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# Foods and beverages that make significant contributions to macro- and micronutrient intakes of children in South Africa – do they meet the food-based dietary guidelines?

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**Objective.** The aim of this study was to determine which foods and beverages contribute most (≥ 5% of total) to energy, macronutrient and micronutrient intakes of South African children aged 12 - 108 months. It was also our intention to evaluate the dietary content according to the Food-Based Dietary Guidelines (FBDGs) (2001) for South Africans aged 7 years and older. Low energy and micronutrient intakes are widespread in South Africa and it is important to examine which foods are currently contributing to nutrient intake in order to make appropriate suggestions regarding dietary improvements.

**Methods.** The National Food Consumption Survey was undertaken in 1999 on a representative sample of children aged 12 - 108 months ($N$ = 2 818). Dietary intake of each participant was determined by means of a 24-hour recall undertaken with the primary caregiver of the child. Dietary aids were used to assist in the determination of portion sizes of foods and drinks consumed. The FoodFinder database was used to determine the dietary composition of the dietary intake according to local food tables. Statistical analyses involved calculating the percentage contribution of different food items towards total intake of each specific nutrient.

**Results.** Only a few food items contributed significantly to the intakes of many nutrients. Maize porridge and bread contributed 27% and 14.8% to total energy, 19.1% and 15.7% to protein and 40% and 17.2% to carbohydrate intake, respectively. In terms of micronutrients, maize porridge and bread contributed 10.9% and 15.6% to iron, 14.9% and 16.9% to zinc, 9.8% and 19.5% to niacin and 37.6% and 15.6% to thiamin intake. In terms of the FBDGs, guidelines not being met were those aimed at improving variety of foods eaten, increasing fruit and vegetable intake, increasing legume intake, and eating more animal foods. Ones that were being met were making starches the basis of most meals, and using fats sparingly.

**Conclusion.** Maize and bread contributed significantly to macronutrients and most micronutrients, with the exception of calcium. Food fortification of these items will increase these values significantly. The diet of children in South Africa (12 - 108 months) in 1999 was found to have little variety, was low in fat and animal foods, particularly dairy foods, and contained a low intake of legumes, fruit and vegetables.

In the South African context it has been shown that a large number of children have an inadequate intake of vitamin A, thiamin, niacin, riboflavin, vitamins $B_6$, $B_{12}$ and C, folic acid, calcium, iron, and zinc.[1] It was projected that the fortification of maize and bread flour, introduced in October 2003, would significantly improve the poor dietary intake of some of these nutrients; however, it is unlikely that food fortification would fully compensate for a significantly inadequate dietary intake of these nutrients. Eating rich sources of specific nutrients remains the only long-term sustainable solution, particularly for younger children who cannot eat large portions of staple fortified foods at a time.

Nutrition educators need to know which foods are rich sources of nutrients so that they can teach a healthy diet in terms of foods and not in terms of nutrients, since nutrients are very often not understood by the general public. Food-Based Dietary Guidelines (FBDGs), as proposed by the Food and Agricultural Organization and the World Health Organization

(1998),[2] have been developed and adopted in South Africa for the purpose of nutrition education by means of foods. These guidelines for adults have been tested on consumers in KwaZulu-Natal and the Western Cape and were found to be practical, affordable, sustainable, culturally sensitive and environmentally friendly for South Africans.[3] South Africa currently has two sets of FBDGs, one for children and adults (Table I) and another for infants and preschool children, which is still being tested.[4]

| Table I. | Food-Based Dietary Guidelines for South Africans aged 7 years and older[3] |
|---|---|

1. Enjoy a variety of foods
2. Be active
3. Make starchy foods the basis of most meals
4. Eat plenty of vegetables and fruits every day
5. Eat dry beans, peas, lentils and soy regularly
6. Chicken, fish, milk, meat or eggs can be eaten daily
7. Eat fats sparingly
8. Use salt sparingly
9. Drink lots of clean, safe water
10. If you drink alcohol, drink sensibly
11. Use food and drinks containing sugar sparingly and not between meals

In this study we determined which foods and beverages were major sources of essential nutrients and then compared these food intakes with the FBDGs aimed at promoting a healthy diet in children and adults. The 2001 FBDGs for South Africans aged 7 years and older are primarily used as a basis for comparison in the discussion.

## Methods and materials

### Subjects

The National Food Consumption Survey (NFCS) was undertaken in 1999. It was the first nationally representative dietary study in South Africa of children aged 12 - 108 months. The sampling procedures, methods and provincial representative weighting have been explained in detail elsewhere, however a brief summary is given here.[1,5] The children were selected from the database of the NFCS ($N$ = 2 894) which had been oversampled by 25% for children from low socio-economic areas, at the directive of the Department of Health. All children who had a complete set of sociodemographic data and a completed 24-hour recall questionnaire ($N$ = 2 818 unweighted) were included in the data analysis. A self-weighting minimum sample size ($N$ = 2 200) was generated in accordance with the population size of the nine provinces, stratified for age, urban and rural area, and provincial and national representation.

### Dietary intakes

Dietary intake of each participant was determined by means of a 24-hour recall and a food frequency questionnaire undertaken with the primary caregiver of the child. In this article only the dietary results of the 24-hour recalls are reported. However, the 24-hour recall questionnaire was validated against a previously validated food frequency questionnaire.[1] This was done by comparing three 24-hour recalls with a frequency questionnaire and by comparison of food items obtained from the dietary interviews with those found in households as determined by a household inventory questionnaire.[1]

Furthermore, reliability of the 24-hour recall questionnaire was ensured by repetition of interviews in 10% of the total sample. A standardised training programme using a specially developed video assisted with overall quality assurance.

The caregiver was required to provide a detailed account of all the food items consumed by the child during the previous 24 hours. In order to further standardise methods dietary aids (food models, utensils and empty containers) were used to assist in the determination of portion sizes of foods and drinks consumed. The Foodfinder database[6] was used to determine the dietary composition of the dietary intake.

