*South African Journal of Clinical Nutrition* 2019;32(1):21–27
http://dx.doi.org/10.1080/16070658.2017.1415783

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**SAJCN**
ISSN 1607-0658 EISSN 2221-1268
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**RESEARCH**

# Nutritional status and food intake of women residing in rural and urban areas of Lesotho

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**Objective:** The socio-demography, anthropometry and food intake of women residing in rural and urban areas of Lesotho were determined.
**Design***:* Cross-sectional survey.
**Setting***:* Basotho women from four randomly selected villages in Maseru and Berea, which includes both urban and rural areas.
**Subjects***:* A total of 452 women were included in the study.
**Outcome** measures: Socio-demographic information was collected using a structured questionnaire completed in an interview with each participant. Standard methods were used to determine anthropometric measurements, while usual food intake was determined using a short unquantified food frequency questionnaire.
**Results:** A large percentage of participants were unemployed with a significantly higher percentage in urban compared with rural areas (65.5 vs. 49.2%; CI 6.8%; 25.4%). A higher percentage of urban than rural participants had a BMI ≥ 30 kg/m$^2$ (53.5 vs. 44.4%, respectively) and waist circumference ≥ 88 cm (62.7 vs. 54.1%, respectively). For both rural and urban participants, stiff maize-meal porridge was commonly consumed with all meals, often with *moroho* (cooked green leafy vegetables). Although a variety of vegetables (onions, cabbage, pumpkin, tomatoes, turnips and potatoes) were frequently eaten by most participants, quantities of intake were not determined. Protein sources consumed almost every day by more than 50% of all participants were dried beans. Chicken, eggs and full cream milk were consumed significantly more frequently by urban participants. Significantly more urban participants had access to a variety of fruits and vegetables, and they were also more likely to consume foods such as polony, russians (sausage containing pork and beef), sausage, sweetened drinks, mayonnaise and margarine more frequently than rural participants.
**Conclusions:** A nutrition transition associated with the frequent intake of processed, sugary and high-fat foods was identified in urban participants. These unhealthy dietary practices may lead to an increased risk of obesity and poor health outcomes. The development of culturally acceptable and relevant interventions is thus recommended.

**Keywords:** Basotho women, nutritional status, food intake, obesity

## Introduction

Worldwide, poor diet quality is a key reason for mortality and disability. This increases the risk for overweight and non-communicable chronic diseases (NCDs) which have been identified as a global priority.[1] On the other hand, maternal and child malnutrition impact on development, schooling and economic productivity.[2,3] According to Victora *et al*. and Wrottesly *et al*. the outcomes of maternal and child undernutrition include shorter adult height, and lower birthweight, which are likely to affect growth and development and also susceptibility to NCDs such as cardiovascular disease and diabetes in adulthood.[3,4]

Lesotho is one of the poorest countries in the world with high levels of food insecurity.[5] The Food and Agriculture Organization of the United Nations reported that 59% of Basotho households fall below the poverty line while 40% live in extreme poverty and 67% are considered poor.[5,6] Chronic poverty, high unemployment rates, food insecurity and widespread chronic malnutrition are key threats to development in Lesotho.

Basotho women carry the burden of household responsibilities.[5] Furthermore, cultural beliefs that may influence food intake of both women and children (such as the early introduction of liquids and foods other than breastmilk) also contribute to malnutrition in Lesotho.[7,8] Information related to food intake of Basotho women is lacking, but a recent study undertaken amongst 16-year-old Basotho adolescents showed that 91.4% consumed less than three servings of vegetables per day; 86.4% consumed less than two servings of fruits per day and the majority consumed mostly bread (63.8%) and maize porridge (56.1%), which may be low in nutrient density. In the adolescent sample, 27.2% of 16-year-old girls were overweight and/or obese.[9]

Data from the 2014 Lesotho Demographic Health Surveys showed that an estimated 45% of women between the ages of 15 and 49 years were overweight (BMI ≥ 25 kg/m$^2$), while 20% were obese, with the prevalence of underweight being relatively low (10.1% of girls 15–19 years had a BMI ≤ 18.5 kg/m$^2$).[10] Moreover, over one-quarter (27%) of women had anaemia,[10] which is often associated with low birthweight.[2]

In view of the challenges faced by Basotho women residing in a complex nutritional environment and the limited information related to their current nutritional status and food intake, the aim of this study was to investigate the nutritional status and food intake of Basotho women residing in rural and urban communities. This information is critical for developing nutrition interventions that are relevant and applicable.

