NATIONAL FOOD CONSUMPTION SURVEY IN CHILDREN AGED 1 – 9 YEARS: SOUTH AFRICA 1999.

(PART II: NUTRIENT INTAKE, FOOD PROCUREMENT AND HOUSEHOLD INVENTORY, HUNGER, AND RECOMMENDATIONS)

INTRODUCTION

SUMMARY OF PART I

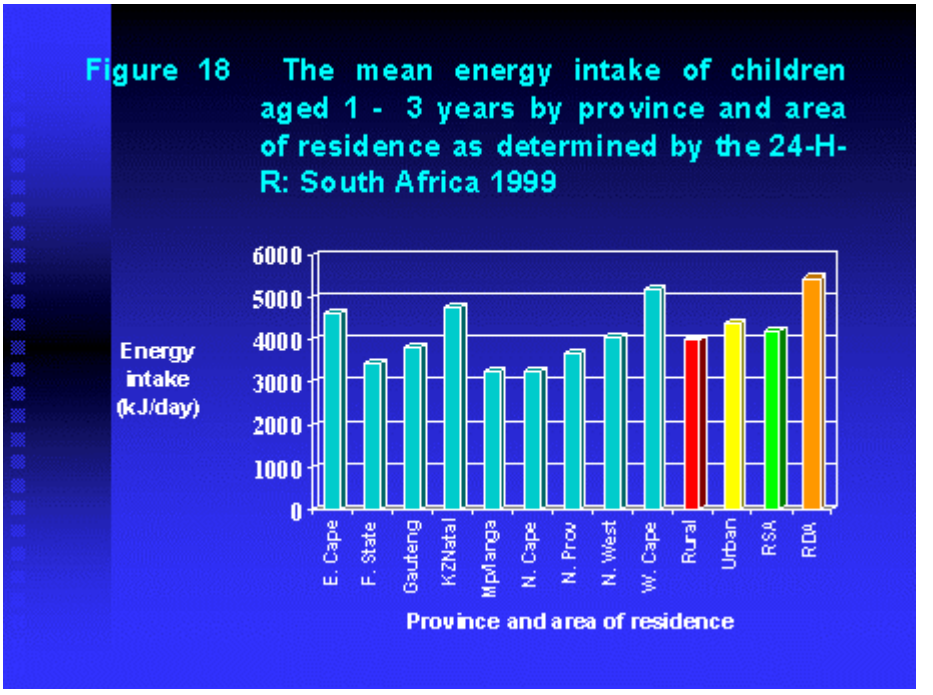
The formulation of a national food fortification programme requires information regarding suitable food vehicle(s) which are consumed sufficiently frequently and in sufficient quantities by the target population, and which do not pose risks for toxicity. The paucity of such data, therefore, necessitated the commissioning of a National Food Consumption Survey with defined objectives. Of the 3120 children that were originally designed to have been included in the survey, data was obtained for a total of 2894 children, which amounts to a 93% response. A very significant percentage of the country's population still lives under adverse socio-economic conditions. One out of ten of all children aged 1 – 9 years was underweight and just more than one in five was stunted. By contrast, one out of thirteen children was overweight in the formal urban areas, a prevalence that was higher among children (one out of eight children) of well educated mothers.

PART II

Nutrient Intake:

Macronutrient intake:

On the basis of the 24-H-RQ, analysed by Province and age, the mean energy intake of children in all Provinces (Figure 18) was below that recommended for age. For reasons of editorial space, only Figures for the 1- 3 years age group have been included in this Update. Energy intake was the lowest in the Northern Cape and Mpumalanga for the 1 – 3 year olds (Figure 18), and in the Free State for the 4 – 6 (4267kJ) and 7 – 9 (4552kJ) year olds. The two Provinces with the highest energy intake for all age groups were the Western Cape and KwaZulu/Natal.



At the national level, one out of five and almost one out of two children respectively had an energy intake less than half and less than two-thirds of their daily energy needs. Indeed, in the Northern Cape, Mpumalanga, Northern Province and the Free State one out of three children of all age groups had less than half of their daily energy needs met. Children of all age groups living in rural areas had a consistently and significantly lower energy intake than children living in urban areas.

