energy (kJ) | 6770 | 2977 | 6396 | 7144 | 10 093 |
| CHO (g) | 233.1 | 97.2 | 221.0 | 245.2 | 46 |
| Total protein(g) | 57.9 | 33.1 | 54.4 | 62.8 | |
| Animal protein (g) | 30.4 | 29.5 | 27.3 | 34.3 | |
| Plant protein-(g) | 27.3 | 14.0 | 26.0 | 29.5 | |
| Total fat (g) | 40.7 | 34.9 | 36.6 | 45.4 | |
| MUFA (g) | 14.2 | 13.5 | 13.8 | 16.3 | |
| PUFA (g) | 9.4 | 8.2 | 8.3 | 10.1 | |
| SFA (g) | 11.5 | 11.0 | 10.0 | 13.1 | |
| P:S ratio | 1.2 | 0.8 | 1.1 | 1.3 | |
| Cholesterol-(mg) | 169.4 | 198.4 | 144.5 | 194.3 | <300 |
| Added sugar (g) | 35.4 | 34.1 | 31.1 | 39.7 | - |
| Fibre (g) | 18.5 | 10.5 | 17.2 | 19.9 | 25# |
| Calcium (mg) | 372.9 | 356.4 | 328.1 | 417.7 | 1000 |
| Iron (mg) | 8.5 | 5.4 | 7.7 | 9.1 | 11 |
| Zinc (mg) | 7.9 | 5.0 | 7.3 | 8.5 | 4.9 |
| Mg (mg) | 285.0 | 150.1 | 266.2 | 303.9 | 220 |
| Na (mg) | 957.4 | 820.5 | 854.4 | 1060.5 | 2000 (2g) |
| K (mg) | 2035.9 | 1119.7 | 1895.2 | 2176.5 | 2000& |
| Se (ug) | 16.5 | 21.7 | 13.8 | 19.2 | 26 |
| 18:3 w3 (ALA)(g) | 0.4 | 0.3 | 0.3 | 0.4 | 1.6 |
| 20:5 w3 (EPA)(g) | 0.04 | 0.2 | 0.01 | 0.1 | |
| 22:6 w3 (DHA)(g) | 0.1 | 0.2 | 0.1 | 0.1 | |
| 18:2 w6 (LA)(g) | 8.6 | 7.8 | 7.6 | 9.6 | 10-12 |
| 20:4 w6 (AA)(g) | 0.1 | 0.1 | 0.1 | 0.1 | |
| W6:w3 ratio | 21.8 | 16.9 | 19.7 | 24.0 | |
| **NAR %** | | | | | |
| Energy | 72.9 | 32.1 | 69 | 76.9 | 100% |
| Total protein | 118.2 | 67.4 | 109.7 | 126.7 | 100% |
| Calcium | 28.7 | 27.4 | 25.2 | 32.1 | 100% |
| Iron | 76.8 | 48.7 | 70.7 | 82.9 | 100% |
| Zinc | 161.4 | 102.9 | 148.5 | 174.3 | 100% |
| Mg | 129.6 | 68.2 | 120.9 | 138.1 | 100% |
| Se | 63.5 | 83.3 | 56.0 | 73.9 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid); #Reference 10; & Reference 32

Table 8.3.8: Mean micronutrient intake and nutrient adequacy ratios (NARs) of South African adult women (n=246) aged 60+ years

| **Nutrients** | **Mean** | **SD** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Folate (ug) | 208.4 | 139.3 | 190.8 | 225.9 | 400 |
| Niacin (mg) | 12.7 | 9.4 | 11.5 | 13.8 | 14 |
| Riboflavin (mg) | 0.9 | 1.1 | 0.7 | 1.1 | 1.1 |
| Thiamine (mg) | 1.0 | 0.6 | 0.8 | 1.0 | 1.1 |
| Vitamin A (RE) | 1054.1 | 2713.2 | 713.2 | 1394.9 | 500 |
| Vitamin B6 (mg) | 0.9 | 0.6 | 0.8 | 0.9 | 1.5 |
| Vitamin C (mg) | 54.9 | 127.2 | 38.9 | 70.9 | 45 |
| Vitamin B12 (mg) | 6.4 | 24.8 | 3.2 | 9.5 | 2.4 |
| Vitamin E (mg) | 6.0 | 6.4 | 5.1 | 6.8 | 7.5 |
| Vitamin K (ug) | 238.7 | 790.7 | 139.4 | 338.0 | 55 |
| Vitamin D (ug) | 2.0 | 3.8 | 1.5 | 2.5 | 5.0 |
| **NAR values** | | | | | |
| Folate | 52.1 | 34.8 | 47.7 | 56.5 | 100% |
| Niacin | 90.4 | 67.2 | 81.9 | 98.8 | 100% |
| Riboflavin | 84.3 | 102.0 | 71.4 | 97.1 | 100% |
| Thiamine | 87.2 | 48.0 | 81.2 | 93.3 | 100% |
| Vitamin A | 185.4 | 459.8 | 127.6 | 243.1 | 100% |
| Vitamin B6 | 61.1 | 41.3 | 55.9 | 66.3 | 100% |
| Vitamin C | 122.0 | 282.7 | 86.5 | 157.5 | 100% |
| Vitamin B12 | 264.7 | 1034.5 | 134.7 | 394.6 | 100% |
| Vitamin E | 79.3 | 85.7 | 68.6 | 90.1 | 100% |
| Vitamin K | 434.0 | 1437.6 | 253.4 | 614.6 | 100% |
| Vitamin D | 40.4 | 76.3 | 30.8 | 49.9 | 100% |
| **MAR** | 59.6 | 19.7 | 57.2 | 62.1 | 100% |
| **FVS** | 6.8 | 4.0 | 6.3 | 7.4 | |
| **DDS** | 4.1 | 1.8 | 3.9 | 4.4 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score

Table 8.3.9: Mean energy, macronutrient and mineral intake of South African adult women (n=1726)

| Nutrients | Mean | SD | 95%LCI | 95%UCI | WHO/FAO(29) |
|---|---|---|---|---|---|
| Energy (kJ) | 7239 | 3527 | 7073 | 7406 | 10 093 |
| CHO (g) | 244.5 | 122.4 | 239 | 250 | |
| Total protein(g) | 61.1 | 34.8 | 60 | 63 | 46 |
| Animal protein (g) | 32.1 | 31.1 | 31 | 34 | |
| Plant protein-(g) | 28.6 | 17.9 | 28 | 30 | |
| Total fat (g) | 46.6 | 39.5 | 45 | 49 | |
| MUFA (g) | 15.9 | 14.8 | 15 | 17 | |
| PUFA (g) | 11.1 | 9.3 | 11 | 12 | |
| SFA (g) | 13.2 | 12.5 | 13 | 14 | |
| P:S ratio | 1.2 | 0.8 | 1.1 | 1.2 | |
| Cholesterol-(mg) | 197.9 | 217.8 | 187.6 | 208.1 | <300 |
| Added sugar (g) | 41.1 | 44.7 | 38.9 | 43.2 | - |
| Fibre (g) | 18.7 | 11.9 | 18.2 | 19.3 | 25# |
| Calcium (mg) | 410.3 | 384.9 | 392.2 | 428.5 | 1000 |
| Iron (mg) | 8.8 | 5.8 | 8.5 | 9.1 | 11 |
| Zinc (mg) | 8.4 | 5.9 | 8.1 | 8.6 | 4.9 |
| Mg (mg) | 284.5 | 167.9 | 276.6 | 292.5 | 220 |
| Na (mg) | 1193.4 | 990.0 | 1146.6 | 1240.1 | 2000 (2g) |
| K (mg) | 2038.1 | 1165.3 | 1983.1 | 2093.2 | 2000& |
| Se (ug) | 22.3 | 32.7 | 20.7 | 23.8 | 26 |
| 18:3 w3 (ALA)(g) | 0.4 | 0.3 | 0.4 | 0.4 | 1.6 |
| 20:5 w3 (EPA))(g) | 0.1 | 0.2 | 0.04 | 0.1 | |
| 22:6 w3 (DHA)(g) | 0.1 | 0.3 | 0.1 | 0.1 | |
| 18:2 w6 (LA)(g) | 10.1 | 8.9 | 9.7 | 10.5 | 10-12 |
| 20:4 w6 (AA)(g) | 0.1 | 0.1 | 0.1 | 0.1 | |
| W6:w3 ratio | 25.8 | 25.2 | 24.6 | 27.0 | |
| **NAR %** | | | | | |
| Energy | 78.9 | 38.8 | 77.0 | 80.7 | 100% |
| Total protein | 120.9 | 69.5 | 117.7 | 124.2 | 100% |
| Calcium | 36.8 | 34.7 | 35.1 | 38.4 | 100% |
| Iron | 45.7 | 40.5 | 43.8 | 47.6 | 100% |
| Zinc | 162.2 | 118.6 | 156.6 | 167.8 | 100% |
| Mg | 129.3 | 76.3 | 125.7 | 132.9 | 100% |
| Se | 85.7 | 125.9 | 79.5 | 91.6 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid); # Reference 10; Reference 32

Table 8.3.10: Mean micronutrient intake and nutrient adequacy ratios of South African women (n=1726)

| | Women | | | | |
|---|---|---|---|---|---|
| **Nutrients** | **Mean** | **SD** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
| Folate (ug) | 231.4 | 190.6 | 222.4 | 240.4 | 400 |
| Niacin (mg) | 12.6 | 8.5 | 12.2 | 12.9 | 14 |
| Riboflavin (mg) | 0.9 | 0.9 | 0.9 | 0.9 | 1.1 |
| Thiamine (mg) | 0.9 | 0.6 | 0.9 | 1.0 | 1.1 |
| Vitamin A (RE) | 759.2 | 1764.2 | 675.9 | 842.5 | 500 |
| Vitamin B6 (mg) | 0.9 | 0.6 | 0.9 | 0.9 | 1.3 |
| Vitamin C (mg) | 59.1 | 127.7 | 53.1 | 65.1 | 45 |
| Vitamin B12 (ug) | 4.8 | 15.2 | 4.1 | 5.6 | 2.4 |
| Vitamin E (mg) | 7.1 | 6.9 | 6.8 | 7.4 | 7.5 |
| Vitamin K (ug) | 221.5 | 983.1 | 175.1 | 267.9 | 55 |
| Vitamin D (ug) | 2.6 | 4.5 | 2.4 | 2.8 | 5.0 |
| **NAR values** | | | | | |
| Folate | 57.8 | 47.7 | 55.6 | 60.1 | 100% |
| Niacin | 88.2 | 59.9 | 85.4 | 91.0 | 100% |
| Riboflavin | 84.9 | 83.9 | 81.0 | 88.9 | 100% |
| Thiamine | 90.3 | 50.7 | 87.9 | 92.7 | 100% |
| Vitamin A | 143.5 | 318.3 | 128.5 | 158.6 | 100% |
| Vitamin B6 | 68.3 | 47.7 | 66.0 | | 100% |
| Vitamin C | 134.3 | 294.0 | 120.4 | 148.2 | 100% |
| Vitamin B12 | 201.5 | 631.1 | 171.7 | 231.3 | 100% |
| Vitamin E | 95.0 | 92.1 | 90.6 | 99.4 | 100% |
| Vitamin K | 402.7 | 1787.5 | 318.3 | 487.1 | 100% |
| Vitamin D | 52.7 | 89.6 | 48.5 | 56.9 | 100% |
| **MAR** | 59.9 | 19.9 | 59.0 | 60.9 | 100% |
| **FVS** | 7.0 | 3.9 | 6.8 | 71.1 | |
| **DDS** | 4.2 | 1.7 | 4.1 | 4.3 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score

Table 8.3.11: Mean energy, macronutrient and mineral intake of South African adult women by urban and rural distribution

| | URBAN (n=1196) | | | | RURAL (n=530) | | | |
|---|---|---|---|---|---|---|---|---|
| **Nutrients** | **Mean** | **SD** | **95%LC** | **95%UC** | **Mean** | **SD** | **95%L CI** | **95%UCI** |
| Energy (kJ) | 7269 | 3766 | 7056 | 7483 | 7207 | 3237 | 6931 | 7484 |
| CHO (g)* | 217.4 | 111.0 | 211 | 224 | 275.9 | 127.6 | 265.0 | 286.8 |
| Total protein(g)+ | 63.2 | 37.7 | 61 | 65 | 58.7 | 31.0 | 56.0 | 61.3 |
| Animal protein (g)* | 40.1 | 33.4 | 38 | 42 | 22.9 | 25.4 | 20.9 | 25.1 |
| Plant protein-(g)* | 22.5 | 13.5 | 22 | 23 | 35.7 | 19.7 | 33.9 | 37.4 |
| Total fat (g)* | 59.8 | 44.2 | 57 | 62 | 31.3 | 26.0 | 29.1 | 33.5 |
| MUFA (g)* | 20.8 | 16.6 | 20 | 22 | 10.2 | 9.8 | 9.3 | 11.0 |
| PUFA (g)* | 13.1 | 10.9 | 12 | 14 | 8.7 | 6.3 | 8.2 | 9.3 |
| SFA (g)* | 17.6 | 13.9 | 17 | 18 | 8.2 | 8.4 | 7.5 | 8.9 |
| P:S ratio* | 0.9 | 0.7 | 0.1 | 0.9 | 1.5 | 0.9 | 1.4 | 1.6 |
| Cholesterol-(mg)* | 243.5 | 227.3 | 230.6 | 256.4 | 145.3 | 193.8 | 128.7 | 161.8 |
| Added sugar (g)* | 53.8 | 48.5 | 51.0 | 56.5 | 26.4 | 34.5 | 23.4 | 29.3 |
| Fibre (g)* | 16.8 | 11.4 | 16.2 | 17.5 | 20.9 | 12.1 | 19.9 | 21.9 |
| Calcium (mg)* | 489.9 | 411.7 | 466.6 | 513.3 | 318.6 | 329.2 | 290.5 | 346.7 |
| Iron (mg) | 8.7 | 5.6 | 8.4 | 9.0 | 9.0 | 6.1 | 8.4 | 9.5 |
| Zinc (mg)* | 8.9 | 6.6 | 8.5 | 9.3 | 7.7 | 4.9 | 7.3 | 8.2 |
| Mg (mg)* | 229.4 | 121.8 | 222.4 | 263.3 | 348.6 | 190.2 | 332.3 | 364.8 |
| Na (mg)* | 1288.2 | 1001.9 | 1231.4 | 1345.1 | 1084.5 | 967.2 | 1001.9 | 1167.0 |
| K (mg)* | 2132.2 | 1239.8 | 2061.9 | 2202.5 | 1930.8 | 1065.3 | 1839.9 | 2021.7 |
| Se (ug)* | 27.1 | 27.9 | 25.5 | 28.7 | 16.7 | 36.9 | 13.5 | 19.8 |
| 18:3 w3 (ALA)(g) | 0.4 | 0.4 | 0.4 | 0.5 | 0.3 | 0.2 | 0.3 | 0.3 |
| 20:5 w3* (EPA)(g) | 0.04 | 0.1 | 0.03 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 |
| 22:6 w3 (DHA)(g) | 0.1 | 0.3 | 0.1 | 0.1 | 0.1 | 0.3 | 0.1 | 0.2 |
| 18:2 w6* (LA)(g) | 11.9 | 10.6 | 11.3 | 12.5 | 8.1 | 6.0 | 7.5 | 8.6 |
| 20:4 w6 (AA) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| W6:w3 ratio* | 27.4 | 29.8 | 25.7 | 29.1 | 23.9 | 18.3 | 22.3 | 25.5 |
| **NAR %** | | | | | | | | |
| Energy | 79.2 | 41.7 | 76.9 | 81.6 | 78.5 | 35.2 | 75.5 | 81.5 |
| Total protein | 125.3 | 75.2 | 121.0 | 129.5 | 116.0 | 62.1 | 110.7 | 121.3 |
| Calcium | 43.8 | 36.2 | 41.8 | 45.9 | 28.6 | 30.9 | 26.0 | 31.3 |
| Iron | 43.4 | 39.3 | 41.2 | 45.7 | 48.3 | 41.7 | 44.8 | 51.9 |
| Zinc | 172.9 | 132.8 | 165.4 | 180.5 | 149.9 | 98.5 | 141.5 | 158.3 |
| Mg | 104.3 | 55.4 | 101.1 | 107.4 | 158.4 | 86.4 | 151.1 | 165.8 |
| Se | 104.3 | 107.1 | 98.2 | 110.3 | 64.1 | 141.9 | 52.0 | 76.2 |

+ p<0.05; * p<0.01 (Independent t-test) significant urban-rural differences
LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid)

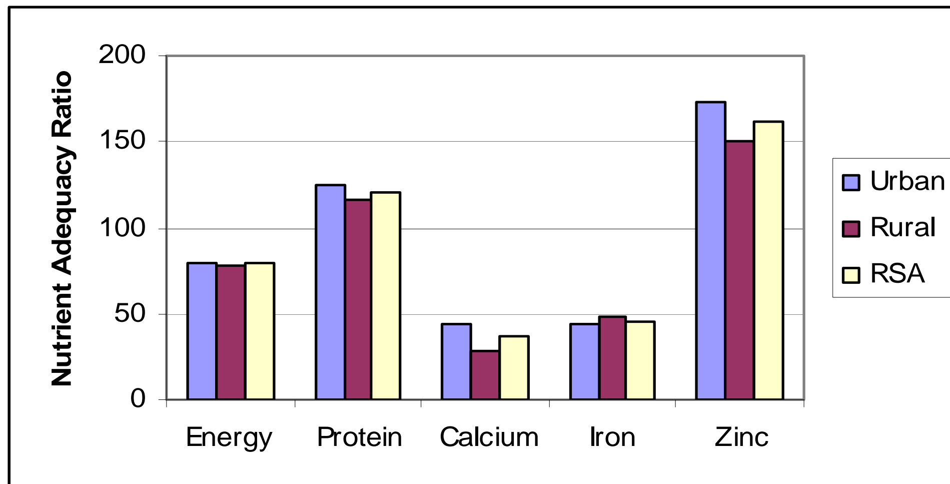


Figure 8.3.1: Nutrient adequacy ratios of macronutrient intake of South African (RSA) women