## Materials and methods

### *Study setting*

Two out of 10 districts in Lesotho, namely Maseru and Berea, were included in the study due to the fact that the urban and rural areas in these districts were fairly accessible. Maseru is the

capital and the only city of Lesotho and is situated in the Maseru district, which includes both urban and rural areas, while the Berea district includes an urban town as well as a large rural area.

### *Overview and design*

A cross-sectional design was applied.

A pilot study showed that the study was feasible, appropriate and acceptable. Twenty-six women from four villages, two in Maseru and two in Berea, were included in the pilot study (not included in the main study). The clarity of questions included in the questionnaires and the length of time it would take to complete the questionnaires and the anthropometric measurements were determined. These enabled the instruments to be refined to the point where no more changes were needed.

Data were collected during 2012 and a total of 452 women were included in the main study.

### *Recruitment process*

In each of the two purposefully selected districts, the four villages that were included in the study were randomly selected. The researcher met with community leaders (chiefs) in each village and explained the purpose and procedures of the study (using the information in the information document). In each village the chief arranged a community meeting (pitso) to inform women about the project. In each village, women were visited at their homes and invited to participate if they met the inclusion criteria (age group 19–60 years). The following categories of women were excluded from the study: (1) domestic workers that lived in the homes of women participating in the study, (2) pupils/students, (3) acutely ill women, (4) disabled women, and (5) pregnant and lactating women. These groups have unique characteristics that need special considerations which were beyond the scope of this study. All women who met the inclusion criteria and signed informed consent were included in the study. In terms of consent to participate, illiterate women made a cross in the presence of a witness. Once they had agreed to participate, the date and venue for data collection was communicated to them.

### *Data collection*

All questionnaires were completed at a central point in each village by a Sesotho researcher and five trained assistants (students from the Department of Nutrition at the National University of Lesotho) during an interview with each participant under supervision of the researcher to ensure quality assurance.

A socio-demographic questionnaire adapted from the one developed for the Assuring Health for All in the Free State (AHA-FS) study was modified for use in this study to determine socio-demographic circumstances and reported health status of participants.[11]

Standard methods to determine weight, height and waist circumference were applied by one trained researcher using calibrated equipment. All measurements were taken in the morning to the nearest 0.1 mm. For obese individuals, waist circumference measurements were taken at the umbilicus level, after a normal expiration. BMI and waist circumference were categorised according to published cut-off points.[12]

A short food frequency questionnaire, to determine types of foods and frequency of consumption (not quantified), was developed by the researcher, based on foods that are commonly consumed in Lesotho.[13] Foods that were included were grouped according to food groups. Frequency of consumption was determined by assessing food items reported to be consumed every day to most days (four or more than four days a week).

### *Ethics*

Permission to conduct the study was obtained from the Health Sciences Research Ethics Committee of the Faculty of Health Sciences of the University of the Free State and the Ministry of Health and Social Welfare in Lesotho. Informed consent was obtained from participants in Sesotho after they were informed that participation was voluntary and that the identity of participants would be kept confidential.

### *Statistical analysis*

Descriptive statistics, namely frequencies and percentages for categorical data and medians and percentiles for continuous data, were calculated for rural and urban groups. Rural and urban groups were compared by means of 95% confidence intervals for percentage or median differences.