The reverse was, however, the case for total protein intake. For all age groups and Provinces the mean intakes were greater than the RDA. The highest mean intakes were found in the Western Cape and KwaZulu/Natal and the lowest in the Free State, Eastern Cape, Mpumalanga and Gauteng. Urban children had a significantly greater mean intake than rural ones ($p = 0.0001$). The Northern Cape and the Free State had the greatest percentage children with a protein intake less than half of the RDA. No gender differences were noted.

Mean carbohydrate intake was highest in the Western Cape, KwaZulu/Natal and the Eastern Cape. Lowest mean intakes were found in the Northern Cape and Gauteng. No significant differences were found with respect to rural-urban areas but only with respect to gender in the 1 – 3 year old group. The highest mean sugar intake was found in the Western Cape, Eastern Cape and Gauteng. The lowest mean intake was recorded in the Northern Province, Free State and Mpumalanga. Urban children had a significantly ($p = 0.0001$) greater mean intake than children living in rural areas. No gender differences were found.

The highest mean fat intake was found in the Western Cape, KwaZulu/Natal and Gauteng. The lowest intake was found in the Free State, Northern Cape, and Eastern Cape. Children living in urban areas had a significantly ($p = 0.001$) higher fat intake than those living in the rural areas, irrespective of gender.

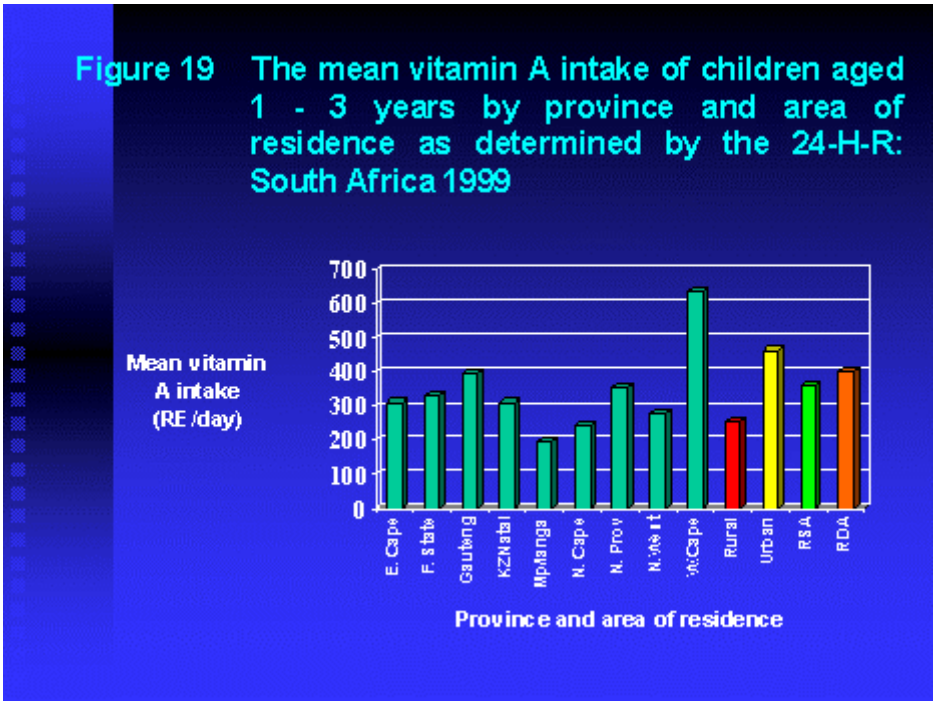
Distribution of energy: In terms of the energy distribution of the diet (Table 1), total fat, as a percentage of the total energy intake, was less than 30% in all Provinces with the exception of the Western Cape. On a similar basis, the protein contribution to energy intake was less than 15% in all Provinces, whereas that of carbohydrate was greater than 65% in all Provinces, with the exception of the Western Cape (59%). Sugar, as a percentage of energy intake was highest in the Western Cape (14%) and in the Northern Cape (13%) and lowest in the Free State, Northern Province and Mpumalanga. The P:S ratio ranged from 1.0 in Gauteng to 1.5 in Eastern Cape and the Northern Province. Children living in rural areas had a significantly greater ($p< 0.001$) percentage of energy contribution from protein of plant origin, a pattern that tended to be also similar at the national level. In this regard, the consumption of animal

