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Household food security — what health professionals should know

N P Steyn, H-L Robertson, M Mekuria, D Labadarios

Objectives. To determine national food security (availability) from national food production and consumption data and to compare 'available' consumption data with actual consumption data obtained from dietary surveys in order to predict household food security.

Design. Survey of the literature and calculations from South African food balance sheets.

Methods. Data were obtained from reports and food balance sheets published by the Department of Agriculture's Directorate of Agricultural Economic Trends, the Development Bank of Southern Africa and the World Bank. Food available for individual consumption was calculated (production minus animal feed minus export and import) and compared with actual consumption data derived from dietary surveys published locally.

Results. Findings indicate that the growth rates of staple foods and livestock over the last 23 years are lower than the population growth rate. The average available daily energy is 9 772 kJ and the protein content is 66.8 g as calculated from food balance sheets. However, dietary surveys indicate that urban and rural blacks have considerably lower energy intakes, indicating poor household food security. Mean daily energy intakes were found to be 7 345 kJ for urban, and 7 130 kJ for rural black South Africans.

Conclusion. We recommend that research focus on causes of food insecurity in order to implement effective intervention programmes. It is essential that such research be multidisciplinary and include agriculturalists, health professionals and social scientists.

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'A food-secure world would be one in which food as a human right would be the form of social behaviour, an expectation upheld and enforced by all and for all.'[1]

Departments of Human Nutrition and Agricultural Economics, University of the North, Sovenga, Northern Province

N P Steyn, PhD

M Mekuria, PhD

Vitamin Information Centre, Roche Products, Chloorkop, Gauteng

H-L Robertson, BSc (Diet)

Department of Human Nutrition, University of Stellenbosch, Tygerberg, W Cape

D Labadarios, MB ChB, PhD, FACN

During the last 25 years, hunger and malnutrition have become increasingly rife in Africa. This has been particularly evident in countries such as Ethiopia, Sudan and Somalia, which have experienced famine since the 1980s.[2] The World Bank's 1990 report estimated that in 1985, over 180 million people in sub-Saharan Africa were living in poverty (per capita income below US$370). They also projected that by the year 2000 the number of poor in Africa would increase to 265 million.[3] The Food and Agricultural Organisation (FAO) has classified 88 countries of the world as low income food deficit countries (LIFDC) and of these, 42 are in sub-Saharan Africa.[4]

Today, the real crisis in Africa is the steady decline in food production per capita.[2] Major food crops in sub-Saharan Africa have increased by 1.6%, whereas the population has increased by 2.8%.[5] Since the 1960s food production has consistently lagged behind population growth and a food shortfall of 40% has resulted. On the basis of past trends, the FAO has predicted that cereal deficits in Africa will increase from 9 million tons in 1984 to 58 million tons by 2010.[2] In Asia on the other hand, food production since 1960 has consistently exceeded population growth. India was the biggest poverty region in the world in 1960, but as a result of yields per hectare increasing by 2.4% per annum, the need for food aid had virtually been eliminated by the 1980s. Africa, on the other hand, has only increased its yields by 0.1% per annum since 1960.[5]

Many reasons have contributed to famine in Africa: war, persistent low economic growth, poor agricultural performance, drought, environmental degradation and rapid population increase have been described as the major contributing factors.[6-8] Those factors contributing to decreased food production and their contribution to malnutrition need to be addressed in the short and the long term by policy-makers. Food security has been identified as one of the underlying causes of malnutrition and death.[9] A lack of information on food security and the nutritional situation of households can be a major constraint in planning and policy formulation.[10]

Prior to 1983, food security was conceptualised as a *national* food self-sufficiency or food availability. However, in 1983 the FAO redefined food security by adding three key concepts: (*i*) quantity and quality; (*ii*) accessibility to all; and (*iii*) sustainability of the supply. In 1986, the World Bank added another concept and the definition of food security became: 'Access by all people at all times to enough food for a healthy active lifestyle.'[11] The most recent definition comes from the 1996 World Food Summit: 'Food security is when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active lifestyle' (World Food Plan of Action, World Food Summit, Rome, 1996).