### Data analyses

Three methods were used to determine the contribution of food items to nutrient intake using the SAS programme.[7]

1. The percentage contribution of each food item to the total nutrient intake was calculated by adding all the food item nutrient contributions and then calculating how much each food contributed to the total amount of the nutrient. Only items that contributed to at least 5% of the total nutrient content were included in the results.

2. The nutrient content of each food item was correlated with the total nutrient intake of the group using Pearson and Spearman's correlation coefficients. Both were used since Pearson's is suitable for weighted data and Spearman's for non-parametric data.

3. Logistic regressions were done by means of the forward method, which calculates the F-statistic and reflects the variables' contribution to the model if included. Variables are added one by one to the model until no remaining variable produces a statistically significant F-value.

Furthermore, the data were compared with the recommended FBDGs where possible. This was done

by comparing either per capita portion sizes with recommended portion sizes (i.e. animal foods and fruit and vegetables) or else by comparing main foods eaten daily (which contributed more than 5% of total nutrient intake) with those recommended by the FBDGs.[3]

## Results and discussion

Consideration of which foods make a significant contribution to the nutrient intake of children in this country should be done in the context of the widespread low nutrient intakes reported by the 1999 NFCS[1] (Table II). It is also important to note the skewed distribution of nutrient intakes in South African children, resulting in the median intakes being considerably lower than the mean intakes for a number of micronutrients (Table II).

Maize porridge contributed 27% of the total energy intake of the group of children (Table III). Maize porridge also had a significant correlation ($r = 0.252$) with total energy intake. Nearly 50% of total energy intake came from maize porridge, bread (white and brown), sugar and margarine (brick/normal and low-fat). The F-value of maize was highest and significant ($p < 0.0001$). The major food items contributing to energy intake in this study correlate closely with the most commonly consumed items in other studies. Studies in the black population in both urban and rural areas documented that the most commonly consumed items were maize porridge, sugar, brown bread and white bread.[8-10] Figs 1 and 2 illustrate the major contributions made to energy and nutrient intake by maize porridge, and brown and white bread. These food

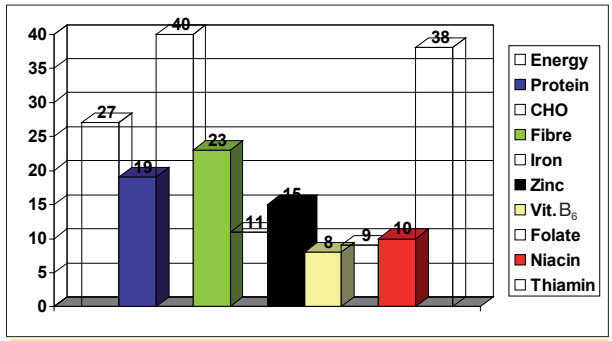


*Fig. 1. Percentage contribution of maize porridge to the overall energy and nutrient intake of children aged 12 - 108 months in the NFCS (1999).*

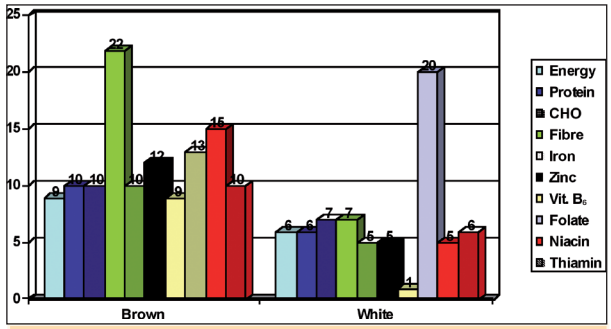


*Fig. 2. Contribution of white and brown bread to overall nutrient intake of children aged 12 - 108 months in the NFCS (1999).*

items contributed significantly to the contribution of many nutrients. Maize porridge and bread respectively contributed 27% and 14.8% to total energy, 19.1% and 15.7% to protein, and 40.0% and 17.2% to carbohydrate intake. In terms of micronutrients, the respective contributions of maize porridge and bread were 10.9% and 15.6% to iron, 14.9% and 16.9% to zinc, 9.8% and

**Table II. Mean and median nutrient intakes of nutrients in children (12 - 108 months)**

| Nutrient | Mean (SD) *N* = 2 818 unweighted *N* = 2 200 weighted | Median (Q1 - Q3) *N* = 2 818 unweighted *N* = 2 200 weighted | 95% confidence intervals for the mean |
|---|---|---|---|
| Energy (kJ) | 5 048 (2 020) | 4 732 (3 383 - 6 365) | 4 963 - 5 132 |
| Protein (g) | 37.3 (18.0) | 34.0 (22.0 - 48.6) | 36.5 - 38.0 |
| Carbohydrate (g) | 183.0 (74.0) | 170.6 (123.9 - 230.0) | 179.9 - 186.1 |
| Added sugar (g) | 27.3 (24.8) | 19.1 (12.0 - 36.0) | 26.3 - 28.3 |
| Fat (g) | 30.0 (20.1) | 25.2 (13.4 - 40.8) | 29.1 - 30.8 |
| Fibre (g) | 12.3 (7.6) | 10.4 (6.6 - 15.7) | 12.0 - 12.7 |
| Calcium (mg) | 321.9 (262.4) | 235.2 (115.6 - 434.8) | 310.9 - 332.8 |
| Iron (mg) | 6.0 (4.0) | 5.0 (3.0 - 7.8) | 5.9 - 6.2 |
| Zinc (mg) | 5.0 (2.8) | 4.3 (2.8 - 6.4) | 4.9 - 5.2 |
| Vitamin A (µg) | 416.3 (955.5) | 184.7 (76.9 - 401.7) | 376.3 - 456.2 |
| Thiamin (mg) | 0.69 (0.33) | 0.61 (0.42 - 0.88) | 0.68 - 0.70 |
| Riboflavin (mg) | 0.75 (0.77) | 0.46 (0.25 - 0.88) | 0.72 - 0.78 |
| Niacin (µg) | 7.2 (4.8) | 5.7 (3.1 - 9.7) | 7.0 - 7.4 |
| Vitamin $B_6$ (mg) | 0.60 (0.42) | 0.47 (0.28 - 0.79) | 0.59 - 0.62 |
| Folate (mg) | 132.6 (101.9) | 99.4 (55.2 - 170.4) | 128.3 - 136.8 |
| Vitamin $B_{12}$ (µg) | 2.7 (9.3) | 0.93 (0.08 - 2.24) | 2.3 - 3.1 |
| Vitamin C (mg) | 37.7 (142.4) | 15.0 (3.4 - 34.5) | 31.7 - 43.6 |

