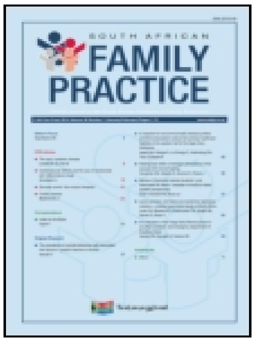

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RESEARCH

The nutrient intake of children aged 12–36 months living in two communities in the Breede Valley, Western Cape province, South Africa

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Objective: The objective of this study was to describe the current macro- and micronutrient intake of children (both boys and girls) in two selected communities in the Breede Valley, Worcester.
Design: This was a quantitative cross-sectional study.
Setting: The study focused on two disadvantaged communities in Worcester (Avian Park and Zweletemba) in the Breede Valley, Western Cape province.
Subjects: The study subjects were 248 children (Avian Park, $n = 117$; Zweletemba, $n = 131$) aged 12–36 months.
Method: The macro-and micronutrient intake of the children was determined using a validated, interviewer-administered quantitative food frequency questionaire, and compared against the estimated average requirement (EAR) and adequate intake (AI) of nutrients. The nutrient adequacy ratio was calculated, as well as percentage deviation from the EAR and AI.
Results: More than 20% of the children had a calcium and folate intake that deviated by more than 50% below the EAR in both communities and for both genders. More participants in Zweletemba had an intake that deviated by more than 50% above the EAR and AI, compared to Avian Park, for carbohydrate, thiamine, niacin and iron.
Conclusion: With the exception of folate, calcium and selenium, the average reported nutrient intake of the children (boys and girls) in both the communities was adequate.

Keywords: food frequency questionaire, macronutrients, micronutrients, nutrient intake

Introduction

Deficiencies of macronutrients and essential micronutrients are important risk factors for childhood morbidity and mortality. Approximately 60% of the 10.9 million deaths that occur annually in children aged five years and younger have been attributed directly or indirectly to malnutrition.[1–3]

Without intake of the right nutrients, optimal growth and full development of the mental, physical and intellectual capabilities of children cannot be achieved.[1] Furthermore, malnutrition in early childhood is strongly associated with shorter adult stature and reduced economic productivity, as well as increased risk of degenerative diseases later in life.[4–6]

In South Africa, according to the 1999 National Food Consumption Survey (NFCS), one in two children aged 1–9 years had an intake of approximately less than half the recommended level for energy and other important micronutrients, including calcium, iron, zinc, selenium, vitamin A, vitamin D, vitamin C, vitamin E, riboflavin, niacin, folic acid and vitamin B_6.[7] The National Food Consumption Survey-Fortification Baseline (NFCS-FB-I) of 2005 reported that a large proportion of the children were still vitamin or mineral deficient.[8] These results led to South African mandatory food fortification legislation.[8]

To contribute to the development of a nutrition research platform at Stellenbosch University Rural Clinical School in Worcester, the Division of Human Nutrition, Stellenbosch University, initiated a large, multi-phased community nutrition security project in two communities in Worcester (Avian Park and Zweletemba), Breede Valley, Western Cape, in 2011. The first phase of the community nutrition security project, a baseline study, described the food security situation of the communities, and investigated ways in which the local food system could be improved to maximise the healthy growth and development of young children in the community. This was in line with Stellenbosch University's Hope Project, which is rooted in it's three functions, teaching and learning, research and community interaction, and showcasing academic initiatives that serve human need. It uses these core functions to create sustainable answers to some of South Africa's and Africa's most pressing challenges.[9]

Recent data on the nutrient intake of children aged 12-36 months in both the Western Cape and South Africa are scarce and necessitate further research, especially because of urbanisation and transition which are currently occurring in South Africa.

Therefore, this paper describes and compares the nutrient intake of boys and girls aged 12–36 months. The study was approved by the Human Research Ethics committee of Stellenbosch University (Ref N10/11/368). The mothers and primary caregivers provided written informed consent before participating in the study.