Body mass index (BMI) was categorised as follows:

underweight < 18.5 kg/m$^2$; normal 18.5–24.9 kg/m$^2$; overweight 25.0–29.9 kg/m$^2$; obesity class one 30.0–34.9 kg/m$^2$; obesity class two 35.0–39.9 kg/m$^2$; extreme obesity class three ≥ 40 kg/m$^2$.[12]

Waist circumference was categorised as follows: < 80 cm ideal; ≥ 80 cm increased risk; ≥ 88 cm substantial risk.[12]

## Results

Socio-demographic profiles are described in Table 1. In both rural and urban areas, over a third of participants were in the age group 45–54 years (35.4% and 31.6%, respectively). More than half of all the participants (55.9%) were unemployed with a significantly higher percentage of unemployed persons in the urban compared with rural areas (65.5% vs. 49.2%; CI 6.8%; 25.4%). Participants reported a monthly income between R100 and R500 in 35.9% of rural areas (US$±6–34 ), whereas income in urban areas varied from R100 (17.7%) to R3000 (23.12%) (US$±34–205). Most rural participants used a communal tap for water access (79.3% rural vs. 34.8% urban; CI –67.5%; –53.2%), whereas most urban participants had access to their own tap (63.1% urban vs. 2.3% rural; CI 35.7%; 52.4%, respectively). Few participants (20.9%) had a bathroom in their dwelling, with significantly more urban households having a bathroom compared with rural households (8.6% vs. 37.9%; CI –37%; –21.6%). About half of all households used a cast-iron pot (52.5%) with significantly more in the rural areas (78.4% rural vs. 43.9% urban; CI 51.4%; 66.4%). Less than 40% of the study participants had a refrigerator (38.9%) with significantly more in urban areas (69.5% urban vs. 16.7% rural; CI –60.2%; –44.2%).

Anthropometric information included BMI and waist circumference (Table 2). Almost half (48.2%) of study participants were obese (BMI ≥ 30 kg/m$^2$), of which more than half resided in urban areas (53.51% urban vs. 44.4% rural, CI –18.4%; 0.3%). Moreover, most women had a waist circumference of ≥ 88 (57.7%) with more living in urban areas (62.7% urban vs. 54.1% rural; CI –17.0%; 1.4%).

Table 3 depicts food items consumed every day to most days of the week from different food groups in rural and urban participants. Bread, cereals and grain products, such as sour porridge (72.9% rural vs. 32.6% urban) and stiff homemade