Food security can therefore be conceptualised at three levels. Global food security requires there to be sufficient food available to feed the world population. National food security requires there to be sufficient food available in the country to meet the needs of the whole population throughout the year. Individual food security requires sufficient food to be available at household level to meet the requirements of each household member.[12]

South Africa is not classified as a LIFDC by the FAO because it is a country that produces a food surplus. It is generally accepted that South Africa produces sufficient food for the total population, yet a large proportion of the population faces undernutrition and hunger.[13]

At household level, nutritional status is used as an indicator for measuring household food security. A national study of nutritional status of preschool children in South Africa found that 1 in 3 children had a marginal vitamin A status and 1 in 5 children was anaemic. Almost 1 in 4 children was stunted and 1 in 10 underweight.[14] According to international criteria, stunting is a major problem in South Africa, particularly in rural areas. Stunting is a consequence of a chronic food (energy) shortage over a long period of time.[15] The high prevalence of stunting in this country is therefore a reflection of poor household food security.

The objective of this study was to examine data available in order to establish food security at national level. These data were then compared with dietary data from individuals (summarised from various studies in South Africa) in order to obtain information on household food security.

Methods

The authors obtained data from reports and food balance sheets published by the Department of Agriculture's Directorate of Agricultural Economic Trends (Food Balance Sheets 1993 - 1994 and unpublished data), the Development Bank of South Africa and the World Bank, all of which annually publish data on food production and food consumption in South Africa.[16,17] Consumption data were derived by taking total production of a specific food item in the country and by subtracting the total amount used for animal feed and the total amount imported and exported; the remainder reflected net human consumption of that specific food item. This amount was then divided by the number of the population assumed to represent the individual (per capita) 'consumption' of a given food. The latter represents 'available' consumption of a food item, which is a very crude estimate as it does not take into consideration waste or losses due to storage. By adding together all the various foods consumed, it was possible to calculate the average energy, protein, fat and carbohydrate available per person by using local South African food tables;[18] this gave an indication of national food security. The available consumption data were then compared with actual consumption, as derived from a meta-analysis of dietary surveys;[19] this gave an indication of individual food security.

To date, there has never been a national nutritional survey in South Africa; consequently data from a meta-analysis comprising 55 studies and reports were used.[19] All of these studies met certain inclusion criteria, such as randomisation and number of subjects per group, and used the 24-hour recall method of dietary assessment.[19]

Results

Overall food production (staples and livestock) and population growth in South Africa are presented in Table I and Fig. 1. A closer look at crop production data reveals that the major staple food, maize, experienced a series of fluctuations during the period under consideration, with lowest production figures in 1973, 1983/84 and 1992. The growth rates in production per year for 23 years are maize + 1.5%; wheat + 1.2%; sorghum + 0.69%; barley + 3.72%; and rye - 5.8%. With the exception of barley, all showed a growth rate less than the population growth rate. Similarly, livestock production figures indicate that, except for poultry and eggs, growth was less than 3.6%.

Table I. Comparison of livestock and crop production with population growth in South Africa from 1970 to 1993[16]

	1970	1985	1991	1993	Annual growth[18] (%)
Population (x 1 000)	19 211	27 241	31 244	32 589	2.80
Livestock (x 1 000 tons)					
Beef and veal	431.9	650	654	608	1.26
Mutton and lamb	214.9	194.9	177.2	134.6	–2.60
Pork	81	107.4	112	129	1.60
Chicken	121	515	753	683	3.57
Eggs	107	190	270	274	2.65
Crops (x 1 000 tons)					
Maize	6 179	8 295	8 161	9 431	1.50
Wheat	1 396	1 683	2 136	1 979	1.20
Grain sorghum	379	602	103	451	0.69
Oats	121	12	38	47	–6.80
Barley	33	256	262	230	3.72
Rye	7	2	3	3	–5.80

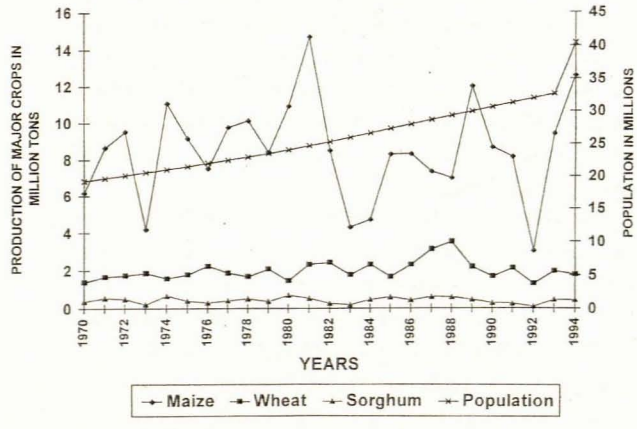

Fig. 1. Comparison of crop production with population growth in South Africa from 1970 to 1993 (Food Balance Sheets 1993 - 1994).[17,18]

Table II indicates national food and macronutrient availability in South Africa on the basis of recent statistics of the Directorate of Agricultural Trends food balance sheets. South Africans, on average, eat primarily maize followed by wheat, vegetables, milk and potatoes. Average available energy is 9 772 kJ and average available protein is 66.8 g per day. Grains provide 50 - 60% of energy intake and availability has remained relatively stable since 1985 (Table III). Sugar represents the next greatest contributor to energy intake followed by fat (butter and oil). Meat and dairy products show a decline in intake since 1985, whereas fats have increased by nearly 70%.