Method

Data collection

The study followed a quantitative, cross-sectional design, with a representative sample of children (boys and girls) from both communities. A power analysis of one-way analysis of variance with a 5% significance was used in the main community nutrition security project. This was designed with 90% power, and it gave a sample size of 170 per area using an effect size of $\delta = 0.25$ with 5% significance. To allow for a response rate of 85%, the total sample size included 200 children aged 0–36 months per area. For the purposes of our study, the nutrient intake of children aged 12–36 months was determined.

Area maps were obtained and all streets were numbered and randomly selected with a computer-generated, random numbers table. An equal number of houses from every selected street were included. Starting points at each street were randomly selected and the direction of approach was alternated. Households were included until a total number of houses for each street was obtained. If there were not enough households within a street to qualify for inclusion, another street was selected and those households were approached for participation. Where more than one household at an address was eligible, participation was determined through random selection. The same procedure was used in situations in which more than one child was eligible for participation.

A socio-demographic questionnaire was used to gather basic descriptive information on the participants. Each section of the questionnaire was adapted from previous studies conducted in South Africa.[6–8,10] A previously validated quantitative food frequency questionnaire (QFFQ) was used to determine the nutrient intake of the children.[7] The QFFQ included 254 South African food items and dishes, with four frequency options, including "number of times per day", "number of days per week", "number of times per month", and "seldom". Space was provided at the end of each food group to add foods consumed, but not listed, in that section of the questionnaire. The computer food code and standard serving sizes were given for each item. Columns were provided for the amount of food consumed in household measures, as well as in weight, and the frequency of consumption of each item.[7] Dishes that were consumed less than once a month or seldom were not considered to be frequent enough and were not included in the analysis.

The purpose of the QFFQ was to assess the frequency of consumption of specific food items or food groups in a pre-specified period. The original design of the food frequency questionnaire (FFQ) was devised to provide descriptive qualitative information on usual food consumption. When portion size estimates are added to the frequency-of-use categories in a FFQ, the method becomes semi-quantitative, allowing the derivation of energy and selected nutrient intake.[11] The quantity and frequency of the consumption of specific food items or dishes over a period of one month (28 days) were recorded.

Both questionnaires were interview based and were completed by specially trained field workers in the participants' first language.

Data analysis

Average daily nutrient intake was calculated with FoodFinder® 3[12] software programme, based on the South African food composition tables, and included all mandatory food fortification for the relevant food products. The following nutrients were analysed: total energy, protein, carbohydrates, fibre, vitamin A, thiamine, riboflavin, niacin, vitamin B_{12}, vitamin B_6, folate, calcium, iron, magnesium, selenium and zinc.

The IBM SPSS® version 19[13] software programme was used to statistically analyse the data for each individual participant. A Kolmogorov-Smirnov normality test was conducted to determine the skewness of the data. Because the estimated average requirement (EAR) is an indication of the average requirements for various macro-and micronutrients, it was important to compare the nutrient intake with the EAR value to determine any deviation from the EAR, as well as the number of children to whom deviation applied. All nutrient raw values and percentage differences from the EAR value were found to differ significantly from a normal distribution, and were thus treated non-parametrically, hence median, interquartile range and percentiles were calculated and used to describe the data for the macro- and micronutrient intake of the children. A nutrient adequacy ratio (NAR) was calculated by dividing the intake of each nutrient by the EAR/adequate intake (AI) value for the nutrient, multiplied by 100 for each participant. A NAR value of 100% for a nutrient indicated that the children were consuming the adequate requirement for the specific nutrient. The protein intake of the participants was converted from g/day to g/kg/day by dividing the total daily protein intake of each child with the child's current weight. Percentage deviation from the EAR/AI[14–19] was calculated by subtracting the median intake for each nutrient from its EAR/AI value and multiplying it by 100. AI was used for a comparison for energy and fibre.

Finally, percentage deviation from EAR/AI was categorised into four groups (−100 to −50%, −50 to 0%, 0 to 50% and those greater than 50% of the EAR/AI) based on their percentage deviation. The categorisation was used to indicate how much the intake of the children deviated above or below the EAR. All of the analyses were stratified by gender and area of residence.