**Table III. Contribution of foods providing ⩾ 5% of energy and macronutrient of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank) and % contribution to total nutrient intake | % consuming food, average portion size & mean per capita intake of food item (g) | Mean (SD) and 95% CI of per capita intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, (level of significance of correlation), Spearman |
|---|---|---|---|---|---|---|---|
| **Energy** | | | | | | | |
| Maize porridge | (1) | 76.7% | 1 363 | 1 013 | 0.099 | 339.2 | 0.252 |
| & dishes | 27 | 445.0 | (1 213) | 293 - 2 025 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 1 313 - 1 414 | | | | 0.145 |
| Brown bread | (2) | 38.9% | 445 | 0 | 0.066 | 294.3 | 0.226 |
| | 8.8 | 105.8 | (661) | 0 - 649 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 41.2 | 418 - 473 | | | | 0.175 |
| White bread | (3) | 27.3% | 300 | 0 | 0.050 | 202.1 | 0.283 |
| | 6.0 | 99.8 | (570) | 0 - 331 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 27.3 | 277 - 324 | | | | 0.215 |
| Sugar | (4) | 77.0% | 279 | 204 | 0.010 | 130.0 | 0.200 |
| | 5.5 | 21.3 | (298) | (102 - 408) | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 16.4 | 266 - 291 | | | | 0.245 |
| Brick margarine | (9) | 27.2% | 109 | 0 | 0.084 | 258.5 | 0.290 |
| | < 5 | 13.5 | (202) | 0 - 149 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 3.7 | 101 - 118 | | | | 0.271 |
| Med/low fat | (36) | 6.3% | 21 | 0 | 0.076 | 289.9 | 0.204 |
| margarine | < 5 | 12.4 | (85) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 0.8 | 17 - 24 | | | | 0.153 |
| **Protein** | | | | | | | |
| Maize porridge | (1) | 76.7% | 7.1 | 5.3 | 0.054 | 219.1 | 0.108 |
| | 19.1 | 445.0 | (6.4) | 1.5 - 10.5 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 6.8 - 7.3 | | | | 0.037 |
| Brown bread | (2) | 38.9% | 3.5 | 0 | 0.079 | 294.7 | ($p = 0.051$) |
| | 9.5 | 105.8 | (5.2) | 0 - 5.2 | | ($p < 0.0001$) | 0.233 |
| | | 41.2 | 3.3 - 3.8 | | | | ($p < 0.0001$) |
| Chicken meat | (3) | 17.5% | 3.1 | 0 - 0 | 0.104 | 326.3 | 0.190 |
| | 8.3 | 68.9 | (7.3) | 0 - 0 | | ($p < 0.0001$) | 0.322 |
| | | 12.0 | 2.8 - 3.4 | | | | ($p < 0.0001$) |
| White bread | (4) | 27.3% | 2.3 | 0 | 0.067 | 228.9 | 0.252 |
| | 6.2 | 99.9 | 4.4 | 0 - 2.6 | | ($p < 0.0001$) | 0.266 |
| | | 27.3 | 2.1 - 2.5 | | | | ($p < 0.0001$) |
| Full-cream milk | (5) | 38.4% | 2.2 | 0 | 0.060 | 264.5 | 0.217 |
| | 5.8 | 177.4 | (3.9) | 0 - 3.2 | | ($p < 0.0001$) | 0.233 |
| | | 67.9 | 2.0 - 2.3 | | | | ($p < 0.0001$) |
| **CHO** | | | | | | | 0.223 |
| Maize porridge | (1) | 76.7% | 65.9 | 49.0 | 0.184 | 634.3 | 0.429 |
| | 40.0 | 445.0 | (58.4) | 14.3 - 98.0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 63.4 - 68.3 | | | | 0.307 |
| Brown bread | (2) | 38.9% | 18.1 | 0 | 0.103 | 585.3 | 0.200 |
| | 9.9 | 105.8 | (27.0) | 0 - 26.5 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 41.2 | 17.0 - 19.3 | | | | 0.162 |
| Sugar | (3) | 77.0% | 16.4 | 12.0 | 0.046 | 397.3 | 0.281 |
| | 9.0 | 21.3 | (17.5) | 6.0 - 24.0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 16.4 | 15.7 - 17.1 | | | 500.0 | 0.295 |
| White bread | (4) | 27.3% | 13.4 | 0 | 0.123 | ($p < 0.0001$) | 0.243 |
| | 7.3 | 99.9 | (25.5) | 0 - 14.8 | | | ($p < 0.0001$) |
| | | 27.3 | 12.4 - 14.5 | | | | 0.171 |