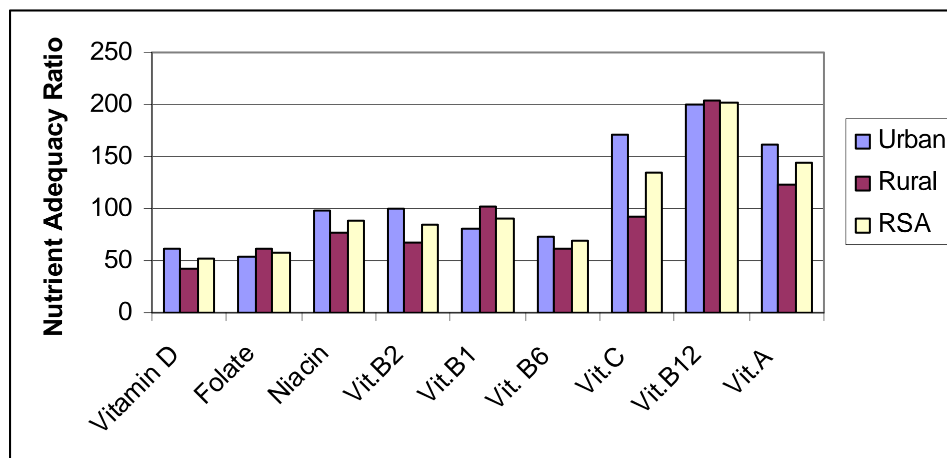


Figure 8.3.2: Nutrient adequacy ratios of micronutrient intake of South African (RSA) women

Table 8.3.12: Mean micronutrient intake and nutrient adequacy ratios of South African adult women (n=1726) by urban and rural distribution

| | URBAN (n=1196) | | | | RURAL (n=530) | | | |
|---|---|---|---|---|---|---|---|---|
| **Nutrients** | **Mean** | **SD** | **95%LCI** | **95%UCI** | **Mean** | **SD** | **95%LCI** | **95%UCI** |
| Folate (ug)* | 217.6 | 170.1 | 207.9 | 227.2 | 247.4 | 211.0 | 229.4 | 265.4 |
| Niacin (mg)* | 13.9 | 9.4 | 13.4 | 14.4 | 10.9 | 6.9 | 10.4 | 11.6 |
| Riboflavin (mg)* | 1.1 | 0.9 | 1.0 | 1.1 | 0.7 | 0.8 | 0.7 | 0.8 |
| Thiamine (mg)* | 0.9 | 0.6 | 0.9 | 0.9 | 1.1 | 0.5 | 1.1 | 1.2 |
| Vitamin A (RE) | 834.8 | 1495 | 749.9 | 919.7 | 672.5 | 2030.9 | 499.2 | 845.8 |
| Vitamin B6 (mg)* | 0.9 | 0.7 | 0.9 | 1.0 | 0.8 | 0.5 | 0.8 | 0.9 |
| Vitamin C (mg)* | 75.1 | 158.6 | 66.1 | 84.1 | 40.6 | 74.0 | 34.3 | 46.9 |
| Vitamin B12 (ug) | 4.8 | 11.9 | 4.1 | 5.5 | 4.9 | 18.2 | 3.3 | 6.4 |
| Vitamin E (mg)* | 8.5 | 7.8 | 8.1 | 8.9 | 5.5 | 5.3 | 5.1 | 5.9 |
| Vitamin K (ug)* | 221.5 | 983.1 | 210.4 | 280.3 | 423.7 | 1416.1 | 332.3 | 544.6 |
| Vitamin D (ug) | 3.1 | 4.3 | 2.8 | 3.3 | 2.1 | 4.7 | 1.7 | 2.5 |
| **NAR values** | | | | | | | | |
| Folate | 54.4 | 42.5 | 51.9 | 56.8 | 61.8 | 52.8 | 57.3 | 66.3 |
| Niacin | 97.8 | 66.4 | 94.0 | 101.6 | 77.1 | 49.2 | 72.9 | 81.3 |
| Riboflavin | 100.1 | 90.3 | 95 | 105.3 | 67.6 | 72.1 | 61.4 | 73.7 |
| Thiamine | 80.4 | 51.3 | 77.5 | 83.3 | 101.8 | 47.5 | 97.8 | 105.9 |
| Vitamin A | 160.9 | 289.3 | 144.5 | 177.3 | 123.6 | 348.4 | 93.9 | 153.3 |
| Vitamin B6 | 73.7 | 52.8 | 70.7 | 76.7 | 61.9 | 40.1 | 58.5 | 65.4 |
| Vitamin C | 171.1 | 366.5 | 150.3 | 191.9 | 91.8 | 167.4 | 77.6 | 106.1 |
| Vitamin B12 | 199.9 | 496.4 | 171.8 | 228.1 | 203.6 | 758.8 | 138.8 | 268.3 |
| Vitamin E | 113.5 | 103.8 | 107.6 | 119.4 | 73.6 | 70.6 | 67.6 | 79.6 |
| Vitamin K | 85.5 | 161.7 | 76.3 | 94.7 | 770.4 | 2574.7 | 550.7 | 990.1 |
| Vitamin D | 61.5 | 85.4 | 56.6 | 66.3 | 42.6 | 93.4 | 34.6 | 50.6 |
| **MAR** | 63.4 | 20.3 | 62.3 | 64.6 | 55.9 | 18.8 | 54.4 | 57.6 |
| **FVS** | 8.7 | 4.0 | 8.5 | 8.9 | 4.9 | 2.7 | 4.7 | 5.2 |
| **DDS** | 5.0 | 1.6 | 4.9 | 5.1 | 3.3 | 1.4 | 3.2 | 3.4 |

+ $p<0.05$; * $p<0.01$ (Independent t-test) significant urban-rural differences; LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score

Table 8.3.13: Percent adults with nutrient intakes less than 67% of the recommended nutrient intakes by area

| | Urban (n=1196) | Rural (n=530) | South Africa (n=1726) |
|---|---|---|---|
| **Nutrients < 67%** | | | |
| Energy (kJ) | 44.4 | 37.8 | 41.4 |
| Total protein(g) | 18.4 | 20.1 | 19.2 |
| Calcium (mg) | 79.4 | 89.0 | 83.8 |
| Iron (mg) | 82.3 | 79.4 | 81.0 |
| Zinc (mg) | 13.1 | 10.6 | 11.9 |
| Mg (mg) | 24.9 | 6.7 | 15.8 |
| Se (ug) | 47.4 | 72.4 | 59.9 |
| Folate (ug) | 73.5 | 69.2 | 71.5 |
| Niacin (mg) | 35.6 | 49.7 | 42.2 |
| Riboflavin (mg) | 40.4 | 65.8 | 52.2 |
| Thiamine (mg) | 47.7 | 21.9 | 35.7 |
| Vitamin A (RE) | 52.4 | 71.4 | 61.2 |
| Vitamin B6 (mg) | 54.3 | 67.1 | 60.3 |
| Vitamin C (mg) | 43.4 | 61.2 | 51.7 |
| Vitamin B12(mg) | 35.4 | 55.2 | 44.6 |
| Vitamin E (mg) | 41.5 | 59.0 | 50.2 |
| Vitamin K (ug) | 65.8 | 63.4 | 64.6 |
| Vitamin D (ug) | 69.8 | 80.2 | 74.6 |

Table 8.3.14: Mean macronutrient distribution of South African adult women (n=1726) by age group

| | 15-29 years | | 30-44 years | | 45-59 years | | 60+ years | |
|---|---|---|---|---|---|---|---|---|
| **Nutrients** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** |
| Protein % E | 13.5 | 4.2 | 14.1 | 4.8 | 15.1 | 5.2 | 14.2 | 4.5 |
| An. Protein % E | 7.2 | 5.3 | 7.2 | 6.2 | 7.9 | 6.5 | 7.2 | 5.7 |
| Pl. protein % E | 6.3 | 2.3 | 6.9 | 3.1 | 7.1 | 3.8 | 6.9 | 2.8 |
| CHO % E | 61.2 | 12.2 | 62.6 | 15.5 | 61.3 | 14.7 | 63.6 | 13.9 |
| Added sugar % E | 10.4 | 9.1 | 10.4 | 12.2 | 8.8 | 8.1 | 9.3 | 8.1 |
| Fat % E | 24.4 | 10.9 | 22.4 | 13.2 | 22.8 | 12.5 | 21.3 | 11.9 |
| MUFA % E | 7.9 | 4.4 | 7.6 | 5.2 | 7.7 | 5.2 | 7.3 | 4.8 |
| PUFA % E | 6.5 | 3.6 | 5.1 | 3.4 | 4.9 | 3.2 | 5.0 | 3.2 |
| SFA % E | 6.7 | 3.7 | 6.3 | 4.4 | 6.6 | 4.6 | 6.1 | 4.1 |

CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids

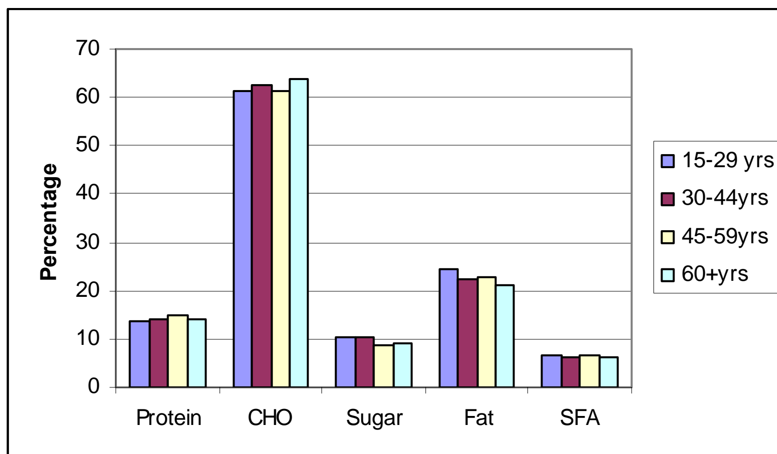


Figure: 8.3.3: Macronutrient distribution of South African adult women (n=1726) by age group

Table 8.3.15: Mean percent contribution of nutrients to energy intake of adult females by urban/rural distribution

| | **South Africa (N=1726)** | | **Urban (N=1196)** | | **Rural (N=530)** | |
|---|---|---|---|---|---|---|
| | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** |
| Protein % E | 14.1 | 4.6 | 14.6 | 5.0 | 13.5 | 4.1 |
| An. Protein % E | 7.3 | 5.9 | 9.2 | 5.9 | 5.1 | 5.1 |
| Pl. protein % E | 6.7 | 3.0 | 5.3 | 2.3 | 8.4 | 2.8 |
| CHO % E | 62.1 | 14.1 | 55.6 | 13.0 | 69.7 | 11.3 |
| Added sugar % E | 9.9 | 9.8 | 12.6 | 9.4 | 6.7 | 9.4 |
| Fat % E | 22.9 | 12.2 | 29.1 | 11.1 | 15.6 | 8.9 |
| MUFA % E | 7.7 | 4.9 | 10.1 | 4.7 | 5.0 | 3.5 |
| PUFA % E | 5.5 | 3.5 | 6.5 | 3.8 | 4.5 | 2.7 |
| SFA % E | 6.4 | 4.2 | 8.6 | 3.9 | 4.0 | 3.0 |

CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids

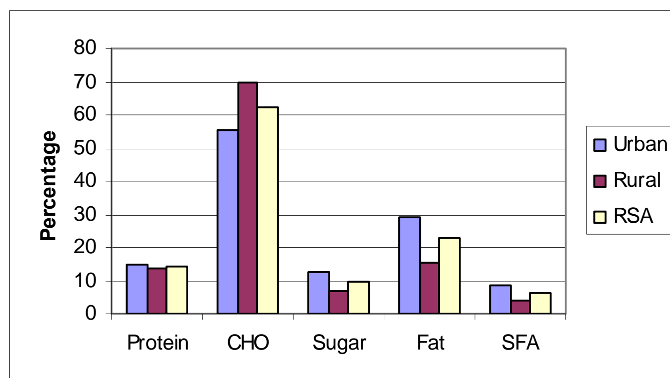


Figure 8.3.4: Macronutrient distribution of total energy intake of South African (RSA) adult females by area

Table 8.3.16: Commonly consumed food items in the South African diet (n=3229)

| **Food item** | **% Consuming the food** | **Average g/person/day of consumers only** | **Average g/ person per capita** |
|---|---|---|---|
| Sugar | 78 | 32.5 | 25.4 |
| Tea | 64 | 480.6 | 305.7 |
| Maize porridge | 56 | 765.1 | 428.8 |
| Brown bread | 54 | 148.9 | 80.5 |
| Coffee | 35 | 489.4 | 169.4 |
| Full cream milk | 35 | 217.2 | 75.1 |
| White bread | 34 | 163.8 | 55.0 |
| Brick margarine | 33 | 21.1 | 6.9 |
| Potatoes | 32 | 170.1 | 53.6 |
| Rice | 25 | 149.4 | 37.4 |
| Non-dairy creamer | 20 | 7.6 | 1.5 |
| Chicken meat | 19 | 111.7 | 21.2 |
| Carbonated cold drinks | 19 | 450.5 | 84.2 |
| Eggs | 16 | 93.0 | 15.0 |
| Mutton | 15 | 160.6 | 23.6 |
| Tomato & onion sauce | 14 | 121.3 | 16.9 |
| Cabbage cooked | 14 | 97.2 | 13.2 |
| Beef | 13 | 149.3 | 19.1 |
| Dry beans | 12 | 202.0 | 24.3 |
| Cheese | 12 | 39.2 | 4.5 |
| Maize e.g. samp | 11 | 416.9 | 43.9 |
| Beef gravy | 10 | 33.9 | 3.4 |
| Medium/low fat spread | 10 | 17.9 | 1.8 |
| Apple | 10 | 231.5 | 22.6 |
| Raw tomato | 10 | 102.1 | 9.9 |
| Fish | 10 | 142.0 | 12.3 |
| Sunflower oil | 9 | 8.5 | 0.7 |
| Jam | 9 | 36.3 | 3.0 |

Table 8.3.17: Commonly consumed food items in the South African diet at breakfast

| **Food item** | **% Consuming the food** | **Average g/person/day of consumers only** | **Average g/ person per capita** |
|---|---|---|---|
| White sugar | 69 | 20.7 | 14.3 |
| Tea | 46 | 368.6 | 169.4 |
| Brown bread | 39 | 127.3 | 49.2 |
| Coffee | 28 | 267.3 | 75.5 |
| Full cream milk | 25 | 106.6 | 26.8 |
| Brick margarine | 19 | 13.5 | 2.6 |
| Non-dairy creamer | 17 | 5.2 | 0.9 |
| White bread | 15 | 110.1 | 16.9 |
| Maize porridge | 14 | 432.3 | 59.8 |

Table 8.3.18: Commonly consumed food items in the South African diet at lunch

| Food item | % Consuming the food | Average g/person/day of consumers only | Average g/ person per capita |
|---|---|---|---|
| Maize porridge | 28 | 526.2 | 149.2 |
| Potatoes | 16 | 151.2 | 24.4 |
| Rice | 12 | 118.8 | 14.7 |
| White sugar | 12 | 15.5 | 1.8 |
| Mutton | 10 | 137.3 | 13.8 |
| Full cream milk | 9 | 125.6 | 11.0 |
| Coffee | 8 | 226.6 | 19.1 |
| Chicken meat | 8 | 101.5 | 8.3 |
| White bread | 8 | 104.8 | 8.3 |

Table 8.3.19: Commonly consumed food items in the South African diet at dinner

| Food item | % Consuming the food | Average g/person/day of consumers only | Average g/ person per capita |
|---|---|---|---|
| Maize porridge | 38 | 467.1 | 179.7 |
| White sugar | 20 | 15.9 | 3.1 |
| Potato | 15 | 147.2 | 22.7 |
| Tea | 15 | 298.8 | 44.6 |
| Full cream milk | 14 | 112.9 | 15.5 |
| White bread | 13 | 130.9 | 17.0 |
| Brick margarine | 12 | 13.7 | 1.6 |
| Rice | 12 | 156.8 | 18.6 |
| Brown bread | 11 | 79.9 | 8.7 |
| Chicken meat | 11 | 98.1 | 10.0 |

Table 8.3.20: Commonly consumed food items in the South African diet between meals

| Food item | % Consuming the food | Average g/person/day of consumers only | Average g/ person per capita |
|---|---|---|---|
| White sugar | 27 | 23.3 | 6.2 |
| Tea | 22 | 337.8 | 73.1 |
| Full cream milk | 20 | 109.1 | 21.8 |
| Coffee | 16 | 346.0 | 54.8 |
| Brown bread | 12 | 124.2 | 14.5 |
| Carbonated beverage | 11 | 390.7 | 40.9 |
| Brick margarine | 10 | 383.1 | 37.8 |
| White bread | 10 | 15.4 | 1.5 |
| Maize porridge | 9 | 137.9 | 12.8 |

Table 8.3.21: Average intake of spreads in the diet of South African women by means of a 24-hour recall

| Food item | % Consuming the food | Average g/person of consumers only | Average g/ person per capita |
|---|---|---|---|
| Hard margarine | 33 | 21.1 | 6.9 |
| Soft margarine | 10 | 17.9 | 1.8 |
| Butter | 2 | 26.0 | 0.4 |
| Cooking fat | 6 | 12.8 | 0.7 |
| Peanut butter | 5 | 30.0 | 1.6 |
| Jam | 8 | 36.3 | 3.0 |
| Beef tallow | 2 | 268.0 | 0.1 |
| Chicken fat | 3 | 11.0 | 0.3 |

Table 8.3.22: Percent spreads bought by South African participants and found in the household food inventory

| Food item | % Bought (n=2192) | % In inventory (n=559)* |
|---|---|---|
| Hard margarine | 1579 (72%) | 306 (55%) |
| Soft margarine | 105 (5%) | 25 (4%) |
| Medium fat spread | 234 (11%) | 66 (12%) |
| Butter & Butro | 77 + 10 (4%) | 0 |
| Cooking fat | 296 (14%) | 81 (14%) |
| Peanut butter | 920 (42%) | 107 (19%) |
| Jam | 1100 (50%) | 126 (23%) |