Results

Table 1 describes the basic socio-demographic information of the participants. Avian Park is a residential area with both African and people of mixed race, whereas mostly African residents live in Zweletemba. Unemployment of mothers and caregivers was high in both communities, and the majority of those employed were wage earners. There was an adult with secondary education in most of the households. People from both communities received government grants. The child grant was most frequently collected. The average income for households in Zweletemba was slightly higher than that for Avian Park (R3 183.77 vs. R2 813.74, respectively), and included money received from government grants. On average, 70% of households in both communities spent more than R400 on food monthly.

61.2% of the participants lived in brick houses in Avian Park, while the corresponding figure was 66.0% for those living in Zweletemba. More people in Avian Park lived in informal structures (32.2%) than those in Zweletemba (27.4%). Fewer households in Avian Park used water from inside taps (71.1% and 92.1%, respectively), while the remainder made use of communal taps. The households in both areas largely used electricity as fuel to cook food (87.7% in Avian Park and 98.3% in Zweletemba). The remaining households used gas or paraffin.

One hundred and seventeen children from Avian Park (55 girls and 62 boys), and 131 children from Zweletemba (65 girls and 66 boys) participated in the study.

Table 2 provides the median, interquartile range, NAR and percentage deviation from the EAR/AI for the boys and girls in the two areas. Median protein, vitamin A and riboflavin intake in both areas exceeded the EAR requirement for all of the children. The median energy, carbohydrate and protein intake for both boys and girls in Avian Park was lower than that in Zweletemba (Table 2). Intake for energy and fibre was below the AI value for all

Table 1: Basic socio-demographic information of the mothers and caregivers who participated in the community nutrition security project study

Population	Avian Park (*n* = 211) *n* (%)	Zweletemba (*n* = 211) *n* (%)
Race		
African	75 (35.6)	229 (94.6)
Mixed race	135 (64.0)	5 (2.1)
Employment status of caregiver		
Unemployed	138 (65.4)	127 (52.7)
Wage earners	42 (19.9)	67 (27.8)
Education level of caregiver		
None or primary school	26 (12.5)	39 (16.1)
Secondary school	179 (85.6)	190 (78.5)
Grants		
None	42 (20.8)	49 (20.6)
Child	151 (74.8)	161 (67.7)
Old age	2 (1.0)	14 (6.0)
Income* (R)	R2 813.74 (R2 370.39)	R3 183.77 (R4 410.73)
Money spent on food per month (> R400)	147 (70.7)	165 (69.6)

*: mean (standard deviation)

Table 2: Median, interquartile range, nutrient adequacy ratio and percentage deviation from the estimated average requirement and the average intake of the girls and boys in Avian Park and Zweletemba