**Table III. (cotd.) Contribution of foods providing ≥ 5% of energy and macronutrient of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank), % contribution to total nutrient intake | % consuming food, average portion size & mean per capita intake of food item (g) | Mean (SD) and 95% CI of per capital intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, (level of significance of correlation), Spearman |
|---|---|---|---|---|---|---|---|
| Rice | (5) | 27.3 | 10.6 | 0 | 0.078 | 523.8 | 0.173 |
| | 5.8 | 143.6 | (20.0) | 0 - 13.8 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 39.1 | 9.8 - 11.5 | | | | 0.153 |
| Added sugar | (1) | 77.0% | 16.4 | 12.0 | 0.473 | 2 523.8 | 0.687 |
| | 60.1 | 21.3 | (17.5) | 6.0 - 24.0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 16.4 | 15.7 - 17.1 | | | | 0.717 |
| Squash | (2) | 14.8% | 2.8 | 0 | 0.167 | 1 300.7 | 0.408 |
| | 10.4 | 307.9 | (7.3) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 45.6 | 2.5 - 3.1 | | | | 0.405 |
| Carbonated cold | (3) | 5.3% | 1.6 | 0 | 0.127 | 1 529.8 | 0.350 |
| drink | 6.0 | 301.6 | (7.0) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 16.0 | 1.3 - 1.9 | | | | 0.286 |
| **Fat** | | | | | | | |
| Brick margarine | (1) | 27.2% | 2.9 | 0 | 0.146 | 482.0 | 0.382 |
| | 9.8 | 13.5 | (5.4) | 0 - 4.0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 3.7 | 2.7 - 3.2 | | | | 0.396 |
| Whole milk | (2) | 38.4% | 2.3 | 0 | 0.036 | 201.0 | 0.262 |
| | 7.7 | 177.1 | (4.1) | 0 - 3.4 | | ($p < 0.0001$) | ($p < 0.0001$ |
| | | 68.0 | 2.1 - 2.5 | | | | 0.272 |
| Maize porridge | (3) | 76.7 | 2.0 | 1.5 | 0.004 | 104.9 | -0.101 |
| & dishes | 6.7 | 445.0 | (2.0) | 0.4 - 3.0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 1.9 - 2.1 | | | | -0.154 |
| Potatoes cooked | (4) | 21.4% | 1.6 | 0 | 0.054 | 216.0 | 0.239 |
| with fat | 5.2 | 120.3 | (5.0) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 25.7 | 1.3 - 1.8 | | | | 0.238 |
| Chicken | (5) | 17.5% | 1.5 | 0 | 0.024 | 226.4 | 0.165 |
| | 5.0 | 69.0 | (3.6) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 12.1 | 1.4 - 1.6 | | | | 0.161 |

19.5% to niacin, and 37.6% and 15.6% to thiamin intake.

It is also important to note the considerable difference in nutrient intake between brown and white bread (Fig. 2). Brown bread provides a far larger contribution to protein, fibre, zinc, niacin and vitamin $B_6$ intakes. It is therefore important for nutrition educators to highlight this when encouraging people to eat healthy foods, particularly after fortification.

Items that contributed to more than 5% of total carbohydrate intake were maize porridge, bread, sugar, and rice. Together these items made up more than 70% of total carbohydrate. Maize porridge had the highest significant correlation with total carbohydrate intake ($r = 0.429$).

The finding that carbohydrates supplied the bulk of the energy is in accordance with the FBDG *'Make starchy foods the basis of most meals'*.[11] This guideline is aimed at optimal intake of cereals and grains, with the objective of promoting an increase in people who have a low intake, or else maintaining optimal intake in those currently eating a reasonable intake. Ideally one would promote unrefined or minimally processed cereal and grains.[11] With the exception of brown bread, the main carbohydrate foods in this study were refined, i.e. white bread, maize meal, white rice and white sugar.

A high intake of unrefined cereals also contributed to a high intake of fibre. In Table IV it is shown that maize, brown bread, white bread, and samp/mealie rice contributed significantly to fibre intake. Brown bread had a correlation of 0.404 with total fibre intake. Additionally, a high carbohydrate intake contributed to the intake of B vitamins: folate, vitamin $B_6$, niacin, riboflavin and thiamin (Tables V and VI).

Forty-seven per cent of the variability of added sugar came from white sugar (Table II). This amounted to 60.1% of total intake of added sugar in the diet. This finding leads one to consider the guideline 'Eat sugar