* Inventory was only done in the poorest households

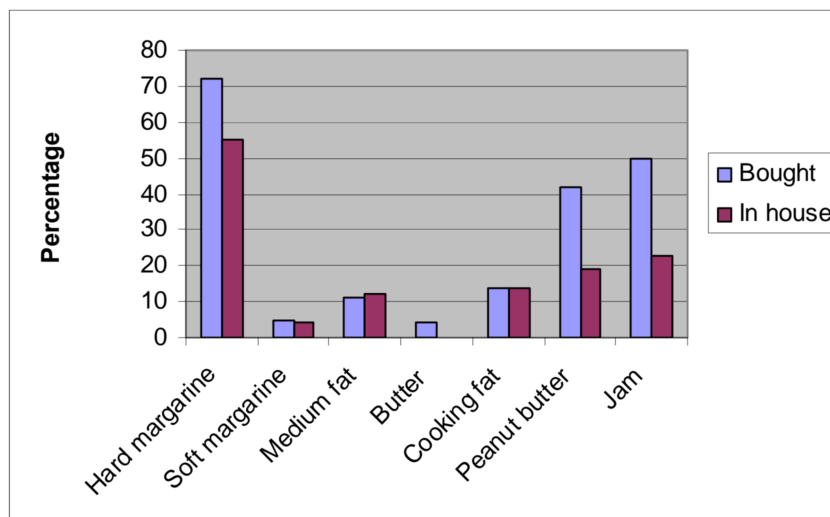


Figure 8.3.5: Type of spreads bought and found in the homes of South African women

Table 8.3.23: Commonly purchased size of items used by SA women

| Food item | 1 st choice | 2nd choice | 3rd choice |
|---|---|---|---|
| Hard margarine | 500 (54%) | 1 kg (33%) | 250 g (11%) |
| Soft margarine | 1 Kg (61%) | 500 g (36%) | 250 g (6%) |
| Butter | 500 g (62%) | 1 kg (15) | 125 g (2%) |
| Cooking fat | 500 g (9%) | - | - |
| Lard | 1 Kg (85%) | 500 g (15%) | - |

### 8.3.2 Dietary intake of Kenyan women

The Kenya participants aged 15-29 years had a mean energy intake of 6912 kJ, carbohydrate intake of 226.2 g and a protein intake of 40.7 g (Table 8.3.24). Most of the protein was in the form of plant protein (20.8 g). Mean fat intake was 63.2 g and 21.0 g was saturated fat. The P:S ratio was 0.8 and cholesterol intake was low at 181.9 mg. Mean calcium intakes were also low at 503.2 mg. Mean iron and zinc intakes were 19.4 mg and 4 mg, respectively. The majority of NAR values fell below 100% with the exception of magnesium. With regard to micronutrients (Table 8.3.25) vitamin D, folate, niacin, riboflavin, vitamin B6 and thiamine had mean NARs less than 100%. The MAR for this group is 57.9%, FVS is 7.5 and the DDS 4.7

Table 8.3.26 presents data on the nutrient intakes of the 30-44-year-old group. They had a mean energy intake of 7249 kJ, carbohydrate intake of 235.7 g, fat intake of 63.9 g and a protein intake of 43.7 g (21 g plant protein). Calcium intake was very low (529.9 mg), while iron (32.7 mg) intake appeared to be adequate. Mean NARs indicated that energy and calcium intakes were most deficient. Vitamin D, folate, riboflavin, thiamine, niacin, and vitamin B6 were the most deficient micronutrients (Table 8.3.27). The MAR for this age group is 60.9%, FVS 7.7, and DDS 4.8.

Women in the 45-59-year-old group had the lowest mean energy intake of 6526 kJ, carbohydrate intake of 239 g, fat intake of 56.2 g and a protein intake of 45.4 g with plant protein being 18.2 g (Table 8.3.28). Mean iron intake appeared to be satisfactory. Mean cholesterol intake was low (149.1mg) as was mean calcium (606.9 mg) intake. These were reflected by the low NARs for energy and calcium. The omega 6:3 ratio was high because of the low ALA intake. Furthermore, many micronutrients appeared to be

deficient in this age group, specifically, vitamin D, folate, niacin, thiamine, riboflavin, and vitamin B6 which had less than optimal NARs (Table 8.3.29). The MAR for this group was 59.6%, similar to the other age groups.

Figures 8.3.6 and 8.3.7 and Tables 8.3.30 and 8.3.31 show the mean values of nutrients in Kenya for the overall sample. Mean energy intake is 6967 kJ, which provides a NAR of 75.2%. The confidence interval is low, indicating that there is not much variation around the mean value. The mean carbohydrate, fat and protein intakes are 231.1 g, 62.3 g and 42.4 g, respectively. A large proportion of the protein is in the form of plant protein (20.5 g). Mean calcium intake is very low with an NAR of 51.2%. The w6:w3 ratio is high (36:1) due to the high intake of ALA. Mean cholesterol levels lie below 300 mg and the P:S ratio is 0.8. Vitamin D, folate, riboflavin, thiamine, niacin, and vitamin B6 have the lowest NAR values. The MAR for the overall group is 59.2%. Food variety score is low at 7.5 and the mean DDS is 4.7.

Table 8.3.32 and 8.3.33 provide the nutrient data of pregnant women in the sample. There were no significant differences in nutrient intakes between the pregnant and normal women. However, there were many significant differences in macronutrient and micronutrient intakes between urban and rural areas of Kenya (Tables 8.3.34). Rural women had a higher mean carbohydrate intake (250.9 g vs. 223.1 g); calcium intake (650 mg vs. 474.3 mg), iron intake (37.6 mg vs. 22.4 mg) and magnesium intake (342.2 mg vs. 279.5 mg). On the other hand, urban women had a higher fat intake (65.8 g vs. 53.9 g), cholesterol intake (181.5 mg vs. 146 mg) and selenium intake (25.9 ug vs. 14.7 ug).The overall poor nutrient quality of the diet is also illustrated by Table 8.3.35. Folate, vitamin D, niacin, riboflavin, thiamine, and vitamin B6 appear to be the most deficient in the diet in both areas. However some NARs were lower in the rural compared with the urban areas, namely vitamin B6, vitamin D, vitamin B12, and vitamin E. Table 8.3.36 further illustrates these micronutrient deficiencies with many subjects having intakes less than 67% of the RNIs.

There were few significant differences in contribution of macronutrients to total energy intake when comparing women by age groups (Table 8.3.37; Figure 8.8). These were higher contributions of protein and carbohydrate to energy intake by the 45-59-year-old group. There were also some significant urban-rural differences in this regard (Table

8.3.38; Figure 8.3.9). Carbohydrate and sugar contributions to energy intake were higher in rural areas, 69.9% vs. 57.4% and 7.9% vs. 7.4%, respectively. In urban areas, the mean fat (34.5% vs. 27.7%) and saturated fat (11.6% vs. 9.6%) contributions were higher than those in the rural areas were.

Foods and beverages commonly consumed by Kenyan women at different intervals of the day are presented in Tables 8.3.39 to 8.3.43. A number of items appear on most of the meal lists: tea, sugar, brown bread, maize porridge, full cream milk, kale, potatoes, white bread, brick margarine, coffee, and rice. It is important to note that 40.8% of the women consumed legumes in some dish or other on the day of the recall. Fruit and vegetable per capita consumption amounted to 239 g per day. The snacks eaten between meals are similar to those of the meals except for the addition of sorghum, pancakes and bananas. Table 8.3.45 illustrates the spreads commonly consumed as measured by 24-hour recalls. Hard (brick) margarine is by far the most common spread and was consumed by more than a third (39%) of the participants on the day prior to the recall. The daily portion of this margarine was 22 g, which is equivalent to about 4 teaspoons.

Overall the sodium intake of the subjects was low, particularly in the rural areas. It amounted to 2408 mg salt plus 45% = 3492 mg salt) in urban areas and 1392 mg salt plus 45% = 2018 mg salt) in rural areas, adding 45% discretionary salt as recommended and calculated according to the method described in Charlton (30). This involves multiplying Na in mg by 2.5 and adding 45% for discretionary salt. The recommended salt intake is 5 g salt per day (8). Potassium intakes fell just below the minimum requirement of 2000 mg for adult health.

Table 8.3.24: Mean energy, macronutrient and mineral intake of Kenyan adult women (n=485) aged 15-29 years

| Nutrients | Mean | SE | 95% LCI | 95% UCI | WHO/FAO (29) |
|---|---|---|---|---|---|
| Energy (kJ) | 6912 | 135 | 6640 | 7183 | 10 093 |
| CHO (g) | 226.2 | 4.6 | 216.9 | 235.5 | |
| Total protein(g) | 40.7 | 1.0 | 38.6 | 42.7 | 46 |
| Animal protein (g) | 9.6 | 0.6 | 8.3 | 10.9 | |
| Plant protein-(g) | 20.9 | 0.4 | 20.1 | 21.6 | |
| Total fat (g) | 63.2 | 2.0 | 59.1 | 67.3 | |
| MUFA (g) | 18.5 | 0.6 | 17.2 | 19.8 | |
| PUFA (g) | 18.6 | 0.7 | 17.2 | 20.0 | |
| SFA (g) | 21.0 | 0.8 | 19.3 | 22.7 | |
| P:S ratio | 1.1 | 0.04 | 1.0 | 1.2 | |
| Cholesterol-(mg) | 181.9 | 7.6 | 166.6 | 197.3 | <300 |
| Added sugar (g) | 30.9 | 1.2 | 28.4 | 33.5 | - |
| Fibre (g) | 15.2 | 0.4 | 14.4 | 15.9 | 25# |
| Calcium (mg) | 503.2 | 38.6 | 425.3 | 581.0 | 1000 |
| Iron (mg) | 19.4 | 1.6 | 16.1 | 22.6 | 29 |
| Zinc (mg) | 4.0 | 0.1 | 3.8 | 4.2 | 4.9 |
| Mg (mg) | 263.0 | 6.8 | 249.4 | 276.6 | 220 |
| Na (mg) | 854.8 | 4.4 | 771.5 | 938.1 | 2000 |
| K (mg) | 1815.9 | 32.7 | 1749.9 | 1881.8 | 2000& |
| Se (ug) | 23.2 | 1.3 | 20.6 | 25.8 | 26 |
| 18:3 w3 (ALA)(g) | 0.3 | 0.01 | 0.3 | 0.3 | 1.6 |
| 20:5 w3 (EPA))(g) | 0.01 | 0.001 | 0.01 | 0.02 | |
| 22:6 w3 (DHA)(g) | 0.1 | 0.007 | 0.03 | 0.06 | |
| 18:2 w6 (LA)(g) | 11.8 | 0.07 | 10.4 | 13.2 | 10-12 |
| 20:4 w6 (AA)(g) | 0.04 | 0.004 | 0.03 | 0.4 | |
| W6:w3 ratio | 29.8 | 3.9 | 35.1 | 44.5 | |
| **NAR %** | | | | | |
| Energy | 74.7 | 1.4 | 71.8 | 77.6 | 100% |
| Total protein | 82.4 | 2.1 | 78.2 | 86.6 | 100% |
| Calcium | 49.9 | 3.9 | 42.1 | 57.8 | 100% |
| Iron | 66.6 | 5.6 | 55.4 | 77.9 | 100% |
| Zinc | 80.6 | 2.3 | 75.9 | 85.3 | 100% |
| Mg | 119.5 | 3.1 | 113.3 | 125.7 | 100% |
| Se | 89.2 | 5.0 | 79.1 | 99.3 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; SE=standard error; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid); #=Reference 10; Reference 32

Table 8.3.25: Mean micronutrient intake and nutrient adequacy ratios (NARs) of Kenyan adult women (n=485) aged 15-29 years

| **Nutrients** | **Mean** | **SE** | **95% LCI** | **95% UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Folate (ug) | 184.4 | 5.2 | 174.0 | 194.8 | 400 |
| Niacin (mg) | 6.2 | 0.2 | 5.7 | 6.7 | 14 |
| Riboflavin (mg) | 0.9 | 0.05 | 0.8 | 1.0 | 1.1 |
| Thiamine (mg) | 1.0 | 0.3 | 0.9 | 1.0 | 1.1 |
| Vitamin A (RE) | 1518.7 | 80.5 | 1356.6 | 1680.9 | 500 |
| Vitamin B6 (mg) | 0.7 | 0.02 | 0.6 | 0.7 | 1.3 |
| Vitamin C (mg) | 82.1 | 3.4 | 75.2 | 89.0 | 45 |
| Vitamin B12 (ug) | 2.6 | 0.8 | 1.1 | 4.2 | 2.4 |
| Vitamin E (mg) | 7.7 | 0.5 | 6.7 | 8.7 | 7.5 |
| Vitamin K (ug) | 1001.5 | 48.4 | 904.1 | 1098.9 | 55 |
| Vitamin D (ug) | 2.2 | 0.1 | 2.0 | 2.5 | 5.0 |
| **NAR** | | | | | |
| Folate | 46.1 | 1.3 | 43.5 | 48.7 | 100% |
| Niacin | 43.9 | 1.7 | 40.4 | 47.4 | 100% |
| Riboflavin | 86.1 | 4.4 | 77.3 | 94.9 | 100% |
| Thiamine | 87.4 | 2.7 | 82.1 | 92.8 | 100% |
| Vitamin A | 300.7 | 16.0 | 268.5 | 332.9 | 100% |
| Vitamin B6 | 52.4 | 1.5 | 49.4 | 55.4 | 100% |
| Vitamin C | 183.5 | 7.6 | 168.2 | 198.8 | 100% |
| Vitamin B12 | 109.1 | 32.1 | 44.4 | 173.8 | 100% |
| Vitamin E | 102.5 | 6.8 | 88.7 | 116.3 | 100% |
| Vitamin K | 1820.9 | 87.9 | 1643.8 | 1997.9 | 100% |
| Vitamin D | 44.4 | 2.5 | 39.3 | 49.5 | 100% |
| **MAR** | 57.9 | 0.76 | 56.4 | 59.4 | 100% |
| **FVS** | 7.5 | 0.2 | 7.2 | 7.9 | |
| **DDS** | 4.7 | 0.1 | 4.5 | 4.8 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score; SE=standard error

Table 8.3.26: Mean energy, macronutrient and mineral intakes of Kenyan adult women (n=372) aged 30-44 years

| Nutrients | Mean | SE | 95%LCI | 95%UCI | WHO/FAO (29) |
|---|---|---|---|---|---|
| Energy (kJ) | 7248.6 | 158.8 | 6928.7 | 7568.4 | 10 093 |
| CHO (g) | 235.7 | 6.5 | 223.7 | 248.8 | |
| Total protein(g) | 43.7 | 1.5 | 40.6 | 46.8 | 46 |
| Animal protein (g) | 10.3 | 0.9 | 8.4 | 12.2 | |
| Plant protein-(g) | 20.9 | 0.5 | 19.9 | 21.8 | |
| Total fat (g) | 63.9 | 2.2 | 59.5 | 68.3 | |
| MUFA (g) | 19.5 | 0.8 | 17.9 | 21.0 | |
| PUFA (g) | 17.3 | 0.7 | 15.7 | 18.7 | |
| SFA (g) | 21.3 | 0.8 | 19.6 | 23.0 | |
| P:S ratio | 0.9 | 0.04 | 0.8 | 1.0 | |
| Cholesterol-(mg) | 167.6 | 9.2 | 149.0 | 186.2 | < 300 |
| Added sugar (g) | 33.0 | 1.8 | 29.4 | 36.5 | - |
| Fibre (g) | 16.8 | 0.5 | 15.8 | 17.8 | 25# |
| Calcium (mg) | 529.9 | 28.7 | 472.2 | 587.7 | 1000 |
| Iron (mg) | 32.7 | 3.6 | 25.4 | 40.0 | 29 |
| Zinc (mg) | 4.3 | 0.2 | 4.0 | 4.6 | 4.9 |
| Mg (mg) | 322.3 | 14.6 | 292.9 | 351.6 | 220 |
| Na (mg) | 905.8 | 56.5 | 792.0 | 1019.5 | 2000 |
| K (mg) | 2101.8 | 61.5 | 1977.9 | 2225.7 | 2000& |
| Se (ug) | 24.4 | 1.5 | 21.4 | 27.4 | 26 |
| 18:3 w3 (ALA)(g) | 0.4 | 0.02 | 0.3 | 0.4 | 1.6 |
| 20:5 w3 (EPA))(g) | 0.01 | 0.003 | 0.01 | 0.02 | |
| 22:6 w3 (DHA)(g) | 0.04 | 0.01 | 0.02 | 0.07 | |
| 18:2 w6 (LA)(g) | 10.8 | 0.7 | 9.3 | 12.3 | 10-12 |
| 20:4 w6 (AA)(g) | 0.05 | 0.01 | 0.04 | 0.06 | |
| W6:w3 ratio | 25.1 | 23.7 | 27.3 | 34.4 | |
| **NAR %** | | | | | |
| Energy | 78.1 | 1.7 | 74.6 | 81.5 | 100% |
| Total protein | 89.2 | 3.1 | 82.9 | 95.5 | 100% |
| Calcium | 53.0 | 2.9 | 47.2 | 58.8 | 100% |
| Iron | 112.8 | 12.5 | 87.6 | 138.0 | 100% |
| Zinc | 87.8 | 3.1 | 81.4 | 94.1 | 100% |
| Mg | 146.5 | 6.6 | 133.2 | 159.8 | 100% |
| Se | 93.8 | 5.7 | 82.3 | 105.4 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; SE=standard error; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid); #= Reference 10; & Reference 32