**Table 1:** Socio-demographic profiles

| Participant characteristics | Total | | Rural | | Urban | | 95% CI for the % differences |
|---|---|---|---|---|---|---|---|
| | *n* | % | *n* | % | *n* | % | |
| *Age groups* | | | | | | | |
| < 25 | 36 | 8 | 25 | 9.7 | 10 | 5.4 | 0.19[1] |
| 25 and < 35 | 115 | 25.4 | 65 | 25.3 | 47 | 25.1 | |
| 35 and < 45 | 89 | 19.7 | 43 | 16.7 | 45 | 24.1 | |
| 45 and < 55 | 153 | 33.9 | 91 | 35.4 | 59 | 31.6 | |
| > 55 | 59 | 13.1 | 33 | 12.8 | 26 | 13.9 | |
| *Language spoken* | | | | | | | |
| Sesotho only | 300 | 66.4 | 224 | 87.2 | 69 | 36.9 | |
| Sesotho and English | 152 | 33.6 | 31 | 12.1 | 118 | 63.1 | [–58.5%; –42.6%]* |
| Education: | | | | | | | |
| Primary school | 227 | 51.1 | 182 | 70.8 | 45 | 24.1 | [–37.9%; 54.4%] |
| Form A–E | 103 | 23.2 | 62 | 24.1 | 41 | 21.9 | |
| Tertiary | 58 | 13.1 | 11 | 4.3 | 47 | 25.1 | [–27.8%; –14.3%]* |
| Diploma/certificate | 56 | 12.6 | 2 | 0.8 | 54 | 28.9 | |
| *Marital status* | | | | | | | |
| Married/living together | 120 | 27 | 65 | 25.3 | 55 | 29.4 | |
| Single | 328 | 73.9 | 197 | 76.7 | 131 | 70.1 | [–1.6%; 15.0%] |
| Household characteristics: | | | | | | | |
| Employment status (*n*) | 442 | | 256 | | 186 | | |
| Unemployed | 239 | 55.9 | 123 | 49.2 | 116 | 65.5 | [–25.4%; –6.8%]* |
| *Number employed in a household* | | | | | | | |
| None | 124 | 27.4 | 38 | 20.2 | 9 | 5.3 | < 0.0001[2] |
| One | 245 | 54.2 | 133 | 70.7 | 107 | 62.9 | |
| Two | 66 | 14.6 | 14 | 7.5 | 52 | 30.6 | |
| Three and more | 5 | 1.1 | 2 | 1.1 | 2 | 1.2 | |
| Don't know | 12 | 2.6 | 1 | 0.5 | 0 | 0 | |
| Family income (*n*) | 441 | | 254 | | 187 | | |
| None | 75 | 16.9 | 66 | 25.8 | 9 | 4.8 | [14.5%; 27.1%]* |
| R100–R500 | 125 | 28.2 | 92 | 35.9 | 33 | 17.7 | [9.9%; 25.9%]* |
| R501–R1000 | 71 | 16.1 | 40 | 15.6 | 31 | 16.7 | |
| R1001–R3000 | 63 | 14.3 | 20 | 7.8 | 43 | 23.1 | |
| R3001–R5000 | 25 | 5.7 | 2 | 0.8 | 23 | 12.4 | |
| Over R5000 | 35 | 7.9 | 2 | 0.8 | 33 | 17.7 | |
| Do not know | 48 | 10.9 | 34 | 13.3 | 14 | 7.5 | |
| *Type of dwelling* | | | | | | | |
| Brick/stone | 383 | 84.7 | 212 | 82.5 | 159 | 85 | [–9.3%; 4.6%] |
| Mud | 48 | 10.6 | 32 | 12.5 | 4 | 2.1 | |
| Shack/tin | 9 | 2 | 4 | 1.6 | 7 | 3.7 | |
| *Water access* | | | | | | | |
| Own tap | 127 | 28.1 | 6 | 2.3 | 118 | 63.1 | [–67.5%; –53.2%]* |
| Communal tap | 274 | 60.6 | 203 | 79.3 | 65 | 34.8 | [35.7%; 52.4%]* |
| Bathroom in home | 93 | 20.9 | 22 | 8.6 | 71 | 37.9 | [–37%; –21.6%]* |
| *Type of toilet* | | | | | | | |
| Water system | 51 | 11.3 | 0 | 0 | 51 | 27.3 | |
| Pit latrine | 265 | 58.6 | 183 | 71.2 | 75 | 40.1 | [21.9%; 39.6%]* |
| Ventilated improved pit | 77 | 17 | 16 | 6.2 | 59 | 31.6 | |
| No reply | 57 | 12.6 | 56 | 21.8 | 1 | 0.5 | |
| Others | 3 | 0.7 | 2 | 0.8 | 1 | 0.5 | |
| *Food preparation and storage* | | | | | | | |
| Electricity | 107 | 24.1 | 14 | 5.5 | 93 | 49.7 | [–51.7%; –36.4%]* |
| Gas/paraffin | 254 | 57.2 | 113 | 43.9 | 141 | 75.4 | [–39.6%; –22.4%]* |
| Open fire | 128 | 28.8 | 120 | 46.7 | 8 | 4.3 | [35.2%; 48.9%]* |
| Use cast-iron pot | 234 | 52.7 | 199 | 78.4 | 35 | 18.7 | [51.4%; 66.4%]* |
| Refrigerator | 173 | 38.9 | 43 | 16.7 | 130 | 69.5 | [–60.2%; –44.2%]* |

Notes: *$P < 0.05$.
[1]$\chi^2$.
[2]Fisher's exact test.