Girls							
Nutrient	**EAR/AI value**	**Avian Park (*n* = 55)**			**Zweletemba (*n* = 65)**		
		Median nutrient intake (IQR)	**% deviation from EAR/AI (IQR)**	**NAR (IQR)**	**Median nutrient intake (IQR)**	**% deviation from EAR/AI (IQR)**	**NAR (IQR)**
Energy (kJ)	4 393	3 571.7 (2 282.0, 5 060.7)	−18.7 (−48.1, 15.2)	81.3 (52.0, 115.2)	4 145.0 (2 893.7, 6 191.3)	−5.7 (−34.1, 40.9)	94.4 (65.9, 140.9)
Protein (g/kg/day)	0.87	2.6 (1.7, 3.7)	201.5 (99.0, 321.5)	301.5 (199.0, 421.5)	2.7 (1.8, 3.8)	212.8 (109.6, 334.4)	312.8 (209.6, 434.4)
Carbohydrate (g)	100	103.7 (66.2, 155)	3.7 (−33.8, 55.0)	103.7 (66.2, 155.0)	126.8 (86.6, 203.5)	26.8 (−13.5, 103.5)	126.8 (86.6, 203.5)
Fibre (g)	19	5.7 (3.9, 9.7)	−70.2 (−79.5, −48.9)	29.8 (20.5, 51.1)	6.9 (4.4, 13.2)	−63.6 (−76.8, −30.3)	36.4 (23.2, 69.7)
Vitamin A (µg)	210	477.4 (231.8, 791.2)	127.3 (10.4, 276.8)	227.3 (110.4, 376.8)	450.8 (210.2, 831.3)	114.7 (0.1, 295.8)	214.7 (100.1, 395.8)
Thiamine (mg)	0.4	0.5 (0.3, 0.7)	14.1 (−25.0, 81.7)	114.1 (75.0, 181.7)	0.6 (0.3, 0.8)	39.61 (−15.7, 93.0)	139.6 (84.3, 193.0)
Riboflavin (mg)	0.4	0.8 (0.4, 1.3)	108.1 (5.1, 227.1)	208.1 (105.1, 327.1)	1.2 (0.6, 2.1)	194.1 (38.7, 435.6)	294.1 (138.7, 535.6)
Niacin (mg)	5	6.4 (3.9, 10.9)	26.9 (−22.3, 117.7)	126.9 (77.7, 217.7)	7.4 (4.1, 10.2)	48.2 (−17.6, 103.6)	148.2 (82.4, 203.6)
Vitamin B_{12} (µg)	0.7	2.7 (1.4, 4.0)	278.9 (93.1, 477.5)	378.9 (193.1, 577.5)	2.2 (1.4, 4.2)	211.3 (99.5, 498.0)	311.3 (199.5, 598.0)
Vitamin B_6 (mg)	0.4	0.5 (0.3, 0.9)	44.2 (−24.5, 131.7)	144.2 (75.5, 231.7)	0.7 (0.4, 1.0)	63.9 (10.2, 144.8)	163.8 (110.2, 244.8)
Folate (µg)	120	84.2 (46.9, 140.7)	−29.9 (−60.9, 17.3)	70.1 (39.1, 117.3)	92.8 (53.6, 142.7)	−22.4 (−54.4, 20.0)	77.4 (44.6, 119.0)
Calcium (mg)	500	267.7 (179.2, 401.0)	−46.5 (-64.2, −19.8)	53.5 (35.8, 80.2)	314.8 (196.1, 477.3)	−37.0 (−60.8, −4.5)	63.0 (39.2, 95.5)
Iron (mg)	3.0	4.3 (2.8, 7.8)	43.8 (−6.3, 158.3)	143.8 (93.7, 258.3)	5.1 (2.7, 7.4)	70.8 (-11.0, 145.2)	170.8 (89.0, 245.2)
Magnesium (mg)	65	97.5 (66.5, 150.9)	49.9 (2.3, 132.2)	149.3 (102.3, 232.2)	118.7 (78.8, 168.7)	82.6 (21.3, 159.6)	182.6 (121.3, 259.6)
Selenium (mg)	17	13.7 (9.6, 29.0)	−19.2 (−43.5, 70.3)	80.8 (56.5, 170.3)	17.4 (10.0, 24.6)	2.5 (−41.1, 44.4)	102.5 (58.9, 144.4)
Zinc (mg)	2.5	3.6 (2.4, 5.0)	45.0 (−5.9, 101.1)	145.0 (94.1, 201.1)	3.9 (2.5, 5.6)	54.0 (1.7, 123.6)	154.0 (101.7, 223.6)

(Continued)