Table 8.3.27: Mean micronutrient intake and nutrient adequacy ratios (NARs) of Kenyan adult women (n=372) aged 30-44 years

| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Folate (ug) | 199.9 | 5.4 | 188.9 | 210.8 | 400 |
| Niacin (mg) | 6.6 | 0.4 | 5.9 | 7.4 | 14 |
| Riboflavin (mg) | 1.0 | 0.06 | 0.9 | 1.1 | 1.1 |
| Thiamine (mg) | 1.0 | 0.04 | 0.9 | 1.1 | 1.1 |
| Vitamin A (RE) | 1471.1 | 82.5 | 1304.9 | 1637.3 | 500 |
| Vitamin B6 (mg) | 0.7 | 0.02 | 0.7 | 0.8 | 1.3 |
| Vitamin C (mg) | 85.2 | 4.1 | 76.8 | 93.5 | 45 |
| Vitamin B12 (mg) | 2.0 | 0.7 | 0.6 | 3.5 | 2.4 |
| Vitamin E (mg) | 6.8 | 0.5 | 5.8 | 7.8 | 7.5 |
| Vitamin K (ug) | 929.1 | 73.9 | 780.2 | 1077.9 | 55 |
| Vitamin D (ug) | 2.0 | 0.2 | 1.7 | 2.4 | 5.0 |
| **NAR** | | | | | |
| Folate | 50.0 | 1.4 | 47.2 | 52.7 | 100% |
| Niacin | 47.3 | 2.6 | 42.2 | 52.5 | 100% |
| Riboflavin | 92.2 | 5.1 | 82.1 | 102.4 | 100% |
| Thiamine | 90.3 | 3.6 | 83.1 | 97.6 | 100% |
| Vitamin A | 294.2 | 16.5 | 261.0 | 327.5 | 100% |
| Vitamin B6 | 57.4 | 2.1 | 53.3 | 61.6 | 100% |
| Vitamin C | 189.3 | 9.2 | 170.7 | 207.8 | 100% |
| Vitamin B12 | 85.4 | 29.1 | 26.8 | 143.9 | 100% |
| Vitamin E | 90.7 | 6.9 | 76.9 | 104.6 | 100% |
| Vitamin K | 1689.2 | 134.4 | 1418.6 | 1959.9 | 100% |
| Vitamin D | 40.9 | 3.2 | 34.6 | 47.3 | 100% |
| **MAR** | 60.9 | 1.2 | 58.6 | 63.3 | 100% |
| **FVS** | 7.7 | 0.2 | 7.3 | 8.1 | |
| **DDS** | 4.8 | 0.08 | 4.6 | 5.0 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score

Table 8.3.28: Mean energy, macronutrient and mineral intakes of Kenyan adult women (n=138) aged 45-59 years

| Nutrients | Mean | SE | 95%LCI | 95%UCI | WHO/FAO (29) |
|---|---|---|---|---|---|
| Energy (kJ) | 6526.2 | 285.7 | 5950.8 | 7101.7 | 10 093 |
| CHO (g) | 239.4 | 13.8 | 211 | 267.3 | |
| Total protein(g) | 45.4 | 3.0 | 39 | 51.4 | 46 |
| Animal protein (g) | 11.9 | 2.1 | 8 | 16.1 | |
| Plant protein-(g) | 18.2 | 0.9 | 16 | 19.9 | |
| Total fat (g) | 56.2 | 3.9 | 48.4 | 64.0 | |
| MUFA (g) | 16.9 | 1.2 | 14.4 | 19.4 | |
| PUFA (g) | 16.5 | 1.2 | 14.0 | 19.0 | |
| SFA (g) | 18.0 | 1.5 | 15.0 | 21.0 | |
| P:S ratio | 1.1 | 0.09 | 1.0 | 1.3 | |
| Cholesterol-(mg) | 149.1 | 16.9 | 115.1 | 183.1 | < 300 |
| Added sugar (g) | 27.6 | 2.7 | 22.2 | 32.9 | - |
| Fibre (g) | 15.2 | 0.6 | 13.8 | 16.5 | 25# |
| Calcium (mg) | 606.9 | 93.4 | 418.8 | 795.0 | 1000 |
| Iron (mg) | 37.1 | 6.8 | 23.3 | 50.9 | 29 |
| Zinc (mg) | 4.0 | 0.3 | 3.3 | 4.7 | 4.9 |
| Mg (mg) | 356.4 | 29.4 | 297.1 | 415.7 | 220 |
| Na (mg) | 679.2 | 69.5 | 539.3 | 819.2 | 2000 |
| K (mg) | 2039.5 | 118.0 | 1801.9 | 2277.1 | 2000& |
| Se (ug) | 17.2 | 2.1 | 13.0 | 21.3 | 26 |
| 18:3 w3 (ALA)(g) | 0.3 | 0.03 | 0.3 | 0.4 | 1.6 |
| 20:5 w3 (EPA))(g) | 0.02 | 0.01 | 0.005 | 0.03 | |
| 22:6 w3 (DHA)(g) | 0.07 | 0.02 | 0.03 | 0.1 | |
| 18:2 w6 (LA)(g) | 11.1 | 1.2 | 8.6 | 13.6 | 10-12 |
| 20:4 w6 (AA)(g) | 0.04 | 0.01 | 0.02 | 0.06 | |
| W6:w3 ratio | 28.5 | 19.1 | 25.9 | 49.9 | |
| **NAR %** | | | | | |
| Energy | 70.3 | 3.1 | 64.1 | 76.5 | 100% |
| Total protein | 92.6 | 6.1 | 80.2 | 105.0 | 100% |
| Calcium | 52.9 | 7.1 | 38.6 | 67.1 | 100% |
| Iron | 234.4 | 54.0 | 125.6 | 343.3 | 100% |
| Zinc | 81.8 | 6.8 | 68.1 | 95.5 | 100% |
| Mg | 162.0 | 13.3 | 135.0 | 188.9 | 100% |
| Se | 65.9 | 8.0 | 49.8 | 82.1 | 100% |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid); # = Reference 10; & Reference 32

Table 8.3.29: Mean micronutrient intake and nutrient adequacy ratios (NARs) of Kenyan adult women (n=38) aged 45-59 years

| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** | **WHO/FAO (29)** |
|---|---|---|---|---|---|
| Folate (ug) | 168.7 | 12.9 | 142.8 | 194.7 | 400 |
| Niacin (mg) | 7.0 | 0.6 | 5.9 | 8.1 | 14 |
| Riboflavin (mg) | 0.9 | 0.08 | 0.8 | 1.1 | 1.1 |
| Thiamine (mg) | 1.0 | 0.07 | 0.8 | 1.1 | 1.1 |
| Vitamin A (RE) | 1209.4 | 143.1 | 921.1 | 1497.7 | 500 |
| Vitamin B6 (mg) | 0.7 | 0.05 | 0.6 | 0.8 | 1.3 |
| Vitamin C (mg) | 75.4 | 7.8 | 59.7 | 91.2 | 45 |
| Vitamin B12 (ug) | 2.1 | 1.0 | 0.1 | 4.2 | 2.4 |
| Vitamin E (mg) | 7.1 | 1.0 | 5.1 | 9.1 | 7.5 |
| Vitamin K (ug) | 651.7 | 111.8 | 426.5 | 876.8 | 55 |
| Vitamin D (ug) | 1.5 | 0.2 | 1.1 | 1.8 | 5.0 |
| **NAR values** | | | | | |
| Folate | 42.2 | 3.2 | 35.7 | 48.7 | 100% |
| Niacin | 50.0 | 4.1 | 41.8 | 58.2 | 100% |
| Riboflavin | 84.5 | 7.4 | 69.6 | 99.4 | 100% |
| Thiamine | 86.5 | 6.4 | 73.6 | 99.4 | 100% |
| Vitamin A | 241.9 | 28.6 | 184.2 | 299.5 | 100% |
| Vitamin B6 | 48.9 | 3.6 | 41.6 | 56.2 | 100% |
| Vitamin C | 167.6 | 17.4 | 132.6 | 202.6 | 100% |
| Vitamin B12 | 88.7 | 42.1 | 3.9 | 173.5 | 100% |
| Vitamin E | 94.6 | 13.3 | 67.6 | 121.6 | 100% |
| Vitamin K | 1184.8 | 203.3 | 775.4 | 1594.2 | 100% |
| Vitamin D (ug) | 29.3 | 3.9 | 21.4 | 37.3 | 100% |
| **MAR** | 59.6 | 2.3 | 54.9 | 64.2 | 100% |
| **FVS** | 6.9 | 0.3 | 6.3 | 7.6 | |
| **DDS** | 4.6 | 0.2 | 4.3 | 4.8 | 9 |

LCI=lower confidence interval; UCI=upper confidence interval; NARs=Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score; SE=standard error

Table 8.3.30: Mean energy, macronutrient and mineral intake of Kenyan adult women (n= 1008)

| | Women | | | |
|---|---|---|---|---|
| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** |
| Energy (kJ) | 6967.1 | 106.4 | 6752.7 | 7181.5 |
| CHO (g) | 231.1 | 4.6 | 221.9 | 240.3 |
| Total protein(g) | 42.4 | 1.0 | 40.5 | 44.3 |
| Animal protein (g) | 10.2 | 0.7 | 8.8 | 11.5 |
| Plant protein-(g) | 20.5 | 0.3 | 19.8 | 21.1 |
| Total fat (g) | 62.3 | 1.6 | 59.2 | 65.5 |
| MUFA (g) | 18.6 | 0.5 | 17.5 | 19.7 |
| PUFA (g) | 17.8 | 0.5 | 16.8 | 18.8 |
| SFA (g) | 20.6 | 0.6 | 19.3 | 21.9 |
| P:S ratio | 1.0 | 0.03 | 1.0 | 1.1 |
| Cholesterol-(mg) | 171.2 | 6.4 | 158.4 | 184.0 |
| Added sugar (g) | 31.1 | 1.1 | 28.9 | 33.2 |
| Fibre (g) | 15.8 | 0.3 | 15.3 | 16.3 |
| Calcium (mg) | 525.2 | 26.1 | 472.6 | 577.8 |
| Iron (mg) | 26.8 | 1.9 | 23.0 | 30.5 |
| Zinc (mg) | 4.1 | 0.1 | 3.9 | 4.3 |
| Mg (mg) | 297.7 | 8.9 | 279.8 | 315.5 |
| Na (mg) | 845.4 | 38.5 | 767.9 | 922.9 |
| K (mg) | 1950.9 | 37.4 | 1875.5 | 2026.3 |
| Se (ug) | 22.7 | 1.1 | 20.4 | 24.9 |
| 18:3 w3 (ALA)(g) | 0.3 | 0.01 | 0.3 | 0.4 |
| 20:5 w3 (EPA))(g) | 0.01 | 0.002 | 0.01 | 0.02 |
| 22:6 w3 (DHA)(g) | 0.05 | 0.007 | 0.03 | 0.06 |
| 18:2 w6 (LA)(g) | 11.3 | 0.5 | 10.3 | 12.2 |
| 20:4 w6 (AA)(g) | 0.05 | 0.004 | 0.04 | 0.06 |
| W6:w3 ratio | 36.1 | 1.7 | 32.7 | 39.6 |
| **NAR %** | | | | |
| Energy | 75.2 | 1.1 | 72.9 | 77.5 |
| Total protein | 86.2 | 1.9 | 82.2 | 90.2 |
| Calcium | 51.2 | 2.45 | 46.2 | 56.1 |
| Iron | 108.6 | 9.94 | 88.6 | 128.6 |
| Zinc | 83.3 | 2.21 | 78.9 | 87.8 |
| Mg | 135.3 | 4.04 | 127.2 | 143.4 |
| Se | 87.2 | 4.3 | 78.4 | 95.9 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; SE=standard error; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid)

Table 8.3.31: Mean micronutrient intake and nutrient adequacy ratios of Kenyan women (n =1008)

| | Women | | | |
|---|---|---|---|---|
| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** |
| Folate (ug) | 187.4 | 3.9 | 179.6 | 195.2 |
| Niacin (mg) | 6.5 | 0.3 | 6.0 | 7.0 |
| Riboflavin (mg) | 1.0 | 0.04 | 0.9 | 1.1 |
| Thiamine (mg) | 1.0 | 0.03 | 0.9 | 1.0 |
| Vitamin A (RE) | 1465.5 | 64.7 | 1335.2 | 1595.8 |
| Vitamin B6 (mg) | 0.7 | 0.02 | 0.7 | 0.7 |
| Vitamin C (mg) | 82.1 | 2.9 | 76.2 | 88.0 |
| Vitamin B12 (ug) | 2.3 | 0.6 | 1.0 | 3.6 |
| Vitamin E (mg) | 7.3 | 0.4 | 6.5 | 8.0 |
| Vitamin K (ug) | 926.4 | 49.1 | 827.4 | 1025.3 |
| Vitamin D (ug) | 2.0 | 0.1 | 1.8 | 2.3 |
| **NAR** | | | | |
| Folate | 46.8 | 1.0 | 44.9 | 48.8 |
| Niacin | 46.1 | 1.8 | 42.5 | 49.7 |
| Riboflavin | 87.8 | 4.0 | 79.8 | 95.8 |
| Thiamine | 88.2 | 2.5 | 83.2 | 93.2 |
| Vitamin A | 291.6 | 12.9 | 265.6 | 317.6 |
| Vitamin B6 | 53.6 | 1.4 | 50.8 | 56.4 |
| Vitamin C | 183.0 | 6.50 | 169.9 | 196.1 |
| Vitamin B12 | 96.4 | 26.52 | 43.0 | 149.9 |
| Vitamin E | 96.8 | 4.9 | 86.9 | 106.6 |
| Vitamin K | 1684.3 | 89.3 | 1504.4 | 1864.2 |
| Vitamin D | 40.7 | 2.2 | 36.3 | 45.2 |
| **MAR** | 59.2 | 0.9 | 57.5 | 60.9 |
| **FVS** | 7.5 | 0.1 | 7.2 | 7.8 |
| **DDS** | 4.7 | 0.07 | 4.6 | 4.8 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR= Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score; SE=standard error

Table 8.3.32: Mean energy, macronutrient and mineral intake of Kenyan pregnant women (n=53)

| | Women | | | |
|---|---|---|---|---|
| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** |
| Energy (kJ) | 6700 | 254.6 | 6187 | 7213 |
| CHO (g) | 254 | 13.7 | 226.4 | 281.7 |
| Total protein(g) | 42.9 | 2.7 | 37.5 | 48.3 |
| Animal protein (g) | 8.3 | 1.5 | 5.3 | 11.2 |
| Plant protein-(g) | 20.3 | 1.2 | 17.9 | 22.7 |
| Total fat (g) | 52.6 | 3.0 | 46.6 | 58.7 |
| MUFA (g) | 15.2 | 1.1 | 13.1 | 17.3 |
| PUFA (g) | 14.6 | 1.1 | 12.4 | 16.7 |
| SFA (g) | 17.4 | 1.1 | 15.1 | 19.7 |
| P:S ratio | 1.0 | 0.03 | 0.9 | 1.0 |
| Cholesterol-(mg) | 158.5 | 22.9 | 112.4 | 204.7 |
| Added sugar (g) | 29.7 | 3.8 | 22.1 | 37.4 |
| Fibre (g) | 15.8 | 1.1 | 13.5 | 18.1 |
| Calcium (mg) | 576.7 | 78.1 | 419.4 | 734.0 |
| Iron (mg) | 32.8 | 7.3 | 18.1 | 47.6 |
| Zinc (mg) | 4.0 | 0.3 | 3.4 | 4.6 |
| Mg (mg) | 325.9 | 25.2 | 275.1 | 376.7 |
| Se (ug) | 23.8 | 3.1 | 17.6 | 30.0 |
| 18:3 w3 (ALA)(g) | 0.3 | 0.04 | 0.2 | 0.4 |
| 20:5 w3 (EPA))(g) | 0.01 | 0.002 | 0.003 | 0.01 |
| 22:6 w3 (DHA)(g) | 0.04 | 0.02 | 0.01 | 0.08 |
| 18:2 w6 (LA)(g) | 8.4 | 1.1 | 6.1 | 10.7 |
| 20:4 w6 (AA)(g) | 0.04 | 0.01 | 0.01 | 0.06 |
| W6:w3 ratio | 24.1 | 18.3 | 23.6 | 42.3 |
| **NAR %** | | | | |
| Energy | 72.8 | 2.8 | 67.2 | 78.4 |
| Total protein | 85.8 | 5.7 | 74.3 | 97.3 |
| Calcium | 56.7 | 7.8 | 40.9 | 72.4 |
| Iron | 112.5 | 25.0 | 62.1 | 163.0 |
| Zinc | 78.2 | 6.0 | 66.1 | 90.3 |
| Mg | 148.1 | 11.4 | 125.0 | 171.2 |
| Se | 91.5 | 11.9 | 67.5 | 115.5 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; SE=standard error; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid)

Table 8.3.33: Mean micronutrient intake and nutrient adequacy ratios of Kenyan pregnant women (n=53)

| | Women | | | |
|---|---|---|---|---|
| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** |
| Folate (ug) | 191.6 | 14.8 | 161.9 | 221.4 |
| Niacin (mg) | 6.4 | 0.5 | 5.3 | 7.5 |
| Riboflavin (mg) | 0.9 | 0.1 | 0.7 | 1.2 |
| Thiamine (mg) | 1.0 | 0.1 | 0.9 | 1.1 |
| Vitamin A (RE) | 1511.9 | 311.5 | 884.5 | 2139.4 |
| Vitamin B6 (mg) | 0.7 | 0.1 | 0.5 | 0.8 |
| Vitamin C (mg) | 87.0 | 7.9 | 71.2 | 102.8 |
| Vitamin B12 (ug) | 3.3 | 2.6 | 1.9 | 8.5 |
| Vitamin E (mg) | 6.5 | 1.0 | 4.4 | 8.5 |
| Vitamin K (ug) | 893.8 | 147.5 | 596.7 | 1190.8 |
| Vitamin D (ug) | 1.6 | 0.3 | 1.0 | 2.3 |
| **NAR** | | | | |
| Folate | 47.9 | 3.7 | 40.5 | 55.3 |
| Niacin | 44.9 | 3.9 | 37.0 | 52.9 |
| Riboflavin | 86.7 | 10.7 | 65.2 | 108.3 |
| Thiamine | 89.7 | 6.0 | 77.7 | 101.7 |
| Vitamin A | 296.8 | 62.6 | 170.7 | 422.8 |
| Vitamin B6 | 52.2 | 5.7 | 40.7 | 63.7 |
| Vitamin C | 195.8 | 17.5 | 160.4 | 231.1 |
| Vitamin B12 | 137.1 | 107.2 | 78.8 | 353.1 |
| Vitamin E | 86.2 | 13.3 | 59.4 | 113.1 |
| Vitamin K | 1625.0 | 268.1 | 1084.9 | 2165.0 |
| Vitamin D | 32.7 | 6.7 | 19.1 | 46.5 |
| **MAR** | 59.7 | 1.8 | 56.1 | 63.4 |
| **FVS** | 7.4 | 0.3 | 6.7 | 8.0 |
| **DDS** | 4.7 | 0.2 | 4.3 | 5.0 |