**Table 2:** Anthropometric information on rural and urban participants

| BMI | All (*n* = 442) | | Rural (*n* = 257) | | Urban (*n* = 185) | | 95% CI for % difference |
|---|---|---|---|---|---|---|---|
| | *n* | % | *n* | % | *n* | % | |
| < 25 | 111 | 25.1 | 73 | 28.4 | 38 | 20.5 | [0.4%; 15.6%] |
| 25–< 30 | 118 | 26.7 | 70 | 27.2 | 48 | 25.9 | |
| ≥ 30 | 213 | 48.2 | 114 | 44.4 | 99 | 53.5 | |
| Waist (circumference reference values) | | | | | | | |
| < 80 | 115 | 26 | 73 | 28.4 | 42 | 22.7 | |
| ≥ 80–< 88 | 72 | 16.3 | 45 | 17.5 | 27 | 14.6 | |
| ≥ 88 | 255 | 57.7 | 139 | 54.1 | 116 | 62.7 | [–17.0%; 1.4%] |

porridge (71.3% rural vs. 14.9% urban) were consumed significantly more often in rural than urban areas (CI 31.2%; 48.4% and CI 48.0%; 63.1%), respectively, whereas brown bread (83.9% urban vs. 53.79% rural) and commercial stiff porridge (35.3% urban vs. 10.7% rural) were consumed significantly more often in urban than rural areas (CI –37.9%; –21.8% and CI –32.5%; –16.9%), respectively. Although a variety of vegetables were eaten by most participants on a frequent basis, quantities of intake were not determined. Onions, cabbage, pumpkin, tomatoes, turnips and potatoes were reported to be consumed almost every day by more than 50% of all participants. Urban participants consumed vegetables such as onions (85.6% urban vs. 61.9% rural), tomatoes (72.2% urban vs. 54.1% rural) and carrots (59.9% urban vs. 31.4% rural) significantly more often

**Table 3:** Frequency of intake of foods from different food groups

| Factor | Every day to most days | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total (*n* = 442) | | Rural (*n* = 255) | | Urban (*n* = 187) | | 95% CI for the % differences |
| | *n* | % | *n* | % | *n* | % | |
| *Breads, cereals and other grain products* | | | | | | | |
| Brown bread | 294 | 66.5 | 137 | 53.7 | 157 | 83.9 | [–37.9%; –21.8%]* |
| Sorghum—soft | 293 | 66.3 | 177 | 69.4 | 116 | 62 | [-1.5%; 16.3%] |
| Stiff porridge—induna chai# | 259 | 58.6 | 110 | 43.1 | 149 | 79.7 | [-44.4%; –27.7%]* |
| Sour porridge | 247 | 55.9 | 186 | 72.9 | 61 | 32.6 | [31.2%; 48.4%]* |
| Stiff porridge—homemade#[1] | 209 | 47.4 | 181 | 71.3 | 28 | 14.9 | [48.0%; 63.1%]* |
| Samp | 134 | 30.3 | 81 | 31.8 | 53 | 28.3 | [-5.3%; 11.9%] |
| Pasta (refined) | 111 | 25.1 | 43 | 16.9 | 68 | 36.4 | [-27.7%; –11.2%]* |
| Stiff porridge—commercial | 93 | 21 | 27 | 10.6 | 66 | 35.3 | [-32.5%; –16.9%]* |
| White bread | 61 | 13.8 | 44 | 17.3 | 17 | 9.1 | [1.7%; 14.3%]* |
| Scones | 57 | 12.9 | 23 | 9 | 34 | 18.2 | [-16.0%; –2.5%]* |
| Cake | 46 | 10.5 | 19 | 7.5 | 27 | 14.5 | [-13.4%; –1.2%]* |
| *Vegetables* | | | | | | | |
| Onion | 318 | 71.9 | 158 | 61.9 | 160 | 85.6 | [-31.1%; –15.5%]* |
| Cabbage | 279 | 63.1 | 170 | 66.7 | 109 | 58.3 | [-0.7%; 17.4%] |
| Pumpkin | 274 | 61.9 | 153 | 60 | 121 | 64.7 | [-13.6%; 4.5%] |
| Tomato | 273 | 61.8 | 138 | 54.1 | 135 | 72.2 | [-26.6%; –9.0%]* |
| Turnip | 239 | 54.1 | 144 | 56.5 | 95 | 50.8 | [-3.7%; 14.9%] |
| Potatoes | 226 | 51.1 | 139 | 54.5 | 87 | 46.5 | [-1.4%; 17.2%] |
| Spinach | 219 | 49.6 | 115 | 45.1 | 104 | 55.6 | [-19.7%; –1.1%]* |
| Carrots | 192 | 43.4 | 80 | 31.4 | 112 | 59.9 | [-37.2%; –19.2%]* |
| Wild vegetables (e.g. wild *moroho*) | 156 | 35.3 | 124 | 48.6 | 32 | 17.1 | [22.9%; 39.2%]* |
| Green peas | 132 | 29.9 | 82 | 32.2 | 50 | 26.7 | [–3.3%;13.8%] |
| Green pepper | 131 | 29.6 | 44 | 17.3 | 87 | 46.5 | [–37.5%; –20.6%]* |
| Green beans[1] | 120 | 26.7 | 60 | 23.6 | 60 | 32.1 | [–16.9%; –0.1%]* |
| *Fruit* | | | | | | | |
| Apples | 120 | 26.7 | 100 | 39.2 | 128 | 68.5 | [–37.7%; –20.0%]* |
| Guava | 228 | 51.6 | 29 | 11.3 | 47 | 25.1 | [–21.2%; –6.5%]* |
| Raisins | 76 | 17.2 | 26 | 10.2 | 42 | 22.5 | [–19.5; –5.4%]* |
| Plums | 68 | 15.4 | 36 | 14.1 | 30 | 16 | [–8.9%; 4.7%] |
| *Meat, poultry, fish, legumes, eggs and nuts* | | | | | | | |
| Eggs | 236 | 53.4 | 106 | 41.6 | 130 | 69.5 | [–36.5%; –18.7%]* |
| Dried beans | 258 | 58.5 | 140 | 55.1 | 118 | 63.1 | [–17.0%; 1.3%] |
| Goat meat | 29 | 6.6 | 21 | 8.2 | 8 | 4.3 | [–0.9%; 8.5%] |