**Table IV. Contribution of foods providing ≥ 5% of mineral & fibre of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank), % contribution to total nutrient intake | % consuming food, average portion size & mean per capita intake of food item (g) | Mean (SD) and 95% CI of per capital intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, Spearman |
|---|---|---|---|---|---|---|---|
| **Calcium** | | | | 0 | | | |
| Full-cream | (1) | 38.4% | 81.6 | 0 - 120 | 0.296 | 2 316.0 | 0.524 |
| liquid milk | 25.4% | 177.1 | (144.9) | | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 68.0 | 75.6 - 87.7 | 0 | | | 0.463 |
| | | 11.7% | 58.5 | 0 - 0 | 0.344 | 1 476.2 | 0.586 |
| Full-cream | (2) | 309.0 | (178.2) | | | ($p < 0.0001$) | ($p < 0.0001$) |
| processed milk | 18.2% | 36.1 | 51.1 - 66.0 | 0 | | | 0.403 |
| | | | 25.6 | 0 - 0 | 0.070 | 684.5 | 0.172 |
| Wild leaves/ | (3) | 9.5% | (91.4) | | | ($p < 0.0001$) | ($p < 0.0001$) |
| spinach | 8.0% | 151.9 | 21.8 - 29.4 | 0 | | | 0.154 |
| Brown bread & | (4) | 14.5 | 22.7 | 0 - 33 | 0.013 | 318.5 | 0.032 |
| rolls | 7.0% | 38.9% | (33.7) | | | ($p < 0.0001$) | ($p = 0.087$) |
| | | 105.8 | 21.2 - 24.1 | | | | 0.054 |
| | | 41.2 | | | | | ($p = 0.004$) |
| **Iron** | | | | 0.5 | | | |
| Maize products | (1) | 76.7 | 0.653 | 0.125 - 1.0 | 0.028 | 100.6 | 0.130 |
| & dishes | 10.9% | 445.0 | (0.679) | | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 0.625 - 0.682 | | | | -0.025 |
| | | | | 0 | | | $p = 1860$ |
| Wild leaves/ | (2) | 9.5% | 0.638 | 0 - 0 | 0.006 | 28.3 | 0.463 |
| spinach | 10.6% | 151.9 | (2.259) | | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 14.5 | 0.543 - 0.732 | 0 | | | 0.326 |
| Brown bread & | (3) | 38.9% | 0.615 | 0 - 0.9 | 0.030 | 110.6 | 0.142 |
| rolls | 10.2% | 105.8 | (0.912) | | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 41.2 | 0.576 - 0.653 | 0 | | | 0.194 |
| White bread & | (4) | 27.3% | 0.327 | 0 - 0.36 | 0.030 | 118.6 | 0.141 |
| rolls | 5.4% | 99.9 | (0.621) | | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 27.3 | 0.301 - 0.353 | | | | 0.129 |
| **Zinc** | | | | | | | |
| Maize products | (1) | 76.7% | 0.750 | 0.55 | 0.027 | 185.2 | 0.077 |
| & dishes | 14.9% | 445.0 | (0.699) | 0.163 - 1.10 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 0.721 - 0.779 | | | | 0.006 |
| | | | | | | | $p = 0.7615$ |
| Brown bread & | (2) | 38.9% | 0.579 | 0 | 0.057 | 240.3 | 0.258 |
| rolls | 11.5% | 105.8 | (0.861) | 0 - 0.84 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 41.2 | 0.543 - 0.615 | | | | 0.239 |
| White bread & | (3) | 27.3% | 0.272 | 0 | 0.052 | 239.8 | 0.197 |
| rolls | 5.4% | 99.9 | (0.516) | 0 - 0.30 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 27.3 | 0.251 - 0.294 | | | | 0.169 |
| Full-cream | (4) | 38.4% | 0.258 | 0 | 0.026 | 168.1 | 0.176 |
| liquid milk/ | 5.1% | 177.1 | (0.459) | 0 - 0.38 | | ($p < 0.0001$) | ($p < 0.0001$) |
| maas | | 68.0 | 0.239 - 0.278 | | | | 0.197 |
| **Fibre** | | | | | | | |
| Maize porridge | (1) | 76.7% | 2.82 | 2.0 | 0.059 | 501.4 | 0.250 |
| & dishes | 22.9% | 445.0 | (2.71) | 0.63 - 4 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 2.70 - 2.93 | | | | 0.190 |
| Brown bread & | (2) | 38.9% | 2.72 | 0 | 0.169 | 711.3 | 0.404 |
| rolls | 22.0% | 105.8 | (4.03) | 0 - 4.0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 41.2 | 2.55 - 2.88 | | | | 0.424 |

**Table IV. (cotd.) Contribution of foods providing > 5% of mineral & fibre of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank), % contribution to total nutrient intake | % consuming food, average portion size & mean per capital intake of food item (g) | Mean (SD) and 95% CI of per capital intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, Spearman |
|---|---|---|---|---|---|---|---|
| White bread & rolls | (3)<br>6.9% | 27.3%<br>99.9<br>27.3 | 0.84<br>(1.60)<br>0.65 - 0.91 | 0<br>0 - 0.93 | 0.045 | 446.2<br>($p < 0.0001$) | 0.076<br>($p < 0.0001$)<br>0.016<br>$p = 0.386$ |
| Dry beans | (4)<br>6.3% | 7.2%<br>186.9<br>13.4 | 0.77<br>(2.97)<br>0.65 - 0.90 | 0<br>0 - 0 | 0.145 | 784.3<br>($p < 0.0001$) | 0.360<br>($p < 0.0001$)<br>0.265 |
| Maize rice/ samp | (5)<br>6.2% | 8.6%<br>318.2<br>27.3 | 0.76<br>(3.28)<br>0.62 - 0.90 | 0<br>0 - 0 | 0.133 | 966.6<br>($p < 0.0001$) | 0.324<br>($p < 0.0001$)<br>0.188 |
| Wild fruits/ loquats/ guavas | (12)<br><5% | 0.49%<br>338.2<br>1.67 | 0.44<br>(1.54)<br>0.38 - 0.25 | 0<br>0 - 0 | 0.165 | 554.3<br>($p < 0.0001$) | 0.406<br>($p < 0.0001$)<br>0.089 |

and sugar-containing foods sparingly and not between meals',[12] the main objective of this guideline being protection against dental caries, obesity and decreased nutrient density of a diet high in sugar. It is useful to consider the sugar intake against the goal of limiting sugar intake to 10% or less of the total energy intake.[13] For South Africa as a whole, most of the sugar intake (65%) is in the form of table sugar and this contributes 5.5% of the total energy intake. However, a substantial amount of the sugar intake, 16.4%, comes from cold drinks.

Maize porridge, bread, chicken and milk were the items which contributed most to protein intake. Maize porridge alone was responsible for 19.1% of the total protein intake. Chicken and milk were the only two animal products which contributed more than 5% to the protein intake of the group. The guideline on animal foods states that *'Chicken, fish, milk, meat or eggs can be eaten daily'*.[14] The argument for this guideline is based on the fact that animal foods are the best sources of high-quality protein and certain essential micronutrients such as iron, zinc, vitamin $B_{12}$ and calcium.[14] However, the per capita intake of animal foods in this study falls far below that recommended for optimal health, namely 400 - 500 ml milk, fish 2 - 3 times a week (38 g/day), 80 - 90 g red meat/day and about 4 eggs per week (28 g/day).[15] Fish and egg consumption contributed to less than 5% of daily protein intake. This is one area where the population does not appear to follow the optimal choices; hence this guideline should receive priority, particularly in lower socio-economic areas. Since animal protein foods are generally more expensive than vegetable protein sources, these are frequently limited in the diet of poorer people.