LCI=lower confidence interval; UCI=upper confidence interval; NAR= Nutrient adequacy ratio; MAR=Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score; SE=standard error

Table 8.3.34: Mean energy and macronutrient distribution of Kenyan adult women by urban and rural distribution

| | URBAN (n=716) | | | | RURAL (n=292) | | | |
|---|---|---|---|---|---|---|---|---|
| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** | **Mean** | **SE** | **95%LCI** | **95%UCI** |
| Energy (kJ)* | 7051 | 130 | 6787 | 7314 | 6761 | 185 | 6355 | 7169 |
| CHO (g)+ | 223.1 | 5.0 | 212.9 | 233.3 | 250.9 | 9.7 | 229.4 | 272.3 |
| Total protein(g)* | 41.0 | 1.0 | 39.0 | 43.0 | 45.8 | 2.3 | 40.7 | 50.8 |
| Animal protein(g)+ | 11.1 | 0.8 | 9.5 | 12.7 | 7.8 | 1.2 | 5.1 | 10.6 |
| Plant protein-(g)* | 20.8 | 0.4 | 20.1 | 21.6 | 19.6 | 0.6 | 18.2 | 21.0 |
| Total fat (g)+ | 65.8 | 1.9 | 61.9 | 69.7 | 53.9 | 2.7 | 47.9 | 60.0 |
| MUFA (g)+ | 19.9 | 0.7 | 18.6 | 21.2 | 15.4 | 0.9 | 13.4 | 17.4 |
| PUFA (g)+ | 18.4 | 0.6 | 17.2 | 19.5 | 16.3 | 1.0 | 14.2 | 18.4 |
| SFA (g)+ | 22.0 | 0.8 | 20.4 | 23.7 | 17.2 | 1.0 | 15.1 | 19.3 |
| P:S ratio+ | 1.0 | 0.04 | 0.7 | 0.9 | 1.1 | 0.06 | 1.0 | 1.2 |
| Cholesterol-(mg)+ | 181.5 | 7.3 | 166.6 | 196.4 | 146.0 | 12.8 | 117.8 | 174.1 |
| Added sugar (g) | 31.1 | 1.2 | 28.6 | 33.5 | 31.0 | 2.2 | 26.0 | 35.9 |
| Fibre (g) | 15.7 | 0.3 | 15.0 | 16.3 | 16.0 | 0.3 | 15.2 | 16.7 |
| Calcium (mg)* | 474.3 | 20.4 | 432.9 | 515.8 | 650 | 75.6 | 483.5 | 816.5 |
| Iron (mg)+ | 22.4 | 1.8 | 18.8 | 26.0 | 37.6 | 4.7 | 27.2 | 47.9 |
| Zinc (mg)+ | 4.3 | 0.1 | 4.0 | 4.6 | 3.7 | 0.2 | 3.3 | 4.1 |
| Mg (mg)+ | 279.5 | 7.5 | 264.3 | 294.7 | 342.2 | 24.2 | 288.8 | 395.7 |
| Na (mg) + | 963.0 | 50.3 | 860.9 | 1065.2 | 556.9 | 49.3 | 448.3 | 665.4 |
| K (mg) | 1959. | 39.2 | 1879.5 | 2038.6 | 1930.8 | 86.6 | 1740.2 | 2121.5 |
| Se (ug)+ | 25.9 | 1.5 | 22.9 | 28.9 | 14.7 | 1.4 | 11.5 | 17.8 |
| 18:3 w3+ (ALA)(g) | 0.4 | 0.01 | 0.3 | 0.4 | 0.3 | 0.02 | 0.2 | 0.3 |
| 20:5 w3* (EPA)(g) | 0.01 | 0.002 | 0.01 | 0.02 | 0.01 | 0.03 | 0.003 | 0.02 |
| 22:6 w3+ (DHA)(g) | 0.05 | 0.01 | 0.04 | 0.06 | 0.1 | 0.02 | 0.01 | 0.1 |
| 18:2 w6+ (LA)(g) | 11.9 | 0.6 | 10.8 | 12.9 | 9.9 | 0.9 | 7.8 | 11.9 |
| 20:4 w6+ (AA)(g) | 0.06 | 0.01 | 0.05 | 0.06 | 0.03 | 0.01 | 0.02 | 0.04 |
| W6:w3 ratio | 26.1 | 30.5 | 32.1 | 39.1 | 37.4 | 4.2 | 28.2 | 46.7 |
| **NAR %** | | | | | | | | |
| Energy | 76.1 | 1.4 | 73.3 | 78.9 | 73.0 | 2.0 | 68.6 | 77.4 |
| Total protein | 83.4 | 2.0 | 79.3 | 87.5 | 93.1 | 4.7 | 82.8 | 103.4 |
| Calcium | 46.7 | 2.0 | 42.5 | 50.8 | 62.2 | 6.9 | 47.0 | 77.4 |
| Iron | 84.5 | 7.6 | 69.0 | 100.0 | 167.7 | 28.8 | 104.2 | 231.2 |
| Zinc | 86.8 | 2.8 | 81.0 | 92.5 | 75.0 | 3.3 | 67.8 | 82.2 |
| Mg | 127.0 | 3.4 | 120.1 | 133.9 | 155.6 | 11.0 | 131.3 | 179.9 |
| Se | 99.7 | 5.7 | 88.2 | 111.2 | 56.4 | 5.5 | 44.3 | 68.5 |

*p<0.05 Wilcoxon 2 sample test; + p<0.01 (significant urban-rural differences)
LCI=lower confidence interval; UCI= upper confidence interval; NAR=Nutrient adequacy ratio
CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; SE=standard error; (ALA=alpha-linolenic acid; EPA=eicosapentanoic acid; DHA=docosahexanoic acid; LA=linoleic acid; AA=arachidonic acid)

Table 8.3.35: Mean micronutrient intake and nutrient adequacy ratios of Kenyan adult women (n=1995) by urban and rural distribution

| | URBAN (n=716) | | | | RURAL (n=292) | | | |
|---|---|---|---|---|---|---|---|---|
| **Nutrients** | **Mean** | **SE** | **95%LCI** | **95%UCI** | **Mean** | **SE** | **95%LCI** | **95%UCI** |
| Folate (ug)+ | 196.6 | 4.8 | 186.8 | 206.3 | 164.9 | 6.4 | 150.9 | 178.9 |
| Niacin (mg) | 6.6 | 0.3 | 5.9 | 7.3 | 6.2 | 0.4 | 5.4 | 6.9 |
| Riboflavin (mg)+ | 1.0 | 0.06 | 0.9 | 1.2 | 0.8 | 0.04 | 0.7 | 0.9 |
| Thiamine (mg) | 1.0 | 0.03 | 0.9 | 1.0 | 1.0 | 0.04 | 0.9 | 1.1 |
| Vitamin A (RE) | 1504.0 | 86.7 | 1327.8 | 1680.1 | 1371.1 | 68.6 | 1220.2 | 1521.9 |
| Vitamin B6 (mg)+ | 0.7 | 0.02 | 0.7 | 0.8 | 0.6 | 0.03 | 0.6 | 0.7 |
| Vitamin C (mg) | 82.7 | 3.6 | 75.4 | 89.9 | 80.8 | 5.0 | 69.8 | 91.8 |
| Vitamin B12(ug)+ | 2.9 | 0.9 | 1.0 | 4.7 | 1.0 | 0.3 | 0.4 | 1.6 |
| Vitamin E (mg)+ | 7.7 | 0.4 | 6.8 | 8.5 | 6.2 | 0.7 | 4.6 | 7.9 |
| Vitamin K (ug) | 927.9 | 60.6 | 804.8 | 1050.9 | 922.7 | 81.8 | 742.8 | 1102.7 |
| Vitamin D (ug) + | 2.3 | 0.1 | 2.0 | 2.5 | 1.5 | 0.2 | 1.1 | 1.8 |
| **NAR** | | | | | | | | |
| Folate | 49.1 | 1.2 | 46.7 | 51.6 | 41.2 | 1.6 | 37.7 | 44.7 |
| Niacin | 47.0 | 2.3 | 42.3 | 51.7 | 43.9 | 2.6 | 38.2 | 49.5 |
| Riboflavin | 94.4 | 5.4 | 83.5 | 105.3 | 71.6 | 3.8 | 63.3 | 80.0 |
| Thiamine | 88.2 | 3.1 | 82.0 | 94.5 | 88.1 | 4.1 | 79.1 | 97.1 |
| Vitamin A | 299.2 | 17.3 | 264.0 | 334.3 | 272.9 | 13.8 | 242.6 | 303.3 |
| Vitamin B6 | 55.8 | 1.7 | 52.4 | 59.2 | 48.2 | 2.5 | 42.7 | 53.7 |
| Vitamin C | 184.3 | 7.9 | 168.2 | 200.5 | 179.9 | 11.1 | 155.4 | 204.3 |
| Vitamin B12 | 118.9 | 37.1 | 43.6 | 194.2 | 41.4 | 11.5 | 16.1 | 66.7 |
| Vitamin E | 102.3 | 5.6 | 90.8 | 113.7 | 83.2 | 9.8 | 61.5 | 104.8 |
| Vitamin K | 1687.0 | 110.1 | 1463.2 | 190.8 | 1677.7 | 148.7 | 1350.4 | 2004.8 |
| Vitamin D | 45.3 | 2.8 | 39.7 | 51.0 | 29.4 | 3.4 | 21.8 | 36.9 |
| **MAR+** | 60.0 | 1.0 | 57.9 | 62.0 | 57.3 | 1.6 | 53.8 | 60.8 |
| **FVS+** | 7.8 | 0.2 | 7.5 | 8.2 | 6.8 | 0.3 | 6.2 | 7.3 |
| **DDS+** | 4.8 | 1.0 | 4.6 | 4.9 | 4.5 | 0.1 | 4.3 | 4.7 |

* $p<0.05$ Wilcoxon 2 sample test; + $p<0.01$(significant urban-rural differences)
LCI=lower confidence interval; UCI=upper confidence interval; NAR=Nutrient adequacy ratio;
MAR= Mean adequacy ratio; FVS=Food variety score; DDS=Dietary diversity score; SE=standard error

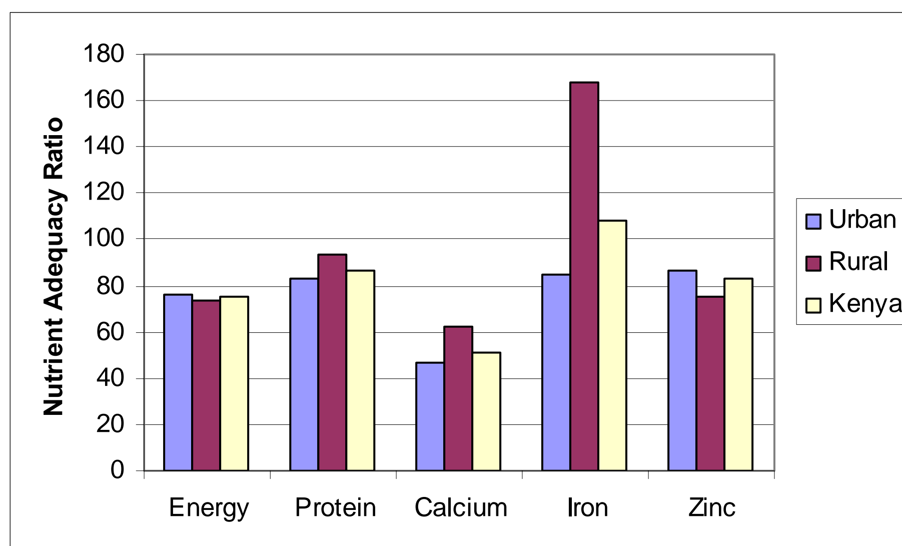


Figure 8.3.6: Nutrient adequacy ratios of macronutrient intake of Kenyan women

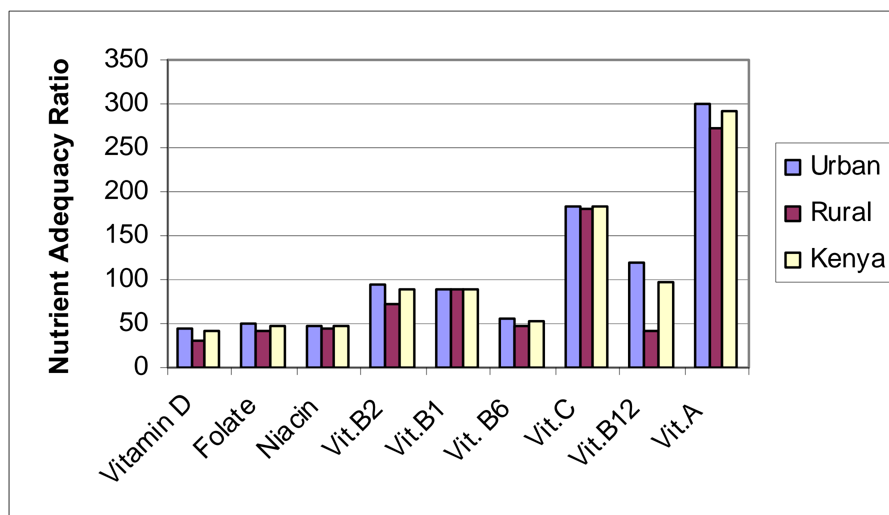


Figure 8.3.7: Nutrient adequacy ratios of micronutrient intake of Kenyan women

Table 8.3.36: Percent adults with nutrient intakes less than 67% of the recommended nutrient intakes by urban-rural distribution

| | **Urban (n=716)** | **Rural(n=292)** | **Total(n=1008)** |
|---|---|---|---|
| **Nutrients < 67% RNI** | | | |
| Energy (kJ) | 40.6 | 47.6 | 42.7 |
| Total protein(g) | 41.3 | 36.3 | 39.8 |
| Calcium (mg) | 86.6 | 77.4 | 83.9 |
| Iron (mg) | 80.3 | 62.0 | 75.0 |
| Zinc (mg) | 39.4 | 53.4 | 43.5 |
| Mg (mg) | 15.4 | 12.0 | 14.4 |
| Se (ug) | 40.8 | 68.5 | 48.8 |
| Folate (ug) | 80.7 | 86.6 | 82.4 |
| Niacin (mg) | 82.0 | 84.3 | 82.6 |
| Riboflavin (mg) | 43.4 | 58.6 | 47.8 |
| Thiamine (mg) | 38.0 | 41.4 | 39.0 |
| Vitamin A (RE) | 10.6 | 19.2 | 13.1 |
| Vitamin B6 (mg) | 71.8 | 79.5 | 74.0 |
| Vitamin C (mg) | 21.8 | 23.3 | 22.2 |
| Vitamin B12(mg) | 80.2 | 88.7 | 82.6 |
| Vitamin E (mg) | 51.9 | 65.1 | 55.8 |
| Vitamin K (ug) | 32.0 | 30.1 | 31.5 |
| Vitamin D | 79.5 | 90.4 | 82.6 |

RNI=Recommended nutrient intakes (29)

Table 8.3.37: Mean macronutrient distribution of Kenyan adult women (n=1008) by age group

| | 15-29 years | | 30-44 years | | 45-59 years | |
|---|---|---|---|---|---|---|
| **Nutrients** | **Mean** | **SE** | **Mean** | **SE** | **Mean** | **SE** |
| Protein % E | 10.0 | 0.3 | 10.1 | 0.3 | 12.4 | 1.2 |
| An. Protein % E | 2.3 | 0.2 | 2.4 | 0.2 | 3.1 | 0.5 |
| Pl. protein % E | 5.1 | 0.1 | 4.9 | 0.1 | 4.8 | 0.2 |
| CHO % E | 60.1 | 1.5 | 59.0 | 1.1 | 69.6 | 6.4 |
| Added sugar % E | 7.6 | 0.3 | 7.8 | 0.4 | 7.3 | 0.7 |
| Fat % E | 33.8 | 0.6 | 32.8 | 0.7 | 31.7 | 1.1 |
| MUFA % E | 9.8 | 0.2 | 10.0 | 0.3 | 9.4 | 0.4 |
| PUFA % E | 10.0 | 0.3 | 8.8 | 0.2 | 9.6 | 0.5 |
| SFA % E | 11.2 | 0.3 | 11.1 | 0.3 | 10.1 | 0.5 |

CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; SE=standard error *Animal protein and plant protein do not add up to total protein because of discrepancies in the Kenyan food composition tables. The same was found for MUFA, PUFA and SFA – do not add up to total fat. Fat values provided by Unilever – used SA kilojoule values for margarine and cooking fat – some discrepancies in % energy values contributed to this (especially in older age group, as well as rural adults)

Table 8.3.38: Mean percent contribution of nutrients to energy intake of Kenyan adult females by urban-rural distribution

| | Kenya (n=1008) | | URBAN (n=716) | | RURAL (n=292) | |
|---|---|---|---|---|---|---|
| | **Mean** | **SE** | **Mean** | **SE** | **Mean** | **SE** |
| Protein % E* | 10.4 | 0.3 | 9.8 | 0.2 | 11.8 | 0.9 |
| An. Protein % E* | 2.5 | 0.2 | 2.7 | 0.2 | 1.9 | 0.2 |
| Pl. protein % E | 5.0 | 0.1 | 5.1 | 0.1 | 4.9 | 0.1 |
| CHO % E* | 61.0 | 1.5 | 57.4 | 0.8 | 69.9 | 4.7 |
| Added sugar % E | 7.6 | 0.2 | 7.4 | 0.2 | 7.9 | 0.5 |
| Fat % E* | 33.1 | 0.5 | 34.5 | 0.6 | 29.7 | 0.8 |
| MUFA % E | 9.8 | 0.2 | 10.4 | 0.2 | 8.3 | 0.3 |
| PUFA % E | 9.5 | 0.2 | 9.6 | 0.3 | 9.2 | 0.4 |
| SFA % E* | 11.0 | 0.2 | 11.6 | 0.3 | 9.6 | 0.3 |