products (milk and dairy products, eggs, meat, fish) was significantly ($p < 0.0001$) correlated with H/A (Spearman's; $r = 0.11$) and W/A ($r = 0.12$). This was the case overall for children in all age groups ($p < 0.05$), in five of the nine Provinces ($p < 0.05$) and for children living in formal urban areas ($r = 0.14$; $p < 0.0001$). Furthermore, a significant correlation was also found at the national level between energy intake and stunting (Pearson's; $r = 0.16$; $p = 0.0001$) as well as of being underweight (Pearson's; $r = 0.15$; $p = 0.0001$). This was also true for children living in urban as well as in rural areas.

Micronutrient intake

Vitamins

Vitamin A: Only children living in urban areas and the Western Cape in the age groups 1- 3 (Figure 19) (and 4 – 6 age group; not shown) had the recommended intake for vitamin A. The remainder of the children had a low intake of vitamin A, which did not reach the recommended intake for age. Indeed, at the national level less than one out of two (55 – 68%) children had a vitamin A intake that was half the recommended level.



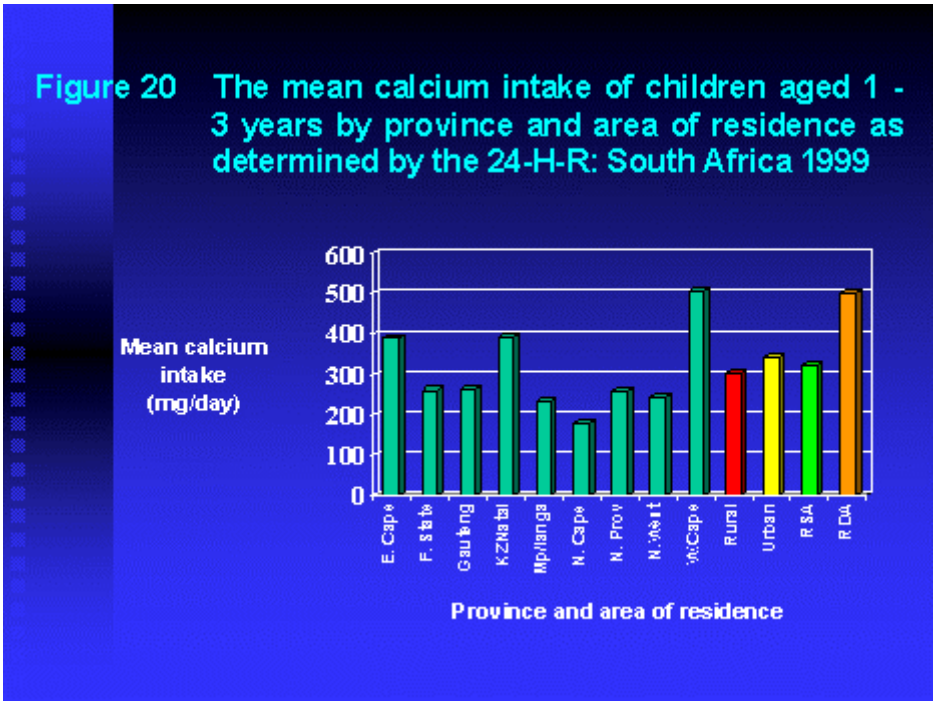
A similar pattern (62 –73%) emerged for children living in the rural areas. Nevertheless, the vitamin A intake of children living in urban areas was also very poor with 48 – 62% of them consuming less than half the recommended intake. It should be noted, however, that the values for the median vitamin A intake were generally far lower than the mean intakes, indicating that the data is skewed and the standard deviation is very large in most instances.