Table 2: Continued

Boys							
Nutrient	**EAR/AI value**	**Avian Park (*n* = 62)**			**Zweletemba (*n* = 66)**		
		Median nutrient intake (IQR)	**% deviation from EAR/AI (IQR)**	**NAR (IQR)**	**Median nutrient intake (IQR)**	**% deviation from EAR/AI (IQR)**	**NAR (IQR)**
Energy (kJ)	4 393	3 924.6 (2 413.7, 5 794.1)	−10.7 (−45.1, 31.9)	89.3 (54.9, 131.9)	4 615.4 (2 952.8, 6 452.0)	5.1 (−32.8, 46.9)	105.1 (67.2, 146.9)
Protein (g/kg/d)	0.87	2.6 (1.7, 3.8)	198.0 (92.4, 334.8)	298.0 (192.4, 434.8)	2.9 (2.0, 3.8)	228.3 (134.2, 340.1)	328.3 (234.2, 440.1)
Carbohydrate (g)	100	127.4 (81.7, 181.7)	27.4 (−18.3, 81.7)	127.4 (81.7, 181.7)	142.4 (86.2, 211.3)	42.4 (−13.8, 111.3)	142.4 (86.2, 211.3)
Fibre (g)	19	8.8 (4.4, 12.6)	−53.6 (−76.7, −33.6)	46.4 (23.3, 66.4)	8.8 (5.4, 13.1)	−53.5 (−71.5, −31.2)	46.5 (28.5, 68.8)
Vitamin A (µg)	210	367.1 (180.6, 662.7)	74.8 (−14.0, 215.6)	174.8 (86.0, 315.6)	517.3 (327.8, 971.9)	146.3 (56.1, 362.8)	246.3 (156.1, 462.8)
Thiamin (mg)	0.4	0.5 (0.3, 1.0)	31.4 (−18.4, 141.3)	131.4 (81.6, 241.3)	0.6 (0.4, 0.8)	56.6 (6.1, 106.2)	156.6 (106.1, 206.2)
Riboflavin (mg)	0.4	0.9 (0.5, 1.5)	126.1 (30.3, 265.0)	226.1 (130.3, 365.0)	1.2 (0.8, 2.5)	196.0 (93.3, 518.9)	296.0 (193.3, 618.9)
Niacin (mg)	5	6.4 (4.9, 11.2)	27.8 (−3.2, 124.3)	127.8 (96.8, 224.3)	8.6 (5.4, 10.7)	72.6 (8.4, 114.1)	172.6 (108.4, 214.1)
Vitamin B_{12} (µg)	0.7	2.7 (1.6, 4.3)	278.8 (123.4, 518.8)	378.8 (223.4, 618.8)	3.3 (1.7, 6.7)	371.4 (142.5, 857.3)	471.4 (242.5, 957.3)
Vitamin B_6 (mg)	0.4	0.6 (0.4, 1.1)	44.5 (−8.2, 172.1)	144.5 (91.8, 272.1)	0.8 (0.5, 1.0)	86.8 (20.3, 155.7)	186.8 (120.3, 255.7)
Folate (µg)	120	97.2 (53.8, 140.0)	−19.0 (−55.2, 16.7)	81.0 (44.8, 116.7)	98.2 (61.5, 138.8)	−18.2 (−48.8, 15.7)	81.8 (51.2, 115.7)
Calcium (mg)	500	303.5 (177.8, 509.7)	−39.3 (−64.4, 1.9)	60.7 (35.6, 101.9)	346.5 (253.1, 553.5)	−30.7 (−49.5, 10.7)	69.3 (50.6, 110.7)
Iron (mg)	3.0	5.1 (2.8, 7.4)	68.6 (−7.1, 147.4)	168.6 (92.9, 247.4)	5.7 (3.7, 8.5)	88.2 (24.2, 182.0)	188.2 (124.2, 282.0)
Magnesium (mg)	65	116.6 (74.0, 175.7)	79.4 (13.8, 170.4)	179.4 (113.8, 270.4)	148.6 (82.2, 192.7)	128.6 (26.4, 196.5)	228.6 (126.4, 296.5)
Selenium (mg)	17	17.7 (9.9, 30.8)	3.9 (−42.1, 81.2)	103.9 (58.0, 181.2)	18.0 (13.5, 26.5)	5.7 (−20.7, 56.0)	105.7 (79.4, 156.0)
Zinc (mg)	2.5	3.9 (2.5, 5.7)	56.5 (−0.3, 127.3)	156.5 (99.7, 227.3)	4.7 (3.1, 5.8)	88.1 (24.7, 132.2)	188.1 (124.7, 232.2)

AI: adequate intake, EAR: estimated average requirement, IQR: interquartile range, NAR: nutrient adequacy ratio

children in both communities, with a percentage deviation as low as −18% below the AI for energy in Avian Park girls and −5% in the Zweletemba girls. The median intake for fibre deviated by more than −50% below the AI for all children in both communities.

Furthermore, the median intake for calcium and folate was inadequate and below the EAR for all of the children in both communities.

The NAR was low for some nutrients, such as fibre and calcium, and very high for others, including protein and vitamin B_{12}. The NAR value for fibre for Avian Park girls and Zweletemba girls was 29.8% and 36.6%, respectively, and deviated from the AI, i.e. −70.2% and −63.6%, respectively. Boys in Avian Park and Zweletemba had a NAR value of 168.2% and 188.2% for iron, respectively. They consumed 68.2% and 88.2%, respectively, above the EAR value (Table 3).