The guideline *'Eat dry beans, split peas, lentils and soya regularly'* was intended to address the intake of protein, particularly in poorer communities.[16] In addition, this guideline was intended to address the intake of dietary fibre, minerals (calcium, copper, iron, magnesium, phosphorus, potassium and zinc) and vitamins (thiamin, riboflavin, niacin and folate).[16] However, it appears that while in total dry beans did not contribute to more than 5% of intake of protein, mineral and most vitamins per day, legumes did make a significant contribution to total fibre and folate intakes (Tables IV and V).

Testing of the preliminary FBDGs showed that women in KwaZulu-Natal and the Western Cape thought that legumes made a valuable contribution to the diet because of their relative cheapness and their high nutritional value (proteins and vitamins).[3] However, in poorer groups, the expense of cooking fuel was a constraint so processed soya products were reported to be used instead of legumes.[3] The FBDG encouraging the intake of legumes/pulses, *'Eat dry beans, peas, lentils and soya regularly'*, needs to be promoted. This could increase the intake of a number of nutrients in an affordable and culturally acceptable manner.

Brick margarine is the main source of dietary fat, followed by whole milk, maize (prepared with added fat), potatoes (prepared with/in fat) and chicken (Table III). However the per capita portions are very small and comply with the guideline: *'Eat fats sparingly'*, which is aimed at lowering fat intake in those following a typical Western diet and to maintain levels in those already following a diet low in fat.[17]

The guideline *'Eat plenty of vegetables and fruit every day'* has many objectives in terms of nutrients.[18]

**Table V. Contribution of foods providing ≥ 5% of vitamins $B_{12}$, $B_6$, folate and vitamin C of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank), % contribution to total nutrient intake | % consuming food, average portion size & mean per capita intake of food item (g) | Mean (SD) and 95% CI of per capital intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, Spearman |
|---|---|---|---|---|---|---|---|
| **Vitamin $B_{12}$** | | | | | | | |
| Beef liver | (1) | 0.76% | 0.70 | 0 | 0.797 | 11 009 | 0.892 |
| | 26.5% | 83.3 | (8.26) | 0 - 0 | | ($p$ <0.0001) | ($p$ < 0.0001) |
| | | 0.64 | 0.36 - 1.05 | | | | 0.142 |
| Sea fish (canned) | (2) | 4.5% | 0.50 | 0 | 0.075 | 1 646 | 0.281 |
| | 18.8% | 94.9 | (2.62) | 0 - 0 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 4.3 | 0.39 - 0.61 | | | | 0.333 |
| Full-cream liquid | (3) | 38.4% | 0.27 | 0 | 0.005 | 154.0 | 0.062 |
| milk | 10.2% | 177.1 | (0.48) | 0 - 0.4 | | ($p$ < 0.0001) | ($p$ = 0.0010) |
| | | 68.0 | 0.25 - 0.29 | | | | 0.454 |
| | | | | | | | ($p$ < 0.0001) |
| Eggs | (4) | 11.4% | 0.15 | 0 | 0.002 | 76.3 | 0.052 |
| | 5.8% | 73.1 | (0.42) | 0 - 0 | | ($p$ < 0.0001) | ($p$ = 0.0062) |
| | | 8.4 | 0.14 - 0.17 | | | | 0.322 |
| | | | | | | | $p$ < 0.0001 |
| Full-cream | (5) | 11.7% | 0.14 | 0 | 0.002 | 64.2 | 0.023 |
| processed milk | 5.4% | 309.0 | (0.44) | 0 - 0 | | ($p$ < 0.0001) | ($p$ = 0.2135) |
| (maas/buttermilk) | | 36.1 | 0.13 - 0.16 | | | | 0.220 |
| | | | | | | | ($p$ < 0.0001) |
| **Vitamin $B_6$** | | | | | | | |
| Brown bread | (1) | 38.9% | 0.06 | 0 | 0.031 | 354.7 | 0.135 |
| | 9.2% | 105.8 | (0.08) | 0 - 0.08 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 41.2 | 0.05 - 0.06 | | | | 0.195 |
| Potato, cooked | (2) | 21.4% | 0.05 | 0 | 0.109 | 418.4 | 0.332 |
| | 8.9% | 120.3 | (0.12) | 0 - 0 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 25.7 | 0.05 - 0.06 | | | | 0.356 |
| Maize porridge & | (3) | 76.7% | 0.05 | 0.04 | 0.009 | 226.2 | -0.096 |
| dishes | 8.3% | 445.0 | (0.06) | 0.01 - 0.07 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 341.4 | 0.05 - 0.05 | | | | -0.195 |
| Rice | (4) | 27.3 | 0.04 | 0 | 0.064 | 316.9 | 0.293 |
| | 6.2% | 143.6 | (0.07) | 0 - 0.05 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 39.1 | 0.02 - 0.04 | | | | 0.390 |
| Chicken | (5) | 17.5% | 0.03 | 0 | 0.023 | 329.3 | 0.267 |
| | 5.6% | 69.0 | (0.08) | 0 - 0 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 12.1 | 0.03 - 0.04 | | | | 0.209 |
| **Folate** | | | | | | | |
| White bread | (1) | 27.3% | 26.4 | 0 | 0.271 | 1 048 | 0.521 |
| | 19.9 | 99.9 | (50.0) | 0 - 29.1 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 27.3 | 24.3 - 28.5 | | | | 0.474 |
| Brown bread | (2) | 38.9% | 17.3 | 0 | 0.066 | 537.7 | 0.100 |
| | 13.0 | 105.8 | (25.6) | 0 - 25.2 | | ($p$ < 0.0001) | ($p$ < 0.0001) |
| | | 41.2 | 16.2 - 18.3 | | | | 0.186 |
| Maize porridge & | (3) | 76.7% | 11.4 | 7.5 | 0.018 | 347.3 | 0.013 |
| dishes | 8.6 | 445.0 | (16.1) | 2.5 - 15.0 | | ($p$ < 0.0001) | ($p$ = 0.4914) |
| | | 341.4 | 10.7 - 12.1 | | | | -0.145 |
| | | | | | | | ($p$ < 0.0001) |