Other vitamins: A large percentage of children (25 – 82%) of all the age groups and in all Provinces had intakes less than 50% RDA for vitamin E, vitamin D, Vitamin C, riboflavin, niacin, vitamin B_6, and folate.

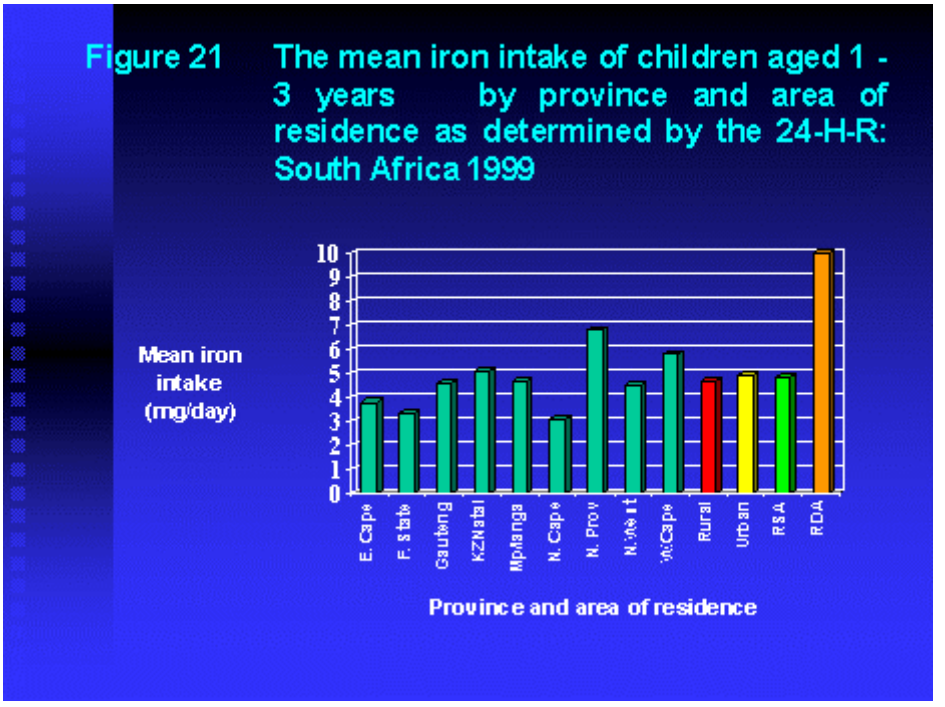
Minerals and trace elements

Calcium: The mean calcium intake was less than half of that recommended in almost 95% of children in most Provinces (Figure 20). At the national level, 81 – 94% of children had an intake much less than half of the recommended intake.

Urban-rural differences in intake were significant ($p = 0.019 - 0.0001$) in all age groups.