Table II. Consumption of macronutrients in South Africa (1994)* (Consumption = production — animal feed — export and import)

Commodity	Net human consumption (x 1 000 tons)	Per capita consumption available kg/year	g/day	Protein (g)	Fat (g)	CHO (g)¶	kJ
Dairy products							
Fresh milk†	1 094	27.69	75.9	2.5	2.5	3.6	198.7
Powder and condensed milk†	297	7.36	20.2	0.7	0.7	1.1	57.2
Cheese†	40	1.01	2.8	0.1	0.8	0.1	33.8
Meat and eggs							
Beef and veal	617	15.29	41.9	6.2	6.2	0.0	341.0
Mutton and lamb	138	3.43	9.4	1.1	1.1	0.0	60.5
Pork	112	2.78	7.6	0.9	0.9	0.0	49.5
Chicken	526	13.03	35.7	4.3	4.3	0.0	236.5
Eggs	219	5.42	14.9	1.9	1.9	0.0	104.5
Legumes and nuts							
Peanuts	45	1.12	3.1	0.8	1.5	0.3	75.7
Dry beans	108	2.68	7.4	1.2	0.1	3.4	82.0
Dry peas and lentils‡	15	0.40	1.0	0.3	0.0	0.4	11.9
Oil seeds and butter							
Peanut oil†	6	0.16	0.4	0.0	0.4	0.0	15.2
Sunflower oil†	108	2.72	7.5	0.0	7.5	0.0	285.0
Other oil/fats‡	80	2.10	5.8	0.0	5.8	0.0	220.4
Butter	15	0.37	1.0	0.0	0.8	0.0	30.4
Grains							
Maize†	3 288	83.20	228.0	21.0	9.8	129.5	2 930.9
Wheat†	1 813	45.88	125.7	16.1	2.5	86.5	1 839.2
Sorghum	153	3.79	10.4	0.9	0.3	6.4	135.5
Barley†	234	5.92	16.2	1.3	0.2	12.8	247.3
Oats†	7	0.18	0.5	0.8	0.3	3.2	79.6
Rice†	374	9.47	25.9	1.7	0.1	20.8	386.3
Vegetables and fruit							
Potatoes	1 114	27.60	75.6	1.4	0.1	14.3	270.7
Sweet potatoes	56	1.38	3.8	0.1	0.0	0.8	15.3
Other vegetables	1 507	37.36	102.3	1.7	0.2	2.2	73.9
Citrus	432	10.92	29.9	0.3	0.0	2.9	54.4
Other fruit	837	20.74	56.8	0.1	0.2	7.0	128.3
Dry fruit and nuts†	17	0.43	1.2	0.2	0.3	0.4	21.6
Other							
Sugar†	1 345	34.04	93.3	-	-	92.8	1 577.6
Cocoa†	9	0.22	0.6	0.1	0.1	0.1	7.2
Sorghum beer	3 250	80.54	220.7	1.1	-	10.8	202.3
Total				66.8	48.6	399.4	9772.4

* Information from Directorate of Agricultural Economic Trends — Food Balance Sheets 1993 - 1994 and unpublished data.
† Only figures available 1993.
‡ Only figures available 1991.
¶ Carbohydrate.

Table III. Contribution by major food groups to total available kilojoules per day for 1985 - 1994*

Food group	1985 kJ‡	1985 (%)	1991 kJ‡	1991 (%)	1993/4† kJ‡	1993/4† (%)
Grains (+ rice)	5 371	(53.8)	6 446	(59.4)	5 619	(57.5)
Dairy products	397	(4.0)	361	(3.3)	290	(3.0)
Meat and eggs	1 106	(11.1)	1 136	(10.5)	792	(8.1)
Legumes and nuts	140	(1.4)	225	(2.1)	170	(1.7)
Vegetables	371	(3.7)	372	(3.4)	360	(3.7)
Fruit	167	(1.7)	195	(1.8)	204	(2.1)
Butter and oil	380	(3.8)	711	(6.6)	551	(5.6)
Sugar	1 563	(15.7)	1 251	(11.5)	1 578	(16.1)
Other (cocoa, sorghum beer)	482	(4.8)	147	(1.4)	209	(2.1)
Total	9 976		10 845		9 772	

* Directorate of Agricultural Economic Trends Food Balance Sheets 1993 - 1994 and unpublished data.
† 1993 statistics were used where 1994 were not available.
‡ Figures rounded off to nearest decimal point.