**Table V. (cotd.) Contribution of foods providing ≥ 5% of vitamins $B_{12}$, $B_6$, folate and vitamin C of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank), % contribution to total nutrient intake | % consuming food, average portion size & mean per capita intake of food item (g) | Mean (SD) and 95% CI of per capital intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, Spearman |
|---|---|---|---|---|---|---|---|
| Dry beans | (4) | 7.2% | 10.9 | 0 | 0.153 | 750.3 | 0.425 |
| | 8.3 | 186.9 | (46.0) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 13.4 | 9.0 - 12.9 | | | | 0.277 |
| Maize rice/samp | (5) | 8.6% | 10.0 | 0 | 0.162 | 1 099 | 0.406 |
| | 7.5 | 318.2 | (47.8) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 27.3 | 8.0 - 12.0 | | | | 0.203 |
| **Vitamin C** | | | | | | | |
| Wild fruits/ loquats | (1) | 0.49% | 5.5 | 0 | 0.849 | 15 932 | 0.922 |
| guava | 14.7% | 338.2 | (128.4) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 1.67 | 0.18 - 10.9 | | | | 0.109 |
| Orange juice | (2) | 4.4% | 4.8 | 0 | 0.029 | 2134 | 0.169 |
| | 12.7 | 261.7 | (23.1) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 11.6 | 3.8 - 5.7 | | | | 0.318 |
| Potato | (3) | 21.4% | 4.6 | 0 | 0.006 | 709.8 | 0.095 |
| | 12.3 | 120.3 | (11.3) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 25.7 | 4.2 - 5.1 | | | | 0.437 |
| Mixed fruit juice | (4) | 1.1% | 4.2 | 0 | 0.083 | 3 434 | 0.295 |
| | 11.1 | 300.3 | (40.9) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 3.3 | 2.5 - 5.9 | | | | 0.167 |
| Cabbage, cooked | (5) | 14.7% | 3.1 | 0 | 0.003 | 515.4 | 0.029 |
| | 8.2 | 84.5 | (7.9) | 0 - 0 | | ($p < 0.0001$) | ($p = 0.1250$) |
| | | 12.4 | 2.7 - 3.4 | | | | 0.306 |
| | | | | | | | ($p < 0.0001$) |

The WHO (2003)[13] has recommended an intake of at least 400 g of fruit and vegetables per day in order to make the diet optimally protective for the prevention of cardiovascular diseases, obesity and certain cancers. This amount is believed to contain sufficient micronutrients, particularly vitamin A, vitamin C, folate, vitamin E, potassium and fibre in the diet. Additionally this amount contains many other substances which protect against chronic diseases, i.e. flavonoids, saponins and lycopene, to mention just a few. However in Table V it is observed that maize, bread and dry beans were the main sources of folate, indicating the importance of these foods as contributors to this nutrient. Fruit and vegetables were however the main sources of nutrients for vitamins A and C. Additionally, beef liver made a large contribution to vitamin A intake ($r = 0.892$).

Overall, the contribution to all nutrients of fruit and vegetables is very low, as are the per capita portions (Tables III, IV and V). Certainly these fall far short of the recommended amount of fruit and vegetables. Fruit and vegetable intakes need to be increased. Nationally only 440 or less out of 2 800 children had an intake of any type of fruit and vegetables in the last 24 hours, although the food frequency data (not reported in this study) indicated that a higher proportion of children eat fruit and vegetables daily.[1] This indicates that there is an acceptance of the consumption of fruits and vegetables and suggests that consumption is limited by factors such as low access and low availability.

Lastly, an examination of the number of different food items occurring in the diet of the study population was done in order to evaluate the guideline *'Enjoy a variety of foods'*.[19] Krebs-Smith *et al.*[20] classified total dietary variety score as a simple count of different food items eaten over a specific period of time. In this study an average of 5.5 (SD 2.5) different food items were found out of a total of 45 different items. A lack of dietary variety is believed to contribute to low energy intakes, low micronutrient intakes and chronic diseases of lifestyle.[21] In the current study variety is similar to that of Kenya,[22] Ghana and Malawi[23] but lower than that of Mali[24] and Vietnam.[25]

Thus for most micronutrients there are relatively few (and often the same) foods which make significant contributions to nutrient intakes. There is an urgent need to improve the dietary intake of children and adults in this country in line with the FBDGs. The guidelines which have been discussed in this article