- P<0.01 significant difference between urban and rural mean intakes; CHO=carbohydrate; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids; SFA=saturated fatty acids; SE=standard error

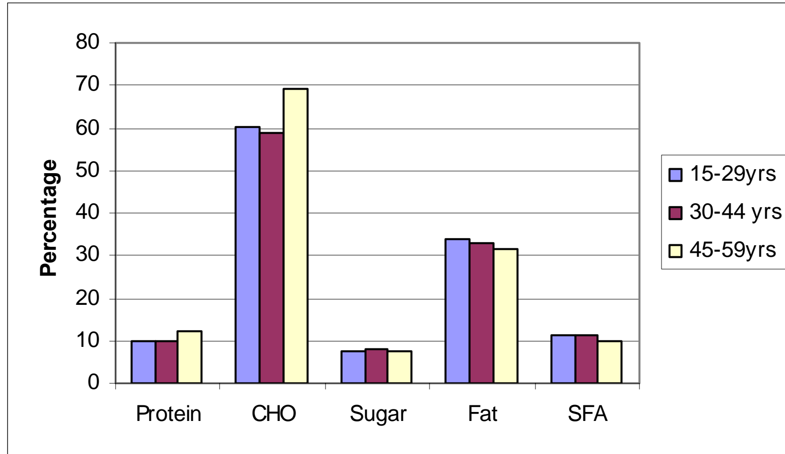


Figure 8.3.8: Macronutrient distribution of Kenyan adult women by age group

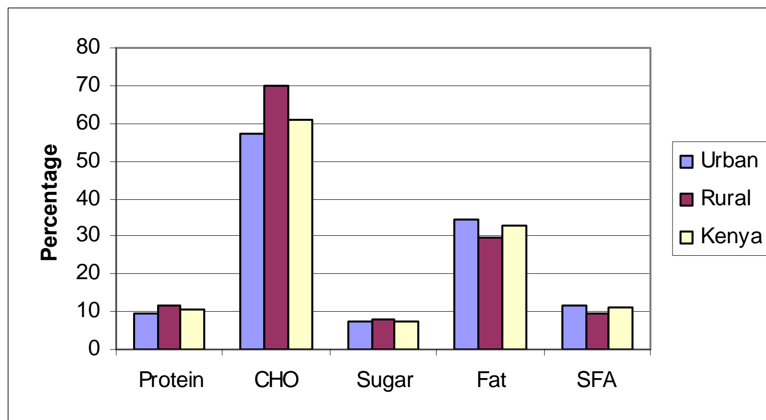


Figure 8.3.9: Macronutrient distribution of Kenyan adult women by area

Table 8.3.39: Commonly consumed food items in the Kenyan diet by 24hour recall of normal (n=1008) and pregnant women (n=53)

| **Food item** | **% Consuming the food** | **Average g/person/day of consumers only** | **Average g/ person per capita** |
|---|---|---|---|
| Tea | 93.8 ( 94.0) | 608.4 (610.8) | 570.4 (574.4) |
| White sugar | 87.5 (87.4) | 27.5 (27.5) | 24.1 (24.1) |
| Full cream milk | 86.6 (87.4) | 123.0 (123.1) | 106.5 (107.6) |
| Cooking fat | 73.5 (73.3) | 21.7 (21.7) | 15.9 (15.9) |
| Maize porridge | 67.8 (67.4) | 283.2 (282.7) | 191.9 (190.6) |
| Kale | 47.3 (47.4) | 154.6 (154.6) | 73.2 (73.3) |
| White bread | 45.9 (45.6) | 87.5 (87.4) | 40.2 (39.8) |
| Hard margarine | 38.9 (39.4) | 21.5 (21.6) | 8.4 (8.5) |
| Beef gravy | 28.3 (28.2) | 118.9 (119.4) | 33.2 (33.6) |
| Rice | 28.4 (27.8) | 158.7 (158.4) | 43.5 (43.9) |
| Githeri * | 26.2 (25.4) | 251.3 (249.3) | 66.6 (65.8) |
| Banana | 24.0 (24.0) | 117.7 (117.2) | 28.0 (28.1) |
| Vegetable oil | 20.0 (19.6) | 20.6 (20.8) | 4.0 (4.1) |
| Cabbage cooked | 19.3 (19.1) | 126.4 (83.2) | 24.1 (16.1) |
| Pancakes | 19.1 (19.4) | 82.6 (122.8) | 15.6 (23.4) |
| Sorghum | 16.0 (15.2) | 424.5 (434.9) | 67.0 (66.1) |
| Fish | 15.9 ( 14.8) | 221.8 (214.0) | 17.9 (16.8) |
| Chapati | 12.4 (12.4) | 135.7 (136.5) | 16.4 (16.9) |
| Oranges | 12.1 (11.7) | 164.4 (163.6) | 19.6 (19.2) |
| Dry beans & lentils+ | 40.8 (39.9) | | |

*maize, beans & tomato; ( )= pregnant women; % + = legumes including githeri

Table 8.3.38: Commonly consumed food items in the Kenyan diet by 24 hour recall at breakfast

| **Food item** | **% Consuming the food** | **Average g/person/day of consumers only** | **Average g/ person per capita** |
|---|---|---|---|
| Tea | 88 | 394.5 | 348.7 |
| White sugar | 83 | 16.4 | 13.6 |
| Full cream milk | 81 | 68.9 | 56.0 |
| White bread | 43 | 79.1 | 34.0 |
| Hard margarine | 36 | 19.0 | 6.8 |
| Pancakes | 11 | 82.3 | 9.4 |
| Brown bread | 6 | 70.6 | 4.0 |
| Chapati | 5 | 109.4 | 5.3 |
| Maize porridge | 5 | 238.7 | 11.4 |
| Banana | 5 | 107.3 | 4.8 |
| Cooking fat | 5 | 10.6 | 0.5 |
| Eggs | 5 | 74.2 | 3.3 |

Table 8.3.39: Commonly consumed food items in the Kenyan diet by 24 hour recall at lunch

| **Food item** | **% Consuming the food** | **Average g/person/day of consumers only** | **Average g/ person per capita** |
|---|---|---|---|
| Cooking fat | 54 | 14.0 | 7.4 |
| Maize porridge | 30 | 207.7 | 61.8 |
| Kale | 19 | 132.8 | 24.6 |
| Githeri | 17 | 233.5 | 38.9 |
| Rice | 14 | 153.7 | 20.6 |
| Vegetable oil | 12 | 13.4 | 1.6 |
| Beef gravy | 11 | 106.7 | 12.1 |
| Tea | 10 | 334.4 | 34.8 |
| Full cream milk | 10 | 56.0 | 5.8 |
| White sugar | 10 | 15.8 | 1.6 |

Table 8.3.40: Commonly consumed food items in the Kenyan diet by 24 hour recall at dinner

| **Food item** | **% Consuming the food** | **Average g/person/day Of consumers only** | **Average g/ person per capita** |
|---|---|---|---|
| Cooking fat | 58 | 13.4 | 7.8 |
| Maize porridge | 51 | 218.2 | 111.9 |
| Kale | 32 | 144.9 | 46.5 |
| Full cream milk | 20 | 76.3 | 15.1 |
| Tea | 19 | 315.9 | 60.2 |
| Beef gravy | 19 | 105.4 | 20.0 |
| White sugar | 17 | 12.6 | 2.1 |
| Vegetable oil | 14 | 14.2 | 2.0 |
| Rice | 13 | 145.0 | 18.4 |
| Cabbage cooked | 12 | 118.3 | 13.6 |
| Githeri | 9 | 216.8 | 19.8 |

Table 8.3.41: Commonly consumed food items in the Kenyan diet by 24 hour recall between meals

| **Food item** | **% Consuming the food** | **Average g/person/day of consumers only** | **Average g/ person per capita** |
|---|---|---|---|
| White sugar | 50 | 13.3 | 6.7 |
| Full cream milk | 45 | 66.4 | 29.6 |
| Tea | 42 | 304.1 | 126.7 |
| Sorghum | 14 | 345.8 | 48.4 |
| Banana | 11 | 118.9 | 12.9 |
| White bread | 7 | 57.3 | 4.4 |
| Pancakes | 7 | 65.5 | 4.7 |
| Hard margarine | 6 | 16.6 | 1.0 |

Table 8.3.42: Average intake of spreads in the diet of Kenyan women by means of a 24-hour dietary recall

| Food item | % Consuming the food | Average g/person/day of consumers only | Average g/ person per capita |
|---|---|---|---|
| Cooking fat | 74 | 21.7 | 15.9 |
| Brick margarine | 39 | 21.5 | 8.4 |
| Vegetable oil | 20 | 20.6 | 4.0 |
| Jam | 4 | 34.1 | 1.2 |
| Sunflower oil | 0.8 | 28.3 | 0.2 |

**Buying practices of Kenyan women**

Results from the BASQ indicate that the average household comprised 2.5 adults and 1.8 children (Table 8.3.43). A household used an average of 4 breads per week of which 3.3 were white loaves (Table 8.3.44). The average household also used 1157.4 g flour per week. In terms of spreads, a household used 171.9 g margarine, 418.1 g cooking fat, and 242.3 g of oil per week (Table 8.3.45). This amounts to 45.6 g margarine, 111.7 g cooking fat and 60.1 g oil per person per week, and 31 g per person per day of fats. Jam, honey, and peanut butter were also commonly consumed, and 14% used avocado as a spread.

The usual meal pattern of the women was a three meal a day pattern (83.1%), while 33.2% had one snack and 27.5% had 2 snacking periods (Table 8.3.46). The majority of women (90%) indicated that they have breakfast every weekday and 97% indicated that they have breakfast every Saturday and Sunday (Table 8.3.47). The most popular foods and beverages consumed at breakfast 4-7 times a week are tea with milk (77.3%), and bread (51.7%) with margarine (43.6%) (Table 8.3.48). About 22% have cooked porridge. The most popular items consumed at breakfast 1-3 times a week are cooked porridge (35%), chapatis (48%), mandazi (fat cakes) (32.1%) and fried egg (31.5%). Regarding the making of flour products, it is clear that 63.6% make chapattis 1-3 times a week and 20.2% make pancakes (Table 8.3.49).

Bread is eaten at breakfast by 88.9% of women and as a morning snack by 11.1% (Table 8.3.50). The usual amount of bread eaten for breakfast is 3-4 slices and at the morning break 2 slices. Predominantly white bread is eaten (> 80%). Table 8.3.51 gives a table of the frequency of food items eaten. The most commonly eaten vegetables over the past week were green leafy vegetables eaten by 94.8% who consumed it more than once (89.2%). This was followed by tomatoes (94.6%), potatoes (84.1%), cabbage (82.7%) and

carrots (70.5%). Beef was consumed by 75.5% more than once a week and fish by 41.7% once a week and by 18.8% more than once a week. Dry beans were consumed by 73.7% and more than once a week by 45.9%. Furthermore, lentils and dry peas were consumed by 16.6% more than once a week. Legumes in total made a large contribution to the diet. Maize was most commonly consumed by 91.2% and more than once by 84.1%. Rice was consumed by 85.2%, githeri (maize, tomato, and beans) by 77.2% and millet by 23.4%.

Table 8.3.43: Frequency distribution of adults and children in the Kenyan households studied according to the BASQ (n=1008)

| Number | No. adults | % adults | No. children | % children |
|---|---|---|---|---|
| 0 | 14 | 1.4 | 221 | 21.9 |
| 1-2 | 617 | 61.2 | 734 | 50.9 |
| 3-4 | 301 | 29.9 | 216 | 21.4 |
| 5-6 | 52 | 5.2 | 46 | 4.6 |
| 7+ | 24 | 2.4 | 12 | 1.19 |
| **Average/household** | 2.5 persons | | 1.8 children | |
| SE | 0.06 | | 0.06 | |
| 95% CI | 2.4-2.7 | | 1.7-1.9 | |

BASQ=breakfast and spreads questionnaire; CI=confidence interval

Table 8.3.44: Amount of bread and flour used by Kenyan families (n=1008) in the past 7 days using the BASQ

| Loaves | White bread | Brown bread | Whole-wheat | Total bread |
|---|---|---|---|---|
| 0 | 259 (25.7%) | 898 (89.1%) | 960 (95.2%) | |
| 1-2 | 487 (22.6%) | 36 (3.6%) | 15 (1.5%) | |
| 3-4 | 223 (22.1%) | 33 (3.3%) | 8 (0.8%) | |
| 5-6 | 31 (3.1%) | 5 (0.5%) | 4 (0.4%) | |
| 7+ | 267 (26.4%) | 36 (3.6%) | 21 (2.1%) | |
| **Mean loaves** | 3.3 | 0.5 | 0.2 | 4.0 |
| SE | 0.2 | 0.1 | 0.1 | 0.2 |
| 95% CI | 3.0-3.6 | 0.3-0.6 | 0.1-0.3 | 3.7-4.4 |
| **Mean flour (g)** | 1157.4 | | | |
| SE | 66.2 | | | |
| 95% CI | 1024.0-1291.7 | | | |

BASQ=breakfast and spreads questionnaire; CI=confidence interval

Table 8.3.45: Percentage Kenyan (n=1008) users of spreads* in the past 7 days (BSAQ)

| Grams | Margarine | Cooking fat | Oil | Other spreads= 384 consumers |
|---|---|---|---|---|
| None | 336 (33.3%) | 189 (18.8%) | 587(58.2% | |
| 1-<100 | 55 (5.5%) | 9 (0.9%) | 5 (0.5%) | Jam = 40.9%<br>Honey =22.1%<br>Peanut butter =15.8%<br>Avocado = 14.3%<br>Butter= 3.9% |
| 100-<200 | 173 (17.2%) | 40 (4.0%) | 31 (3.1%) | |
| 200-<300 | 304 (30.2%) | 215 (21.3% | 68 (6.7%) | |
| 300-<400 | 21 (2.1%) | 27 (2.7%) | 60 (6.0%) | |
| 400-<500 | 2 (0.2%) | 10 (1.0%) | 4 (0.4%) | |
| 500-<1000 | 104 (10.3) | 383 (38.0% | 162(16.1% | |
| 1000+ | 13 (1.3%) | 135 (13.4% | 91 (9.0%) | |
| **Mean/household** | 171.9 | 418.1 | 242.3 | |
| SE | 9.0 | 17.3 | 23.2 | |
| CI | 153.8-189.9 | 383.3-452.8 | 195.6-289 | |
| **Mean / person** | 45.6 | 111.7 | 60.1 | |
| SE | 2.5 | 4.5 | 6.6 | |
| CI | 40.6-50.6 | 102.8-121 | 46.9-73.4 | |

* Percentages are given of those households that used spreads
BASQ=breakfast and spreads questionnaire; CI=confidence interval

Table 8.3.46: Usual meal pattern of the Kenyan participants

| Usual meal pattern | % Participants (n=991) |
|---|---|
| 3 meals a day | 825 (83.1%) |
| 2 meals a day | 158 (15.9%) |
| 1 meal a day | 10 (1.0%) |
| **Usual snacking pattern** | |
| None | 309 (31.1%) |
| 1 snack time | 330 (33.2%) |
| 2 or more snack times | 273 (27.5%) |
| 3 or more snack times | 60 (6.0%) |
| Saturday and Sunday | 21 (2.1%) |

Table 8.3.47: Usual breakfast habits of the Kenyan participants

| No. weekdays breakfast usually eaten | % Participants (n=989) |
|---|---|
| Never | 6 (0.6%) |
| 1-2 days | 31 (3.1%) |
| 3-4 | 57 (5.8%) |
| Everyday | 897(90.5%) |
| **No. weekend days breakfast is eaten** | |
| Never | 8 (0.8%) |
| Only Saturdays | 6 (0.6%) |
| Only Sundays | 16 (1.6%) |
| Both | 959(97.0%) |

Table 8.3.48: Foods usually eaten for breakfast by the Kenyan participants

| Food/beverage | None or rarely | 1-3x week | 4-7 times week |
|---|---|---|---|
| Tea (without milk) | 69.6 | 19.7 | 10.6 |
| Tea with milk | 8.7 | 14.0 | 77.3 |
| Coffee (without milk) | 88.8 | 9.2 | 2.0 |
| Coffee with milk | 89.7 | 8.1 | 2.2 |
| Chocolate | 76.7 | 18.7 | 4.7 |
| Instant cereal | 95.1 | 4.2 | 0.7 |
| Milk on cereal | 78.2 | 15.2 | 6.6 |
| Cooked porridge without spread | 54.8 | 27.0 | 18.3 |
| Cooked porridge with spread | 88.0 | 8.0 | 4.0 |
| Bread | 17.7 | 30.7 | 51.7 |
| Chapati* | 48.4 | 48.0 | 3.6 |
| Mandazi+ | 61.6 | 32.1 | 6.3 |
| Bread with butter | 97.9 | 1.2 | 0.9 |
| With margarine | 33.6 | 22.8 | 43.6 |
| Peanut butter | 94.1 | 3.2 | 2.7 |
| Jam | 85.9 | 7.1 | 6.9 |
| Other | 87.0 | 9.0 | 4.0 |
| Egg boiled | 85.5 | 13.4 | 1.1 |
| Egg fried | 64.7 | 31.5 | 3.8 |
| Fruit | 73.0 | 13.8 | 13.2 |
| Meat not fried | 96.8 | 2.9 | 0.3 |
| Meat fried | 91.5 | 7.5 | 1.0 |
| Left-overs | 59.1 | 26.8 | 14.1 |
| Other | 82.6 | 15.1 | 2.3 |

* Known as roti in RSA; +known as fat cakes in RSA;

Table 8.3.49: Homemade cooking of flour products by the Kenyan participants

| Food/beverage | None or rarely | 1-3x week | 4-7 times week |
|---|---|---|---|
| Mandazi | 81.4 | 17.6 | 1.0 |
| Pancakes | 78.0 | 20.2 | 1.8 |
| Chapati | 33.4 | 63.6 | 3.0 |
| Cookies biscuits | 97.5 | 2.3 | 0.2 |
| Margarine /oil used | 19.9 | 18.3 | 5.5 |
| 56.3 % indicated that they use margarine/oil, but did not indicate a frequency | | | |