Table IV indicates energy and macronutrients available according to food balance sheets, compared with actual consumption data from dietary surveys that have used the 24-hour recall method.[19] It is noteworthy that both urban and rural blacks have dietary intakes of energy and all macronutrients far below what is available, as calculated from food balance sheets. This is indicative of poor household food security. With the exception of carbohydrate, white South Africans exceed the national available quantities, particularly in respect of fat and protein intakes. Only white South Africans have energy intakes which compare favourably with the recommended dietary allowances (RDAs). All groups exceed the RDA intake for protein. The RDA values for 11 - 14-year-old boys have been used for comparative purposes as this is one of the most demanding groups in terms of nutrient requirements.

Fig. 2 illustrates the contribution of macronutrients to energy intake in the diets of South Africans.[20,21] Rural and

Table IV. Comparison of available kilojoules, protein, fat and carbohydrate with consumption levels from dietary surveys (per capita per day)

		Actual consumption (from dietary surveys)[19]			
	Per capita available*	Whites	Urban blacks	Rural blacks	RDA†
Energy (kJ)	9 772.4	10 012	7 345	7 130	10 460
Protein (g)	66.8	83.4	52.9	57.1	45
Fat (g)	48.6	96.6	56.7	45.3	–
Carbohydrate (g)	399.4	289	252.6	257	–

* See Tables II and III.
† Recommended dietary allowance for 11 - 14-year-old boys.

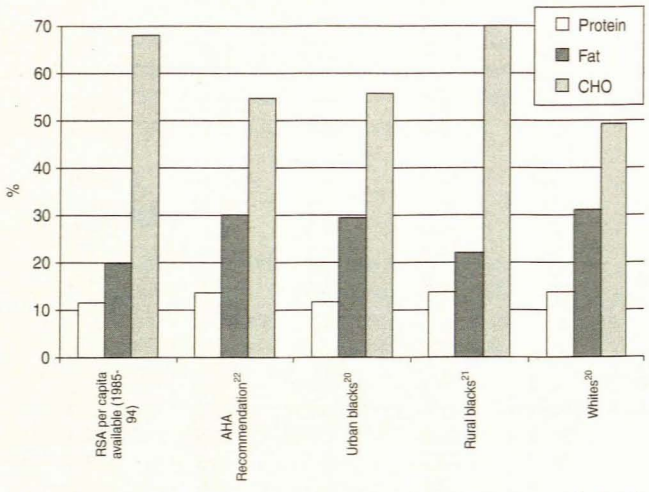

Fig. 2. Contribution of protein, fat and carbohydrate towards total energy per capita available compared with American Heart Association recommendations and South African studies.

urban blacks have an energy distribution very similar to the per capita amount available and fairly ideal in terms of the American Heart Association's recommendations.[22]

Discussion

South African agriculture is characterised by its diversity and dualism — a highly commercial and a developing agricultural sector. The total land area of the country is 122.8 million hectares. Of this area, the white commercial sector constitutes 84.8% (104.1 million ha) while the developing black agricultural sector comprises 15.2% (18.7 million ha). Only 11% of the total land area is considered arable. About half of the country's agricultural production comes from 3% of the country's high potential area (part of Natal and the Western Cape), which has good soils and adequate and well-distributed rainfall.[23]

South Africa's past agricultural policies were focused on national food sufficiency and neglected the development of small-scale farming.[24] This has resulted, on the one hand, in a sector that produces abundant food for both domestic consumption and export markets. On the other hand, subsistence (or traditional) agriculture is unable to produce enough food for people who largely depend on it. The South African black population is currently growing by 2.3% per annum while food production for this sector is lagging behind.[23]

Growth in population, income and income elasticity are the major determinants of demand for food. Population growth in South Africa in 1990 was 2.3% for blacks, 0.7% for whites and 1.7% for other groups. These trends are expected to continue for at least 15 - 20 years. The rapidly increasing population means that an increasing proportion of people are in the income groups that: (*i*) spend a lot of their income on food; and (*ii*) structure their food expenditure relatively heavily towards staple foods. This, in turn, will have an effect on the volume and structure of demand for agricultural products.[23]