(*Continued*)

**Table 3: (*Continued*)**

| Factor | Every day to most days | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total (*n* = 442) | | Rural (*n* = 255) | | Urban (*n* = 187) | | 95% CI for the % differences |
| | *n* | % | *n* | % | *n* | % | |
| Sausage | 186 | 42.1 | 88 | 34.5 | 98 | 52.4 | [–26.9%; –8.6%]* |
| Fish (most often deep fried) | 172 | 38.9 | 59 | 23.1 | 113 | 60.4 | [–45.5%; –28.2%]* |
| Polony and russians | 159 | 35.9 | 62 | 24.3 | 97 | 51.9 | [–36.1%; –18.5%]* |
| Dried peas[1] | 149 | 33.8 | 102 | 40.1 | 47 | 25.1 | [6.2%; 23.4%]* |
| High-fat mince meat | 113 | 25.6 | 51 | 20 | 62 | 33.2 | [–21.5%; –4.9%]* |
| Nuts | 81 | 18.5 | 44 | 17.4 | 37 | 19.9 | [–10.1%; 4.7%] |
| Beef (with fat) | 79 | 17.9 | 34 | 13.3 | 45 | 24.1 | [–18.3; –3.4%]* |
| Chicken (with skin) | 259 | 58.6 | 119 | 46.7 | 140 | 74.9 | [–36.5%; –19.1%]* |
| Offal | 146 | 33 | 73 | 28.6 | 73 | 39 | [–19.2%; –1.5%]* |
| *Milk and milk products* | | | | | | | |
| Milk (mostly full-cream) | 248 | 56.1 | 106 | 41.6 | 142 | 75.9 | [42.5%; –25.14%]* |
| Yoghurt | 73 | 16.5 | 35 | 13.7 | 38 | 20.3 | [–13.9%; 0.4%] |
| Cheese | 50 | 11.3 | 21 | 8.2 | 29 | 15.5 | [–13.8%; –1.2%]* |
| *Fats, oils, sweets* | | | | | | | |
| Sunflower oil | 361 | 81.7 | 209 | 81.9 | 152 | 81.3 | [–6.5%; 8.2%] |
| Sugar | 334 | 75.7 | 197 | 77.6 | 137 | 73.3 | [–3.7%; 12.5%] |
| Sweets | 208 | 47.1 | 117 | 45.9 | 91 | 48.7 | [–12.1%; 6.6%] |
| Sweetened cold drinks | 180 | 40.7 | 92 | 36.1 | 88 | 47.1 | [–20.1%; –1.7%]* |
| Mayonnaise | 111 | 25.1 | 43 | 16.9 | 68 | 36.4 | [–27.7%; –11.2%]* |
| Squash (Oros) | 128 | 28.9 | 50 | 19.6 | 78 | 41.7 | [–30.5%;–13.5%]* |
| Soft margarine | 99 | 22.4 | 30 | 11.8 | 69 | 36.9 | [–33.0%; –17.1%]* |
| Hard margarine | 90 | 20.4 | 40 | 15.7 | 50 | 26.7 | [–18.9%; –3.4%]* |
| Cookies | 83 | 18.8 | 40 | 15.7 | 43 | 22.9 | [–14.9%; 0.1%] |
| Jam | 61 | 13.8 | 36 | 14.1 | 25 | 13.4 | [–6.0%; 7.1%] |
| Lard | 57 | 12.9 | 50 | 19.6 | 7 | 3.7 | [10.1%; 21.5%]* |