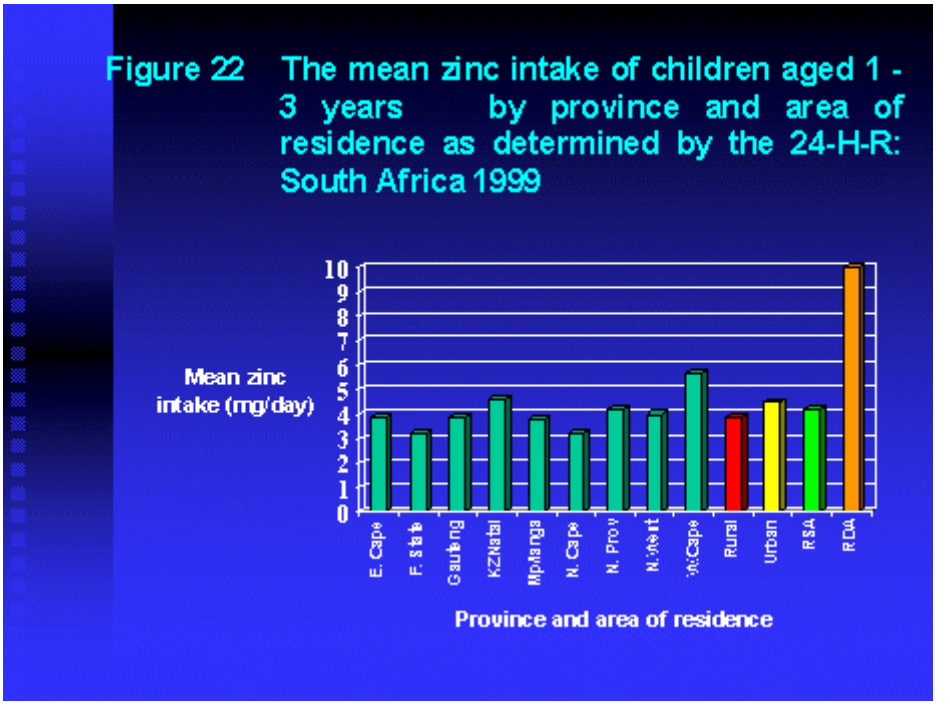


Iron: The mean intake of iron was consistently low in all age groups and all Provinces (Figure 21). The lowest iron intake in all age groups was reported in the Free State, Northern Cape, Eastern Cape and the Free State. At the national level, 41 – 63% of children had an intake less than half of the recommended level. The gender and urban-rural differences in intake were not significant.



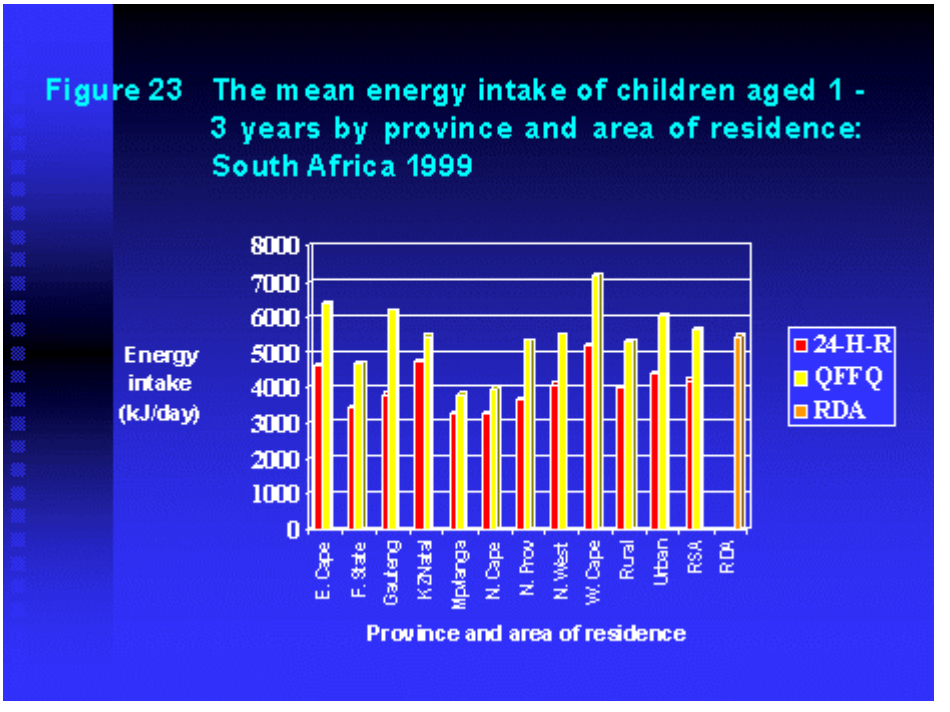
Zinc: Similarly to iron, the mean intake of zinc was inadequate in all age groups and in all Provinces (Figure 22). At the national level, 52 – 69% of children had an intake of less than 50% of the RDA. Zinc intake was consistently and significantly ($p = 0.0001$) lower in children living in rural areas.