Table 8.3.50: Use of bread by the Kenyan participants (n=1008)

| **Bread** | **Breakfast %** | **Morning snack %** | **Lunch %** | **Afternoon snack %** | **Dinner %** | **After dinner %** |
|---|---|---|---|---|---|---|
| Percentage who ate bread | 88.9 | 11.1 | 3.1 | 13.0 | 1.0 | 0.01 |
| **Type of bread** | | | | | | |
| White | 87.1 | 84.8 | 83.9 | 85.5 | 91.7 | 100 |
| Brown | 8.9 | 11.6 | 6.5 | 12.2 | 8.3 | 0 |
| Whole wheat | 4.0 | 3.6 | 9.7 | 2.3 | 0 | 0 |
| **No. of slices** | | | | | | |
| None | 11.1 | 88.9 | 96.9 | 87.0 | 99.0 | 99.09 |
| 1 | 1.8 | 5.3 | 6.5 | 9.2 | 25.0 | 0 |
| 2 | 19.6 | 48.7 | 25.8 | 56.5 | 0 | 28.6 |
| 3 | 29.9 | 26.6 | 29.0 | 15.3 | 41.7 | 28.6 |
| 4 | 39.8 | 15.0 | 22.6 | 17.6 | 16.7 | 42.9 |
| 5+ | 8.8 | 4.4 | 16.1 | 1.5 | 16.7 | 0 |
| **Type spread** | | | | | | |
| Margarine | 80.7 | 79.7 | 74.2 | 84.0 | 91.7 | 71.4 |
| Butter | 2.8 | 2.7 | 0 | 1.6 | 0 | 14.3 |

Table 8.3.51: Foods eaten in past 7 days by Kenyan participants (n=1008)

| **Food** All columns calculated as n/1008 | **% Subjects who consumed the food** | **% Who ate it more than once** | **% Who added Margarine** | **Cooking fat added (%)** | **Oil added or fried (%)** | **Avocado added (%)** |
|---|---|---|---|---|---|---|
| **Vegetables/tubers** | | | | | | |
| Arrowroot | 18.01 | 5.6 | 0.0 | 0.6 | 2.7 | 0 |
| Cassava | 9.4 | 2.8 | 0.0 | 0.0 | 1.6 | 0 |
| Potatoes | 84.1 | 71.8 | 2.6 | 19.8 | 55.9 | 0.4 |
| Plantains | 51.8 | 31.3 | 2.5 | 7.7 | 34.6 | 0 |
| Sweet potatoes | 39.5 | 13.8 | 0.1 | 0.9 | 4.2 | 0 |
| Yams | 7.1 | 2.1 | 0.0 | 0.2 | 1.7 | 0.1 |
| Broccoli | 2.2 | 1.1 | 0.1 | 0.0 | 1.2 | 0 |
| Brinjals | 8.8 | 5.7 | 0.0 | 0.6 | 7.0 | 0 |
| Cabbage | 82.7 | 60.6 | 0.7 | 19.7 | 60.9 | 0.1 |
| Carrots | 70.5 | 60.6 | 0.6 | 15.4 | 50.3 | 0.1 |
| Cauliflower | 3.5 | 2.3 | 0.0 | 0.0 | 0.1 | 0 |
| Baby marrows | 5.8 | 3.1 | 0.0 | 0.5 | 4.5 | 0 |
| French beans | 11.7 | 4.6 | 0.2 | 0.9 | 10.2 | 0 |
| Green peas | 30.9 | 16.3 | 0.9 | 9.6 | 17.7 | 0 |
| Snow peas | 1.8 | 0.7 | 0.0 | 0.3 | 1.1 | 0 |
| Green leafy vegetables | 94.8 | 89.2 | 0.2 | 72.6 | 71.3 | 1.3 |
| Fresh maize | 20.9 | 11.1 | 0.0 | 1.8 | 4.5 | 0 |
| Pumpkin | 15.8 | 6.9 | 0.6 | 2.2 | 0.1 | 0 |
| Tomatoes | 94.6 | 93.5 | 0.1 | 75.6 | 71. | 0.1 |
| Other :onions | 2.8 | 2.3 | 0.0 | 0.0 | 1.0 | 0 |
| Other: pigeon peas | | | | | | |
| **Meat & legumes** | | | | | | |
| Beef | 75.5 | 73.3 | 0.1 | 13.9 | 59.4 | 0 |
| Mutton | 6.1 | 2.2 | 0.0 | 2.9 | 2.7 | 0 |
| Chicken | 26.2 | 5.3 | 0.0 | 3.6 | 21.9 | 0 |
| Fish | 41.7 | 18.8 | 0.1 | 5.1 | 35.5 | 0 |
| Goat | 12.9 | 5.3 | 0.0 | 4.8 | 7.3 | 0 |
| Dry beans | 73.7 | 45.9 | 0.0 | 14.7 | 55.0 | 0 |
| Dry peas | 13.8 | 7.3 | 0.2 | 1.7 | 10.9 | 0 |
| Lentils | 22.0 | 9.3 | 0.0 | 1.0 | 19.7 | 0.1 |
| **Cereals** | | | | | | |
| Millet | 23.4 | 19.4 | 0.6 | 0.4 | 1.0 | 0 |
| Sorghum | 7.6 | 6.4 | 0.3 | 0.0 | 0.3 | 0 |
| Wheat | 63.0 | 29.6 | 0.7 | 12.4 | 43.7 | 0 |
| Maize | 91.2 | 84.1 | 0.2 | 1.2 | 2.8 | 0.1 |
| Mixed cereals | 37.2 | 34.3 | 3.0 | 0.3 | 1.1 | 0.1 |
| Githeri | 77.2 | 46.2 | 0.9 | 15.3 | 50.4 | 4.6 |
| Rice | 85.2 | 58.3 | 3.1 | 14.3 | 53.3 | 1.4 |
| Oats | 1.3 | 1.0 | 0.2 | 0.0 | 0.2 | 0 |
| Other ** | 11.0 | 7.1 | 1.3 | | 0.6 | 0.3 |

* maize, beans, tomatoes **cow peas (1), green grams (4), mukimo (94), omena (1), pasta (5), porridge flour (2)

### 8.3.3 Nigeria dietary results (not yet available)

### 8.3.4 Comparison of countries

Figure 8.4.1 illustrates clearly the main differences between RSA and Kenya with regard to macronutrient intakes. The NAR for energy is very similar in both countries and lies at about 80%. It should however be kept in mind that the dietary recall method used in these studies is known to underestimate dietary intake and may not necessary be because of low intake alone. In RSA, protein and zinc NARs are above 100% while they lie at about 80% in Kenya. The lower intakes of these nutrients are most likely due to the low intake of animal protein by the Kenyan women. Iron intake on the other hand is considerably higher in Kenya and the NAR lies above 100%. This is most probably due to the high intake of legumes (46% more than once a week) by Kenyan women. In RSA, the NAR for iron is less than 50% mainly due to the low intake of animal products and legumes.

In both countries, the NAR for calcium is less than 50%, mainly due to the low intake of dairy products. The latter do appear on the lists of commonly used items. However, the amounts consumed are low since they are used mainly in tea and coffee. It was observed that Kenyan women mainly used whole fresh milk while South African women used fresh milk and powdered milk. The latter sometimes being skim milk, blends and non-dairy creamers.

With the exception of vitamins A, C and B12, all micronutrients have NAR values less than 100% (Figure 8.4.2). Overall, in RSA, NARs are higher than those of Kenya, with the exception of vitamin C and vitamin A. The latter are higher in Kenya because of the higher intake of fruits and vegetables (239 g vs. 205 g) in Kenya. However, in both countries this intake is about 40% to 50% less than the 400 g recommended by the WHO (8). South Africans have lower intakes of fruits and vegetables and less variety than the Kenyans have. In RSA, micronutrients having the lowest NARs were vitamin D, folate, and vitamin B6. In Kenya, they were vitamin D, niacin, and vitamin B6, which all have NARs below 50%. Since vitamin D can be manufactured by the body with modest exposure to sunshine (32), it may appear that this vitamin is unlikely to be deficient in the adults studied. However, it should be considered that vitamin D deficiency is still a possibility in urban areas in women who spend most of their time indoors. This finding also needs to be considered in the light of the very low calcium levels found in the

present study since calcium is also involved in the maintenance of healthy bones and teeth.

With regard to macronutrient distribution (Figure 8.4.3) and contribution to energy intakes, it should be noted that RSA had a higher contribution of free sugar and protein intakes while Kenyans had a higher contribution of fat and saturated fats. Fat and saturated fat intake levels in the RSA diet met the WHO recommendations for contributing less than 30% and less than 10% of energy, respectively. The higher fat and saturated fat intake in Kenya may be due to a few reasons. Firstly, the RSA fat intakes possibly may be underestimated, since there was less focus on intakes of fat and other spreads. Secondly, it is very likely that Kenyan women buy more margarine and cooking fat because of the type of packaging and accessibility of fat sources. In South Africa, hard margarine is only available in paper wrapping while in Kenya it is sold in a convenient plastic tub. This makes it easier to store when families do not have a refrigerator. Thirdly, in Kenya margarine can be purchased in small amounts of 25 g. This is very convenient for families who do not have fridge and are unable to afford a large margarine size. Accessibility of fats was noticed in Kenya where local dealers sell small packets of self-wrapped fat and oil. Usually these were decanted from very large containers and are difficult to identify by brand name.

South African and Kenyan urban participants have the highest FVS mean scores (8.7; 7.8) respectively, indicating that about 8 different food items are consumed daily (excludes tea/coffee, sweets & cold drinks) (Figure 8.4.4). South African and Kenyan DDS mean values are very similar and range from 4 to 5 out of 9 possible groups. Rural South African women have a very low mean DDS of 3.3. A similar trend is followed with mean MAR values. It is highest in urban South African subjects (63.4%) and lowest in South African rural participants (55.9%) (Figure 8.4.5).

Mean salt intake is highest in urban South African women (4669 mg) followed by urban Kenyan subjects (3492 mg) (Figure 8.4.6). It is lowest in rural Kenyan women (1392 mg). Potassium intakes are similar in both countries and lie at about the minimum requirement for health.

The mean values of the omega-6 to omega-3 fatty acids in this study are very high and far above that recommended. This can be mainly attributed to the finding that women had a normal intake of omega-6 fatty acids but a very low intake of the omega-3 fatty acids. However, it should be noted that many participants were unable to identify the type of vegetable oils or fats, which they consumed. Consequently, much of the oil intake was classified as vegetable oil that contains mainly sunflower and peanut oil (high in omega-6 fatty acids) and less corn, canola and soybean oil, which are richer sources of omega-3 fatty acids. Hence, it is likely that the alpha-linolenic intake may have been underestimated. Overall, however, the intake of omega-3 fatty acids appeared to be low, particularly in RSA. Another finding was the fact that fatty fish (high in omega-3 fatty acids) were not consumed regularly by the majority of women. Only 18.8% of women in Kenya had a serving of fish more than once a week and this was lower in South Africa. However, it is necessary to keep in mind that because the Kenyan food tables do not include omega-3 fats it is certain that these fats were underestimated to some extent.

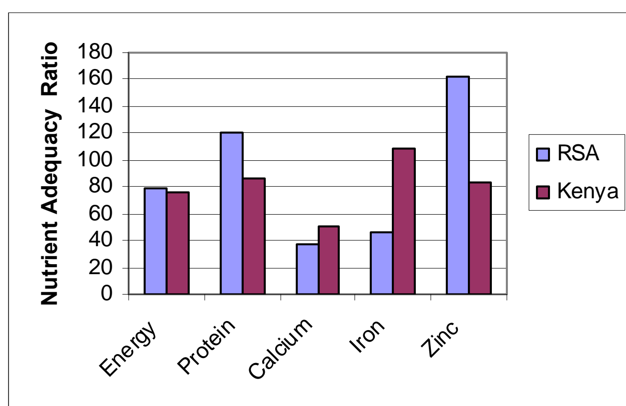


Figure 8.4.1: A comparison of nutrient adequacy ratios of macronutrients of RSA and Kenya

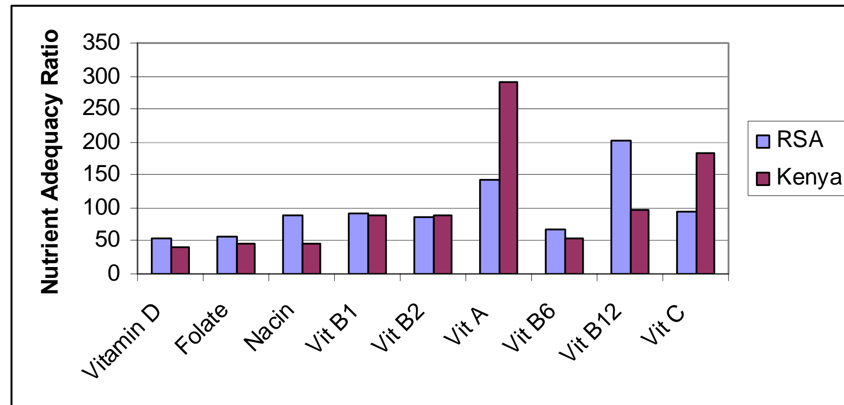


Figure 8.4.2: A comparison of nutrient adequacy ratios of micronutrients of RSA and Kenya

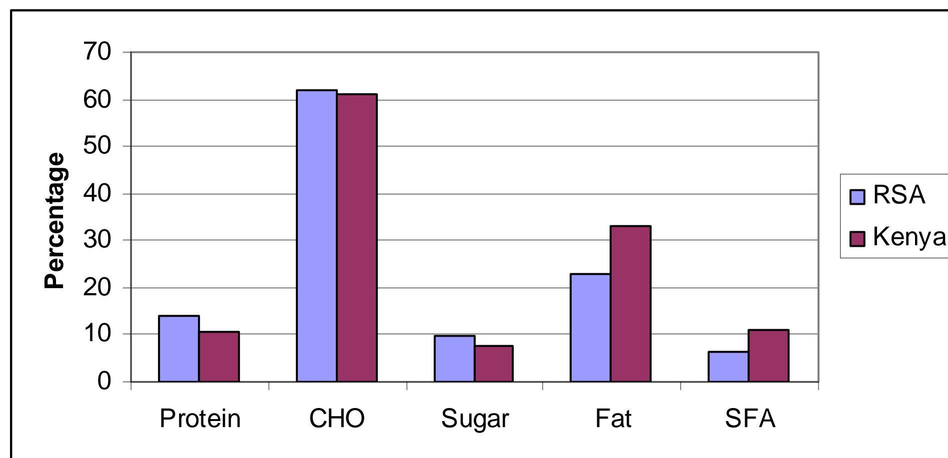


Figure: 8.4.3: A comparison of macronutrient contribution to energy intake of South African and Kenyan participants

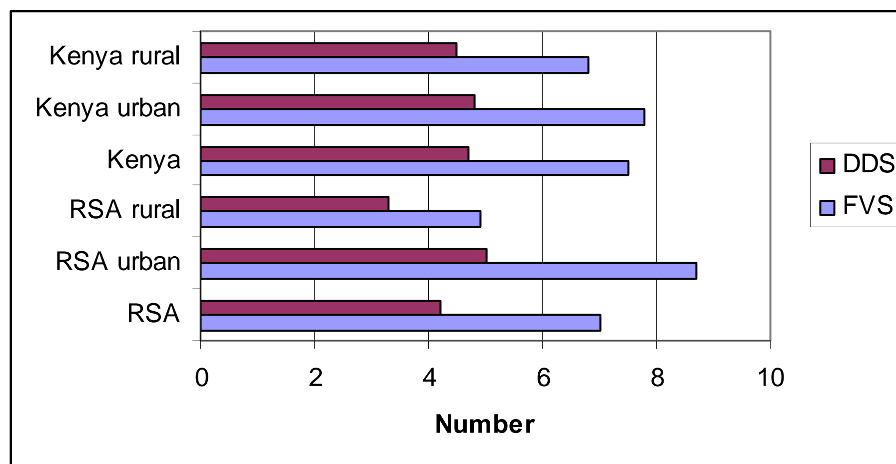


Figure 8.4.4: The mean dietary diversity score (DDS) and food variety scores (FVS) of participants in South Africa (RSA) and Kenya

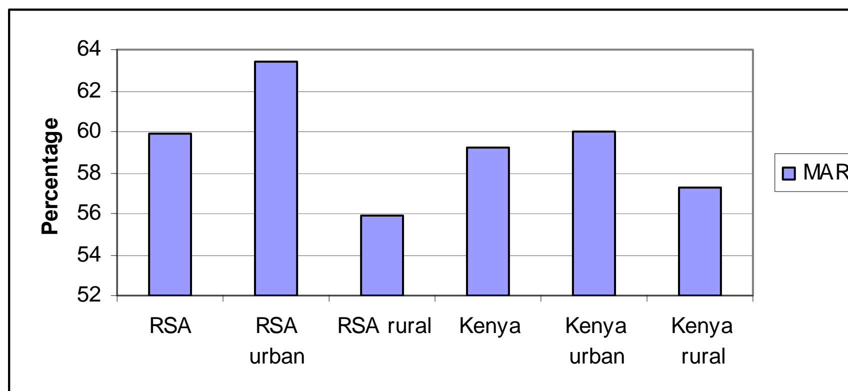


Figure 8.4.5: Mean adequacy ratios (MAR) of participants in South Africa (RSA) and Kenya

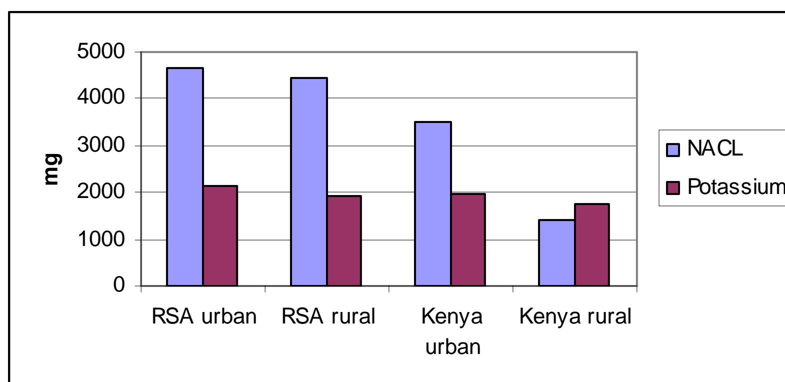


Figure 8.4.6: Mean salt (NACL) and potassium values of participants in South Africa and Kenya

## 8.5 Repeatability of the data

Table 8.4.1 and 8.4.2 present data on the sample of women who had been reassessed by the supervisors of the teams. There was a significant difference only in weight measurements between the first and second measurements. However this is probably due to the small standard deviation found. A correlation between the two weights is highly significant at 0.999. Data for the dietary data indicates that no significant differences were found in nutrients between the first and second ones, which indicate that reliability was ensured.