*$P < 0.05$.
[1]$\chi^2$.
#Chai and Induna—minimally refined maize meal, darker in colour (fortified).
Iwisa—refined and white maize meal (fortified); Home-made—made from regular grinding mills (unfortified).

($p < 0.05$) than rural participants. Protein sources consumed almost every day by more than 50% of all participants were dried beans. Chicken and eggs were consumed significantly more frequently by urban participants than rural participants (74.9% vs. 46.7%; CI –36.5%; –19.1%) and 69.5% vs. 41.6%; CI –36.5; –18.7%), respectively. Urban participants were more likely to consume full-cream milk almost every day (75.9%), than rural participants (41.6%) (CI 42.5%; -25.14%). In both rural and urban areas, sunflower oil (81.7%) and sugar (75.8%) were used every day by most participants. Urban participants consumed significantly more Western and processed foods such as polony and russians (51.9% vs. 24.3%; CI –36.1; –18.5), sausage (52.4% vs. 34.5%; CI –26.9; –8.6), pasta (36.4% vs. 16.9%; CI –27.7; –11.2), sweetened cold drinks (47.1% vs. 36.1%; CI –20.1; –1.7), mayonnaise (36.4% vs. 16.9%; CI –27.7; –11.2) and margarine (36.9% vs. 11.8%; CI –33.0; –17.1) than rural participants.

## Discussion

This study found significant differences in socio-demographic and frequency of food intake between rural and urban participants. Poverty and low levels of literacy in both rural and urban areas may contribute to food insecurity and poor nutritional status.[14] More than half of women included in the study had only completed primary school education, with most residing in rural areas. Rates of unemployment were high (over 50%), especially in urban areas, and access to running water, water-system toilets and electricity were inadequate for many participants. These socio-demographic factors may be related to food intake, as higher education attainment is associated with better food knowledge and better income, enabling improved accessibility to a variety of foods.[15,16] These findings are also in line with the National and United rankings of Lesotho and considered to be major challenges that contribute to food insecurity.[17]

Of concern is the high prevalence of obesity in both rural and especially urban participants included in this study. In 2002, a review by Walker *et al*. reported that changes in diet and environmental factors were responsible for the increasing prevalence of obesity among rural and urban African women, predisposing them to coronary heart disease.[13] A higher percentage of urban than rural participants had a BMI ≥ 30 kg/m$^2$ (53.5% vs. 44.4%, respectively) and waist circumference ≥ 88 cm (62.7% vs. 54.1%, respectively), although the differences did not reach statistical significance. Recently, similar rates of obesity were reported in Lesotho.[8] This percentage is even higher than that reported for neighbouring South African women (39.2%).[18] In the present study, the prevalence of obesity was higher

amongst urban than rural residents, which resembles findings from South Africa,[19] although others have reported higher prevalence of obesity in rural areas.[20] It is widely recognised that obesity has many negative consequences for health and increases the risk for non-communicable diseases such as cardiovascular diseases and diabetes[21] and the 'metabolic syndrome'.[22]