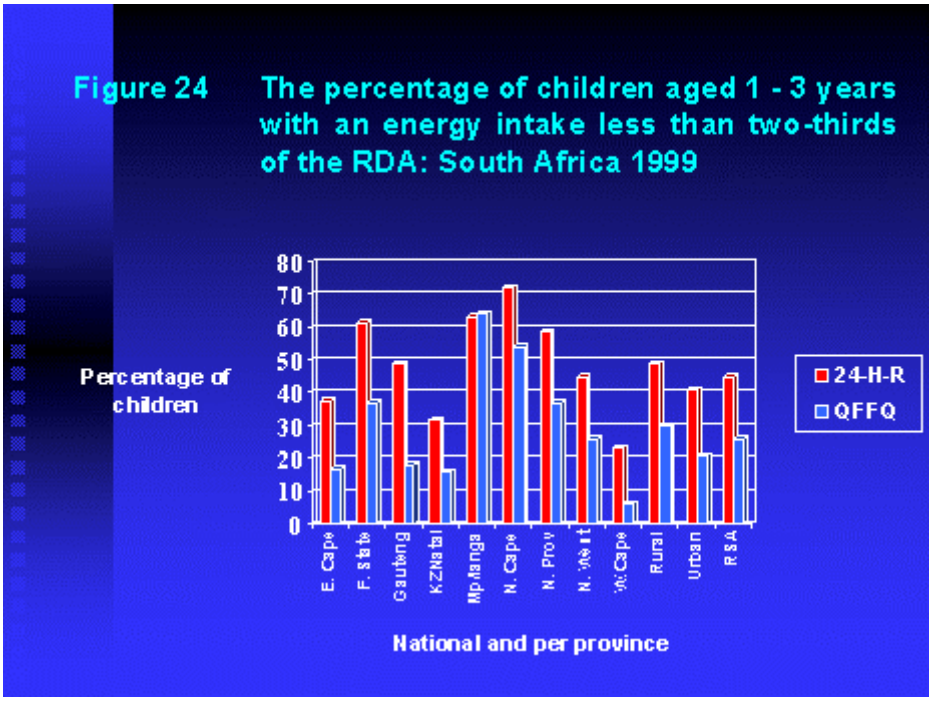
Figure 22 The mean zinc intake of children aged 1 - 3 years by province and area of residence as determined by the 24-H-R: South Africa 1999



It is important to note that the findings on the nutrient intake as obtained by the QFFQ were largely very supportive of those obtained by the 24-H-RQ. However, as expected, nutrient intake in absolute values was higher when obtained by the former than the latter methodology. For the sake of imparting an impression of the pattern of agreement between the two instruments, the comparative energy intake (Figure 23) and the percentage of children aged 1 – 3 years consuming less than two thirds of the RDA for energy (Figure 24) are included as examples.

Figure 23 The mean energy intake of children aged 1 - 3 years by province and area of residence: South Africa 1999





In summary on the nutrient intake of these children, it would appear that, in general, the great majority of children consumed a diet deficient in energy and of poor nutrient density to meet their micronutrient requirements Further, it is also to be noted that the analysis of the data by age revealed the expected increase in mean intake of each nutrient from the age groups 1 - 3, to 4 - 6, to 7 – 9 years of age. For South African children as a whole, the dietary intake of the following nutrients was less than 67% of the RDAs:

- Energy
- CalciumIron
- Zinc
- Selenium
- Vitamin A
- Vitamin D
- Vitamin C
- Vitamin E
- Riboflavin
- Niacin
- Vitamin B_6

Food Procurement and Household Inventory

The assessment of the dietary intake of groups and/or HHs includes techniques such as the food procurement and HH inventory. The design of the present survey was such that data obtained from the food procurement patterns could be compared with the actual consumption data of the child's food intake, which was obtained by the QFFQ. Food procurement patterns included information on the source of foods, purchasing patterns and food storage, frequency and amounts of purchase as well as the product brand name. Also for the purposes of the present survey, HH inventory was defined as a list of all the foods and drinks kept in the house at the time of the interview, and the design of the survey was such that data obtained from the HH inventory could be compared with the actual food intake of the child, which was obtained by the 24-H-RQ. The HH inventory only included foods that were for HH use but did not include live animals, crops still growing in the garden or food that was being or had been cooked.

From the point of view of food fortification, at the national level, the data from the 24-H-RQ indicated that the most commonly consumed food items were maize, sugar, tea, whole milk and brown bread. These same food items together with hard margarine were also identified as being the most commonly consumed foods by the QFFQ. It is equally important to note that these same six items were also the ones that were the most frequently procured (Table 2) and the ones that were found most frequently in the house (Table 3).