The percentage deviation from the EAR/AI of each nutrient was classified into four groups (Table 3). On average, the majority of girls in both the communities had a high reported intake of vitamin A, riboflavin, niacin, iron and zinc (> 50% above the EAR/AI) (Table 3). The majority of the males had a high intake (> 50% above the EAR/AI) for carbohydrates, vitamin A, thiamine, riboflavin, niacin, iron and zinc. There were large numbers (12-34%) of both boys and girls in both communities with a folate, calcium and selenium intake that was well below the recommended EAR (Table 3).

Discussion

This study aimed to describe the macro- and micronutrient intake of children aged 12–36 months in the two participating communities, as well as deviation from the EAR by these children. The results showed that the nutrient intake in both communities was fairly adequate, but children in both the communities had an intake less than the EAR/AI value recommended for their age for a few macronutrients, and vitamins and minerals. However, there was a large variation between the intake of the children in Avian Park and the intake of those in Zweletemba. A higher percentage of the intake in the girls and boys from Zweletemba exceeded the EAR by more than 50% for most of the nutrients.

The median group intake for energy was low in all of the the children in both communities (ranging from 3 571–4 615 kJ), and was lower than the median energy reported in the national survey (5 282 kJ) and the Western Cape (7 078 kJ).[7] It was found in the NFCS that nationally, one in 10 (13%) and one in four (26%) children aged 1–3 years had an energy intake less than half, and less than two

Table 3: Classification of the percentage deviation of nutrient intake from the estimated average requirement and the average intake reference values

Girls								
	Avian Park (*n* = 55)				Zweletemba (*n* = 65)			
Nutrient	−100 to −50%	−50 to 0%	0 to 50%	> 50%	−100 to −50%	−50 to 0%	0 to 50%	> 50%
Energy	23.6	45.5	18.2	12.7	16.9	36.9	24.6	21.5
Protein	0.0	7.5	3.8	88.7	1.8	7.0	8.8	82.5
Carbohydrate	11.0	34.6	27.3	27.3	7.7	27.7	20.0	44.6
Fibre	72.7	18.2	7.3	1.8	63.1	26.2	6.2	4.6
Vitamin A	7.3	12.7	10.9	69.1	6.2	18.5	15.4	60.0
Thiamine	9.1	34.6	21.8	34.6	6.2	30.8	21.5	41.5
Riboflavin	3.6	16.4	12.7	67.3	4.6	10.8	12.3	72.3
Niacin	10.9	23.6	21.8	43.6	7.7	24.6	21.5	46.6
Vitamin B_{12}	3.6	5.5	7.3	83.6	6.1	6.2	7.7	80.0
Vitamin B_6	7.3	30.9	18.2	43.6	6.2	12.3	24.6	57.0
Folate	34.6	36.4	14.6	14.5	27.7	44.6	15.4	12.3
Calcium	43.6	38.2	7.3	10.9	24.2	45.5	16.7	13.6
Iron	7.3	21.8	23.6	47.3	4.6	26.2	16.9	52.3
Magnesium	6.2	7.7	24.6	61.6	6.2	7.7	24.6	61.6
Selenium	23.6	32.7	14.6	49.1	20.0	27.7	29.2	23.1
Zinc	5.5	23.6	23.6	47.3	7.7	16.9	21.5	53.9
Boys								
	Avian Park (*n* = 62)				Zweletemba (*n* = 66)			
Nutrient	−100 to −50%	−50 to 0%	0 to 50%	> 50%	−100 to −50%	−50 to 0%	0 to 50%	> 50%
Energy	19.4	40.3	24.2	16.1	13.6	31.8	31.8	22.7
Protein	0.0	6.6	3.3	90.2	3.2	0.0	9.5	87.3
Carbohydrate	4.9	29.0	29.0	37.1	9.1	24.2	22.7	43.9
Fibre	58.1	25.8	11.3	4.8	56.1	34.8	4.5	4.5
Vitamin A	12.9	14.5	16.1	56.5	9.1	6.1	9.1	75.8
Thiamine	9.7	24.2	19.4	46.8	6.1	18.2	19.7	56.1
Riboflavin	6.5	6.5	21.0	66.1	3.0	3.0	9.1	84.9
Niacin	9.7	17.7	29.0	43.6	4.6	16.7	18.2	60.6
Vitamin B_{12}	4.8	6.5	3.2	85.5	4.5	3.0	7.6	84.8
Vitamin B_6	4.8	24.2	21.0	50.0	6.1	12.1	19.7	62.1
Folate	30.7	29.0	25.8	14.5	21.2	42.4	25.8	10.6
Calcium	38.7	33.9	12.9	14.5	38.5	38.5	9.2	13.8
Iron	4.8	24.2	16.1	54.8	3.0	12.1	21.2	63.6
Magnesium	0.0	19.4	21.0	59.6	3.0	10.6	16.7	69.7
Selenium	19.4	29.0	17.7	33.9	12.1	33.3	27.3	27.3
Zinc	4.8	21.0	22.6	51.6	3.0	10.6	22.7	63.6