Preliminary projections of food demand with different scenarios (2.4% and 3.0% population and income growth, respectively), expressed as a ratio of that of 1990 for the year 2000 and 2010, indicate that the demand for maize will increase by 22% and 47%, respectively. Recent estimates of the self-sufficiency index (SSI) indicate that South Africa is currently self-sufficient in grain crops, while red meat, rice, vegetable oils and coffee have to be imported.[25]

The calculated energy available from food balance sheets indicates that at present there is national food security (9 772 kJ). However, Bender[26] stressed that chronic energy deficiency and hunger are problems of access to food, rather than problems of food availability. This point has been well demonstrated by the FAO,[27] which found that 20 -30% of the population may be consuming less than 80% of the required kilojoules, even though per capita (available) consumption is greater than 100%. In other words, national food security does not guarantee household food security.[28] Correspondingly, having enough food at the household level does not guarantee the nutritional well-being of every household member.

Dietary surveys in South Africa found that average energy and macronutrient intakes of urban and rural blacks are far below what is available, according to calculations from food balance sheets, whereas intakes of whites are considerably higher. Bouis *et al*. found similar results when using nutrient comparisons from food balance sheets compared with 24-hour recall of food intake.[29] They blame discrepancies between the two methods on the fact that food balance sheets are calculated by economists, whereas the 24-hour recall is used by nutritionists and would consequently give more accurate information on actual food intake. Actual dietary surveys in South Africa indicate that many black South Africans are food-insecure.

Mekuria and Moletsane[24] have stressed the importance of household food security research projects which examine the following relevant issues:

'Why does food insecurity exist in a country with an abundant supply of food?

Is the food problem equally severe between regions and households?

Who are the food-insecure?

What can be done to improve food security in South Africa or in a region?

What policy options are available and feasible?'

The problem of food insecurity does not lie in the hands of one scientific discipline. Agriculturalists need to network

with health professionals and social scientists in order to address the problem effectively. Only when we have found answers to the above questions can appropriate multidisciplinary intervention programmes be implemented.

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Congress Proceedings

Hospital malnutrition worldwide

Simon P Allison

In 1793, describing a case of paralysis of the muscles of swallowing, John Hunter wrote: 'It becomes our duty to adopt some artificial mode of conveying food into the stomach by which the patient may be kept alive while the disease continues.'[1] In 1843, Robert Graves of Dublin, best known for his description of thyrotoxicosis, decided that the usual treatment of typhus fever by bleeding, starving and purging, might be partly responsible for the high mortality in this condition and instead gave his patients food and drink, with a resulting drop in death rate. Addressing visiting colleagues, he said: 'You are not to permit your patient to encounter the terrible consequences of starvation because he does not ask for nutriment. Gentlemen, these results are due to good feeding. When I am gone, you may be at a loss for an epitaph for me: I give it to you in these words: He fed fever.' From her experiences in nursing the wounded in the Crimean War, Florence Nightingale wrote in 1859: 'Every careful observer of the sick will agree in this: that thousands of patients are annually starved in the midst of plenty from want of attention to the ways which alone make it possible for them to take food. I would say to the nurse: have a rule of thought about your patient's diet. Consider; remember how much he has had and how much he ought to have today.'

Prevalence

Have things improved? In 1994, McWhirter and Pennington[2] carried out a survey of 500 sequential admissions to five different departments in a UK teaching hospital. Using body mass index (BMI) and simple anthropometric measures, they found that 13% had a BMI of 18-20 (normal 20-25), in 14% it was 16-18, and in 9% < 16. Twenty-eight per cent had a triceps skinfold thickness between the 5th and 15th centile, and 18% had a triceps skinfold thickness below the 5th centile. Forty per cent had a mid-arm muscle circumference between the 5th and 15th centile, and 35% had a mid-arm muscle circumference below the 5th centile. Their findings confirmed previous reports from the USA[3-7] showing that approximately 40% of hospital admissions had some degree of malnutrition and that in half of these it was severe. Colleagues from as far apart as the Philippines and Brazil have also reported similar findings (personal communication). Disturbingly, they also found that only 25% of patients had ever been weighed and in only 48% was there any information of nutritional relevance in the notes.

Department of Diabetes, Endocrinology and Nutrition, Queen's Medical Centre, Nottingham, UK

Simon P Allison, MD, FRCP