Table 8.4.1: Anthropometric data on the sample (n=104) which was repeated using a paired t-test

| Variable | Mean | SD | LCI | UCI | P value t-test* | Pearson's r value** |
|---|---|---|---|---|---|---|
| Weight 1 kg | 64.78 | 15.58 | 61.75 | 67.82 | | |
| Weight 2 kg | 64.98 | 15.63 | 61.94 | 68.02 | | |
| Weight difference | 0.19 | 0.61 | 0.07 | 0.31 | 0.002* | 0.999* |
| Height 1 cm | 161.09 | 5.60 | 160.00 | 162.18 | | |
| Height 2 cm | 160.31 | 11.69 | 158.04 | 162.58 | | |
| Height difference | -0.78 | 9.67 | -2.67 | 1.10 | 0.413 | 0.568* |
| Waist 1 cm | 79.94 | 9.99 | 77.97 | 81.92 | | |
| Waist 2 cm | 80.06 | 9.95 | 78.09 | 82.03 | | |
| Waist difference | 0.12 | 0.58 | 0.004 | 0.23 | 0.04 | 0.998* |
| Hip 1 cm | 100.92 | 9.77 | 99.01 | 102.83 | | |
| Hip 2 cm | 100.89 | 9.75 | 98.98 | 102.80 | | |
| Hip difference | -0.03 | 0.53 | -0.13 | 0.07 | 0.57 | 0.998* |
| BMI 1 $kgm^2$ | 25.02 | 6.44 | 23.8 | 26.27 | | |
| BMI 2$kgm^2$ | 26.86 | 19.93 | 23.98 | 30.73 | | |
| BMI difference | 1.83 | 18.49 | -1.76 | 5.43 | 0.3143 | 0.377* |

SD=standard deviation; LCI=lower confidence interval; UCI=upper confidence interval;
* p<0.01; ** Pearsons correlation coefficient

Table 8.4.2: Dietary data on the sample which was repeated using the paired t-test (n=104)

| Variable | Mean | SD | LCI | UCI | P value t-test |
|---|---|---|---|---|---|
| Energy (kJ) | -225.6 | 1760.9 | -566.4 | 115.1 | 0.192 |
| CHO (g) | -8.4 | 86.8 | -25.2 | 8.4 | 0.325 |
| Protein (g) | -1.1 | 15.0 | -4.0 | 1.8 | 0.455 |
| Animal protein | -0.3 | 7.9 | -1.8 | 1.2 | 0.667 |
| Plant protein(g) | -0.7 | 5.2 | -1.7 | 0.3 | 0.193 |
| Fat (g) | -0.7 | 18.4 | -4.3 | 2.8 | 0.697 |
| MUFA (g) | -0.3 | 6.3 | -1.5 | 0.9 | 0.644 |
| PUFA(g) | -0.7 | 6.7 | -1.9 | 0.6 | 0.296 |
| SFA (g) | 0.02 | 5.6 | -1.1 | 1.1 | 0.966 |
| Cholesterol(mg) | 2.9 | 82.5 | -13.0 | 18.9 | 0.714 |
| Sugar (g) | -3.5 | 26.9 | -8.7 | 1.67 | 0.181 |
| Fibre (g) | -0.1 | 4.4 | -0.9 | 0.7 | 0.792 |
| Calcium (mg) | 16.0 | 325.4 | -46.9 | 78.9 | 0.615 |
| Iron (mg) | -4.4 | 33.2 | -10.9 | 1.9 | 0.172 |
| Zinc (mg) | -0.1 | 1.4 | -0.3 | 0.2 | 0.638 |
| Magnesium (mg) | -7.5 | 103.7 | -27.7 | 12.8 | 0.467 |
| Selenium (ug) | 0.1 | 11.5 | -2.2 | 2.3 | 0.953 |
| w-6:w-3 ratio | 0.4 | 11.5 | -1.9 | 2.7 | 0.733 |
| Folate (ug) | 3.1 | 64.2 | -9.4 | 15.5 | 0.623 |
| Niacin (mg) | -0.2 | 2.9 | -0.8 | 0.4 | 0.502 |
| Riboflavin (mg) | 0.03 | 0.6 | -0.1 | 0.14 | 0.538 |
| Thiamine (mg) | -0.004 | 0.3 | -0.1 | 0.05 | 0.877 |
| Vitamin A (RE) | 102.9 | 1408.1 | -169.5 | 375.5 | 0.455 |
| Vitamin B6 (mg) | -0.01 | 0.3 | -0.06 | 0.03 | 0.554 |
| Vitamin C (mg) | -0.1 | 27.2 | -5.4 | 5.2 | 0.967 |
| Vitamin B12 (ug) | 1.2 | 13.2 | -1.3 | 3.7 | 0.35 |
| Vitamin E(mg) | -0.2 | 4.4 | -1.1 | 0.6 | 0.581 |
| Vitamin K(mg) | 0 | 0 | 0 | 0 | 0 |
| Vitamin D | 0.1 | 0.5 | 0.0 | 0.2 | 0.0453 |

SD=standard deviation; LCI=lower confidence interval; UCI=upper confidence interval

# 9. Discussion and recommendations

Concerning the nutrition transition and the nutritional intake of women in both countries, certain important steps need to be considered. Firstly, the nutrient density of the diet in both countries could be vastly improved by fortification, supplementation, and/or health promotion. South Africa has already followed this route and has introduced mandatory fortification of the staple foods maize and wheat flour after the results of the NFCS (23) showed which nutrients were most deficient in the diet of children. Mandatory fortification was introduced in 2003. Currently, all maize and wheat flour in South Africa are fortified to provide a person 10 years and older with the following percentage of the RDA (per

200 g raw flour): vitamin A 31%; thiamine 25%; niacin 25%; vitamin B6 25%; riboflavin 17%; iron 25%; and zinc 20%. Unfortunately, calcium and folate have not been added to the recipe; mainly due to cost and organoleptic reasons.

Since mandatory fortification is not present in Kenya, independent manufacturers should take the initiative to fortify their products with micronutrients, which are clearly deficient in the diet. In the case of Kenya these would be: calcium, folate, vitamin B6, niacin, thiamine and riboflavin. Vitamin D would need to be reconsidered as an essential fortificant in margarine. Some consideration would also need to be given to iron and zinc. Adding important fortificants to margarine may be one way to ensure that a large group of the population receive additional essential nutrients. This however needs to be done very cautiously since ideally one would not wish to increase the overall fat intake of the adult population.

Another health promotion option introduced in South Africa has been the development and implementation of food-based dietary guidelines (33). One of the guidelines is to "Eat fats sparingly" (33). Ideally, one would like to prevent the dietary fat intake in both countries from exceeding current WHO recommendations in adults. Since a large percentage of women in both countries are overweight and there is an increase in chronic diseases in developing countries, this recommendation is a prudent one aimed at prevention (8).

This is particularly true for Kenya, where adult women are already exceeding the recommendation of more than 30% of energy intake. However, Wolmarans and Oosthuizen (34) have pointed out that eating fats sparingly does not mean a no-fat diet. They cite that fact that a very low fat diet contributes to under nutrition and stunting in children. This may indeed account for the high degree of stunting found in the rural areas of South Africa and Kenya. Furthermore, they remind one that a very-low fat diet may lead to the atherogenic lipoprotein phenotype, increasing the risk for coronary heart disease in adults. Hence, one has to be cautious when promoting spreads. For the majority of young children in both countries one would encourage a higher intake of fat. It is recommended that children younger than 2 years should have an intake of 30-40% of energy intake (9). It is likely that children under age 5 years should also have at least 30% of energy intake from fat.

It is recommended that the high intake of saturated fats in Kenya be reduced in order to promote cardiovascular health. This recommendation is one that can only be addressed by manufacturers of fats and oils since overall the intake of animal products was low in both countries and did not provide the bulk of the saturated fats. Since the current food composition tables which were used to do the dietary analysis do not contain trans fat values it has not been possible to determine the trans fat value of the diet. However, based on the products and processes used in the manufacture of hard margarine and cooking fat it is predicted that trans fat values will exceed the recommended amounts.

Another outcome of the study was the finding that in both countries the intake of omega-3 fatty acids was very low. One of the reasons for this is probably due to the fact that the main food items containing omega-3 fatty acids were not primary food sources ie. fatty fish, flaxseed oil, canola oil and soybean oil. From the Unilever perspective, it may be possible to look at the feasibility of including one of these oils in their spreads. However, considering the limitations of the food tables, it may be necessary to consider evaluating the fatty acid levels of the local fishes such as dagga (Tilapia).

The sodium intake in both countries was moderate to high and less than the recommended 2 g sodium per day. However, one still has to add discretionary salt that would account for an additional 45% of salt added after preparation (30). This increases the South African mean salt intakes to bordering on the maximum recommended levels (8). Because of its association with blood pressure and the benefits of a reduced salt intake, adults are recommended to keep their salt intake below 5 g salt per day. The highest contribution to non-discretionary salt intake in a study in South Africa was found to be (in descending order) bread, beef sausage, steak and kidney pies (commercial), soup reconstituted from powder and hard (brick margarine) (31). Since many of the food items eaten are similar in the two countries, it is likely that these food items may also add the most sodium to the Kenyan diet. Unilever health Institute could hence make an important health improvement by reducing the salt levels of margarine, meat extracts and soup powder. Another option would also be for Kenya to adopt a dietary guideline which is similar to the one in South Africa, namely: “use salt sparingly” (33). Unilever Health Institute could promote this guideline on its promotional materials provided its products met the necessary requirements.

In summary the following recommendations are made to Unilever Health Institute: (1) to improve the micronutrient content of margarine by adding vitamin B6, niacin, folate, riboflavin and thiamine to high/higher levels of the recommended intakes; (2) to reduce the total fat and saturated fat content of margarines and to eliminate as much trans fats as possible; (3) to reduce the sodium intake of the margarines in order to maintain low salt intakes in Kenyan woman and to reduce levels in South African women; In conjunction with this the intake of potassium can be promoted (among other benefits) by promoting a high intake of fruits and vegetables in order to attain 400 g per day, as recommended; (4) to increase the omega-3 fat content of the margarines (if feasible). From a social responsibility point of view Unilever Health Institute could ensure that its advertising includes certain essential messages regarding its spreads: 1) the fact that it includes added micronutrients; a low (or zero) trans content (2) has a reduced fat and saturated fat content; (3) has the added benefit of omega-3 fats; and (4) can be used more liberally in the diets of children under age 5 years, while adults should not increase their levels above 30% of energy intake. These messages should also be used in brochures and other health promotion materials.

While spreads, particularly margarine are an essential component of the modern western diet, these products should be manufactured and promoted in a socially responsible manner so that they make a valuable nutritional composition to the staple diet.

# 10. References

1. Standing Committee on Nutrition (SCN) United Nations System. Nutrition for improved development outcomes. 5th report on the world nutrition situation. Geneva: United Nations, 2004.
2. UNICEF 2000. The state of the world's children. New York: United Nations Children's Fund, 2000.
3. WHO. The prevalence of anaemia in women. A tabulation of available information. WHO/MCH/MSM/92.2. Geneva: World Health Organisation, 1992.
4. De Onis M, Blossner M. The World health Organization global database on child growth and malnutrition: methodology and applications. International Journal of Epidemiology 2003; 32: 518-26.
5. Food and Agricultural Organization. Food balance sheets, 2002. Rome: FAO. Available at: http://faostat.fao.org/
6. FAO/WHO. Fats and Oils in Human Nutrition. Report of a Joint Expert Consultation. Rome: Food and Agriculture Organisation of the United Nations, 1994.
7. Popkin BM. The nutrition transition and obesity in the developing world. Journal of Nutrition 2001; 131(3): 871S-873S.
8. WHO/FAO. Diet, Nutrition and the Prevention of Chronic Diseases. Report of a joint WHO/FAO expert consultation. Geneva: World Health Organization, 2003.
9. Ascherio A, Willett WC. Health effects of trans fatty acids. Am J Clin Nutr 1997;66: 1006S-1010S.
10. Nutrition Information Centre, University of Stellenbosch. Dietary Reference Intakes. Washington, National Academic Press, 2003.
11. United Nations International Children's Fund. The Kenyan Food Consumption Survey. Geneva: UNICEF, 2005.
12. Waudo J, Tuitkoek P, Msuya J, Kikafunda J. Food Consumption patterns, Nutrient Intakes and Food Nutritional status of Women and Children in the Lake Victoria Basis VicRes Report, 2005.
13. Bourne LT, Langenhoven ML, Steyn K, Jooste PL, Laubscher JA, Van der Vyfer E. Nutrient intake patterns in the urban African population of the Cape Peninsula, South Africa: the BRISK study. *Central Afr J Med* 1993; **39**: 238-248.
14. Bourne LT, Langenhoven ML, Steyn K, Jooste PL, Nesamvuni AE, Laubscher JA. The food and meal patterns in the urban African population of the Cape Peninsula, South Africa. *Central Afr J Med* 1994; **40**: 140-148.

15. Labadarios D, Steyn NP, Maunder E, MacIntyre U, Swart R, Gericke G, Huskisson J, Dannhauser A, Vorster HH, Nesamvuni AE. *The National Food Consumption Survey (NFCS): Children Aged 1-9 Years, South Africa, 1999*. Pretoria: Department of Health, 2000.
16. Steyn NP, Burger S, Monyeki KD, Alberts M, Nthangeni G. Variation in dietary intake of the adult population of Dikgale. *S Afr J Clin Nutr* 2001; **14**(4): 140-145.
17. Badenhorst CJ, *Steyn NP*, Jooste PL, Nel JH, Kruger M, Oelofse A, Barnard C. Nutritional status of Pedi schoolchildren aged 6 - 14 years in two rural areas of Lebowa: a comprehensive nutritional survey of dietary intake, anthropometric, biochemical, haematological and clinical measurements. *S Afr J Food Sci Nutr* 1993; **5:** 112-19.
18. Wolmarans P, Langenhoven ML, Benade AJS, Swanepoel ASP, Kotze TJvW, Rossouw JE. Intake of macronutrients and their relationship with total cholesterol and high density lipoprotein cholesterol: The Coronary Risk Factor Study, 1979. *S Afr Med J* 1988; **73**: 12-15.
19. Wolmarans P, Langenhoven ML, van Eck M, Swanepoel ASP. The contribution of food groups to the energy, fat and fibre intake of the Coronary Risk Factor Study (CORIS) population. *S Afr Med J* 1989; **75**: 167-171.
20. Tichelaar HY, *Steyn NP*, Nel JH, Smuts CM, van Jaarsveld PJ, Prinsloo JF, van Rooyen J, Lombard CJ, Dhansay MA, Benade AJS. Effect of catfish supplementation on the fatty acid status and growth of undernourished rural preschool children under 6 years of age: An intervention trial in Lebowa, South Africa. *Asia Pacific J Clin Nutr* 1999; **8(2):** 96-105.
21. Nel JH, Steyn NP. Report on South Africa Food Consumption Studies Undertaken Amongst Different Population Groups (1983-2000): Average Intakes of Foods Most Commonly Consumed, 2002 [Online]. Available: http://www.sahealthinfo.org/nutrition/scientific.htm [2005, January].
22. Steyn NP, Nel JH, Casey A. Secondary data analysis of dietary surveys undertaken in South Africa in order to determine usual food consumption of the population. *Public Health Nutrition*, 2003; **6(7):** 631-644.
23. Labadarios D, Steyn NP, Maunder E, MacIntire U, Swart R, Gericke G, Huskisson J, Dannhauser A, Vorster HH, Nesamvuni EA. The National Food Consumption Survey (NFCS): Children aged 1-9 years, South Africa, 1999. Pretoria: Department of Health, 2002.

24. Department of Health, South African Medical Research Council & Measure DHS+. South Africa Demographic and Health Survey 1998, Pretoria: Department of health, 2002. Full Report [Online]. Available: http://www.doh.gov.za/facts/sadhs-f.html [2005, July 20]. Available from URL: http://www.doh.gov.za/facts/1998/sadhs98/
25. Maziya- Dixon B, Akinyele IQ, Oguntona S, Sanusi RA, Harris E. Nigeria Food Consumption and Nutrition Survey (NFCNS), 2001-2003. International Institute of Tropical Agriculture. Ibadan, 2004.
26. Steyn NP, Senekal M, Norris S, Whati L, MacKeown J, Nel JH. Testing of 2-dimensional drawings and 3-dimensional food models to estimate food portion size in 12-13 year old children in Johannesburg. Asia Pacific J Clin Nutr 2005; !5:
27. Sehmi JK. National Food Composition Tables and the Planning of Satisfactory Diets in Kenya. Nairobi: Ministry of Health, 1993.
28. Hatloy A, Torheim LE, Oshaug A. Food variety-a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. European Journal of Clinical Nutrition 1998; 52:891-898.
29. FAO/WHO. Human vitamin and mineral requirements. Report of a joint FAO/WHO expert consultation. Rome, 2002.
30. Charlton KE, Jooste PL. Eat salt sparingly-sprinkle, don't shake. SAJCN 2001; 14 (3): S55- S63.
31. Charlton K, Steyn K, Levitt NS, Zulu J, Jonathan D, Veldman FJ, Nel JH. Diet and blood pressure in south Africa: intake of foods containng sodium, calcium, and magnesium in three ethnic groups. Nutrition 2005; 21: 39-50.
32. Food and Nutrition Board. Recommended Dietary Allowances. 10th ed. Washington: National Academy Press, 1989.
33. Vorster HH, Love P, Browne, C. Development of food-based dietary guidelines for South Africa-the process. SAJCN 2001; 14 (3): S3-S6.
34. Wolmarans P, Oosthuizen W. Eat fats sparingly-implications for health and disease. SAJCN 2001; 14 (3): S48-SS54.