thirds, of their daily energy needs, respectively.[7] A low energy intake reduces physical activity and concentration, and can lead to stunting and wasting.[4–6] The low intake may be because of lack of purchasing power by the caregivers since many of them were unemployed and depended on a government grant to support their children.

The median protein intake of those in Avian Park and Zweletemba was adequate to high when compared to the EAR, and this correlates with the findings of the 1999 NFCS, according to which all of the children had a high protein intake. The highest median protein intake (51 g) was reported in the Western Cape.[7] Up to 33 g was reported in the current study. However, this high intake value might have been because of reporting bias. Further investigations should be carried out in follow-up papers to identify and describe the reporting trends of mothers and caregivers, especially in terms of protein, riboflavin and vitamin A.

According to the 2005 NFCS-FB-I data, 63.6% of all South African children and 43.5% of children in the Western Cape presented with an inadequate vitamin A status,[20] based on blood levels. Between 56.5% and 75.8% of the vitamin A intake of the children in the study populations exceeded the EAR by more than 50%. However, this QFFQ is not valid when reporting on vitamin A status.[7] Actual blood measurements should be determined to make a further judgement on the children's vitamin A status. In terms of other micronutrients, it was found that calcium and folate intake was low for the majority of the children in both communities, which corresponds with the NFCS figures which revealed that mean folate and calcium intake was low.[7] A low intake of folate may lead to impaired brain development in children, and has also been associated with a greater risk of depression in later life.[22] Moreover, a low calcium intake has been found to result in rickets.[23]

Although initially, it seemed as if the nutrient intake of the children from these areas was mostly adequate, there were clear indications of pockets of poor nutrient intake within each community. The purpose of this article was to present the current situation in the population, and to identify where and what the differences were. A follow-up paper should invesitgate the correlation between nutrient intake and measures of socio-economic status, as well as other variables.

Also, further in-depth investigations must be conducted to further understand the food security situation of those who did not have an adequate intake. The low socio-economic status of the caregivers of the children affected their nutrient intake considedrably. More than 50% of the caregivers were unemployed, and less than 30% earned a wage. The employed caregivers were low-income earners. More than 70% had only attained secondary school education. Low socio-econmic status of caregivers has been associated with malnutrition and impaired developmental potential in children in their first five years.[5] Also, it should be kept in mind that the results reported in this study should be compared with actual blood and anthropometric values to provide more insight into the children's overall nutritional status.

Limitations

Data were collected with a QFFQ which is known to over-report average nutrient intake, and therefore further in-depth investigations into the data should be made regarding the presence, direction and extent of reporting bias, especially in terms of protein, riboflavin and vitamin A . Dietary intake data collected from the children were reported by mothers and cargivers, hence the information provided was second-hand. Also, the parents and caregivers may not have been aware of foods eaten by the child away from home.[7] Because this study was an observational study, the confounding factors may not have been equally distributed between the two groups being compared, and the unequal distribution may have led to bias and subsequent misrepresentation.[21]

Conclusion

From the results of this study, it can be concluded that with the exception of energy, fibre, calcium, folate and selenium, the nutrient intake, derived from the food frequency data on the two communities, was adequate. However, it must be kept in mind that the questionnaire over-reports and therefore further investigations into the nutrition status of the children are required.

Conflict of interest — The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this paper.

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