**Table VI. Contribution of foods providing ≥ 5% of vitamins A, niacin, $B_1$, $B_2$ of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank), % contribution to total nutrient intake | % consuming food, average portion size & mean per capita intake of food item (g) | Mean (SD) and 95% CI of per capital intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, Spearman |
|---|---|---|---|---|---|---|---|
| **Vitamin A** | | | | | | | |
| Beef liver | (1) | 0.76% | 68.1 | 0 | 0.706 | 6 750 | 0.840 |
| | 16.4% | 83.3 | (794.2) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 0.64 | 34.9 - 101.3 | | | | 0.141 |
| Carrots, cooked | (2) | 3.94% | 66.5 | 0 | 0.154 | 3 070 | 0.428 |
| | 16.0 | 72.2 | (352.9) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 2.84 | 51.8 - 81.3 | | | | 0.309 |
| Wild leaves/ | (3) | 9.5% | 56.0 | 0 | 0.029 | 1 007 | 0.136 |
| spinach | 13.5 | 151.9 | (197.1) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 14.5 | 47.7 - 64.2 | | | | 0.355 |
| Full-cream liquid | (4) | 38.4% | 32.0 | 0 | 0.005 | 419 | 0.075 |
| milk | 7.7 | 177.1 | (56.8) | 0 - 47 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 68.0 | 29.6 - 34.3 | | | | 0.245 |
| Brick margarine | (5) | 27.2% | 25.3 | 0 | 0.003 | 318 | 0.073 |
| | 6.1 | 13.5 | (47.0) | 0 - 34.6 | | ($p < 0.0001$) | ($p = 0.0001$) |
| | | 3.7 | 23.4 - 27.3 | | | | 0.124 |
| **Niacin** | | | | | | | |
| Brown bread | (1) | 38.9% | 1.06 | 0 | 0.080 | 400.5 | 0.304 |
| | 14.9 | 105.8 | (1.60) | 0 - 1.56 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 41.2 | 1.00 - 1.13 | | | | 0.327 |
| Chicken | (2) | 17.5% | 0.79 | 0 | 0.167 | 565.1 | 0.409 |
| | 11.0 | 69.0 | (1.90) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 12.1 | 0.71- 0.87 | | | | 0.334 |
| Maize porridge & | (3) | 76.7% | 0.70 | 0.5 | 0.012 | 249.9 | -0.128 |
| dishes | 9.8 | 445.0 | (0.68) | 0.125 - 1.00 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 0.67 - 0.73 | | | | -0.181 |
| Potatoes, cooked | (4) | 21.4% | 0.35 | 0 | 0.040 | 309.8 | 0.207 |
| | 5.0 | 120.3 | (0.83) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 25.7 | 0.32 - 0.39 | | | | 0.224 |
| White bread | (5) | 27.3% | 0.33 | 0 | 0.019 | 241.3 | 0.160 |
| | 4.6 | 99.9 | (0.62) | 0 - 0.36 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 27.3 | 0.30 - 0.35 | | | | 0.169 |
| **Thiamin** | | | | | | | |
| Maize porridge & | (1) | 76.7% | 0.26 | 0.2 | 0.213 | 762.9 | 0.462 |
| dishes | 37.6% | 445.0 | (0.24) | 0.05 - 0.40 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 341.4 | 0.25 - 0.27 | | | | 0.348 |
| Brown bread | (2) | 38.9% | 0.07 | 0 | 0.081 | 453.4 | 0.195 |
| | 9.7% | 105.7 | (0.10) | 0 - 0.10 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 41.1 | 0.06 - 0.07 | | | | 0.157 |
| White bread | (3) | 27.3% | 0.04 | 0 | 0.055 | 265.6 | 0.124 |
| | 5.9% | 99.8 | (0.08) | 0 - 0.05 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 27.3 | 0.04 - 0.04 | | | | 0.069 |
| | | | | | | | $p = 0.0003$ |
| Potatoes, cooked | (4) | 21.4% | 0.03 | 0 | 0.043 | 296.6 | 0.217 |
| | 4.1% | 120.3 | (0.07) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 25.7 | 0.03 - 0.03 | | | | 0.138 |
| **Riboflavin** | | | | | | | |
| Maize-based | (1) | 7.3% | 0.13 | 0 | 0.385 | 1 765 | 0.621 |
| snacks | 16.9 | 27.6 | (0.44) | 0 - 0 | | ($p < 0.0001$) | ($p < 0.0001$) |
| | | 2.0 | 0.11 - 0.15 | | | | 0.424 |

**Table VI. (cotd.) Contribution of foods providing ≥ 5% of vitamins A, niacin, $B_1$, $B_2$ of total intakes in the diet of 12 - 108-month-old children in the NFCS**

| Food/beverage | (Rank), % contribution to total nutrient intake | % consuming food, average portion size & mean per capita intake of food item (g) | Mean (SD) and 95% CI of per capital intake of nutrient for this food item | Median (Q1 - Q3) of intake of nutrient for this food item | Partial R-square | F-value | Pearson's *r*-value, Spearman |
|---|---|---|---|---|---|---|---|
| Full-cream liquid milk | (2)<br>14.5 | 38.4%<br>177.1<br>68.0 | 0.11<br>(0.19)<br>0.10 - 0.12 | 0<br>0 - 0.16 | 0.092 | 705.7<br>($p < 0.0001$) | 0.332<br>($p < 0.0001$)<br>0.464 |
| Full-cream processed milk (maas) | (3)<br>7.2 | 11.7%<br>309.0<br>36.1 | 0.05<br>(0.16)<br>0.05 - 0.06 | 0<br>0 - 0 | 0.031 | 254.1<br>($p < 0.0001$) | 0.147<br>($p < 0.0001$)<br>0.246 |
| Maize porridge & dishes | (4)<br>5.4 | 76.7%<br>445.0<br>341.4 | 0.04<br>(0.04)<br>0.04 - 0.04 | 0.03<br>0.01 - 0.06 | 0.002 | 21.9<br>($p < 0.0001$) | -0.087<br>($p < 0.0001$)<br>-0.123 |
| Eggs | (5)<br>4.4 | 11.4%<br>73.0<br>8.4 | 0.03<br>(0.09)<br>0.03 - 0.04 | 0<br>0 - 0 | 0.012 | 127.1<br>($p < 0.0001$) | 0.145<br>($p < 0.0001$)<br>0.269 |

that were generally found to be met were:

*Make starchy foods the basis of most meals*

*Eat fats sparingly*

The FBDGs discussed and found not to be met by the current intakes of foods were:

*Enjoy a variety of foods*

*Eat plenty of vegetables and fruits every day*

*Eat dry beans, peas, lentils and soy regularly*

*Chicken, fish, milk, meat or eggs can be eaten daily*

These guidelines, if followed, would contribute significantly to the nutrient intakes of children and adults. The challenge is to empower people living in poverty to follow all the guidelines and thus to increase their intake of all essential nutrients.

## Conclusion

Maize and bread contributed significantly to macro- nutrients and most micronutrients, with the exception of calcium. Food fortification of these items has been implemented since October 2003 and will significantly increase the contribution of these foods to micronutrient intake. The diet of children in South Africa (12 - 108 months) in 1999 was found to have little dietary variety, was low in animal foods, particularly dairy foods, and contained a low intake of legumes, fruit and vegetables.

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