Several dietary factors may have contributed to the high rates of overweight and obesity seen in especially urban women included in the current study. Although quantities of foods consumed were not obtained, women reported that vegetables were often fried in fat/oils and eaten in small portions with large portions of stiff maize-meal porridge (data not shown). Women also indicated that fat was not removed from meat or skin from chicken before cooking. Cheap meat sources such as processed meat (polony), chicken feet and offal, which are high in fat, were often eaten, significantly increasing energy intake. Although significantly more urban participants had access to a variety of fruits and vegetables, they were also significantly more likely to frequently consume foods such as polony, russians, sausage, sweetened cold drinks, mayonnaise and margarine than rural participants, which may contribute to increased energy intake and abdominal obesity.[23]

With regard to micronutrient intake, the maize that is imported from South Africa (commercial maize) is fortified, contributing to the intake of micronutrients, especially B-vitamins,[24] while the maize that is eaten more often in rural areas is ground at mills in Lesotho and not fortified. Micronutrient intake has important implications for human health.[25] The intake of food items rich in iron was lacking in the diet of both rural and urban study participants. A recent systematic review including women of reproductive age residing in Ethiopia, Kenya, Nigeria and South Africa showed that inadequate intake of iron is associated with a higher prevalence of anaemia and iron deficiency.[26] However, most rural participants used a cast-iron pot for food preparation, which is likely to contribute to iron intake.[27] Sources of calcium such as milk and milk products were lacking in the diets of rural communities, which may have contributed to an increased risk of osteoporosis.[28]

Maize and sorghum are still seen as staple cereal crops in both rural and urban communities of Lesotho.[29] Also reflected in the results of this study, maize products formed the basis of all meals in both urban and rural communities. *Papa* and *moroho*, followed by brown bread and commercial porridge, were mostly consumed by urban participants whereas sour porridge, stiff homemade porridge and sorghum (soft) were also consumed by rural participants. Daily sugar intake was also reported by more than 70% of participants in both rural and urban communities. Protein sources consumed almost every day in both rural and urban communities included dried beans, mainly eaten as snacks, which is to be commended since they are a healthy food.[30] Sunflower oil was used every day by more than 80% of participants in both rural and urban communities, mainly for the preparation of the vegetables with the *moroho*.

We acknowledge the limitations of the study. Portion sizes of foods consumed were not determined due to the intricate and time-consuming procedure that needs to be applied to obtain reliable information from women of whom more than half had only primary education. In addition, the purpose was to collect data related to frequency of consumption, rather than nutrient intake. Despite this, information related to frequency of intake can make a meaningful contribution to understanding the types of foods that were consumed in this relatively large sample of Basotho women. In addition, seasonal variability may have contributed to a biased picture of fruit and vegetable intake. However, most of the vegetables reportedly eaten (onions, cabbage, pumpkin and tomatoes) are available throughout the year.

In conclusion, a nutrition transition associated with the intake of processed, sugary and high-fat foods was identified in urban participants. These unhealthy dietary practices may lead to an increased risk of obesity and poor health outcomes. It has been estimated that by 2020 nearly 75% of all deaths will be attributable to NCDs that are most often related to an unhealthy diet.[1] In view of this, the need for nutrition interventions to effect behaviour change in Lesotho cannot be over-emphasised. Interventions aimed at improving dietary diversity and food access could contribute to improved domestic food production, food preservation and storage, especially amongst women, who influence household feeding practices.[25,31]

*Disclosure statement* – No potential conflict of interest was reported by the authors.

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**Received: 20-02-2017 Accepted: 03-12-2017**