Table 2 The association between consumption and procurement as determined by the 24-H-R, QFFQ and the FPHIQ: South Africa 1999

Food Item	Children consuming the food item (24-H-R) (%)	Children consuming the food item (QFFQ) (%)	Families procuring the food item (FPHIQ) (%)
Number (n)	2868	2883	2812
Maize	78	94	94
Sugar	76	90	93
Brown Bread**	37	61	52
Tea	46	65	78
Whole Milk	42	61	58
Fat (HM§/cooking fat)	27	54	59

** Brown bread includes brown bread, whole wheat bread, brown flours and whole wheat flours
§ Hard Margarine

Table 3 The association between consumption and food inventory as determined by the 24-H-R, QFFQ and the FPHIQ: South Africa 1999

Food item	Children consuming the food item (24-H-R) (%)	Children consuming the food item (QFFQ) (%)	HHs having food item in the house (FPHIQ) (%)
Number (n)	2868	2883	1728
Maize	78	94	84
Sugar	76	90	66
Brown Bread**	37	61	12
Tea	46	65	52
Whole Milk	42	61	17
Fat (HM§/cooking fat)	27	54	21

** Brown bread includes brown bread, whole wheat bread, brown flours and wholewheat flours
§ Hard Margarine

Indeed, the agreement of the findings obtained by the three different (24-H-R, QFFQ, FPHI) methodologies is rather substantial, especially for the non-perishable food items (Tables 2 and 3) as well as for a number of other frequently consumed food items (Figures 25 and 26).

Figure 25 Food items eaten by children from QFFQ (n=2883) and food items procured by families (n=2812)

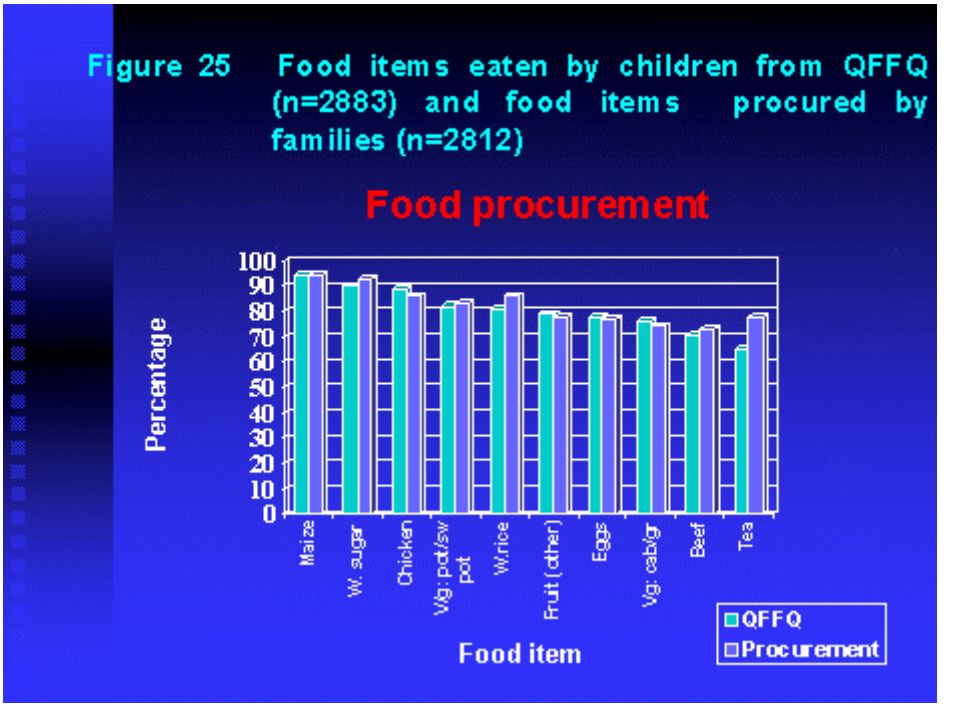
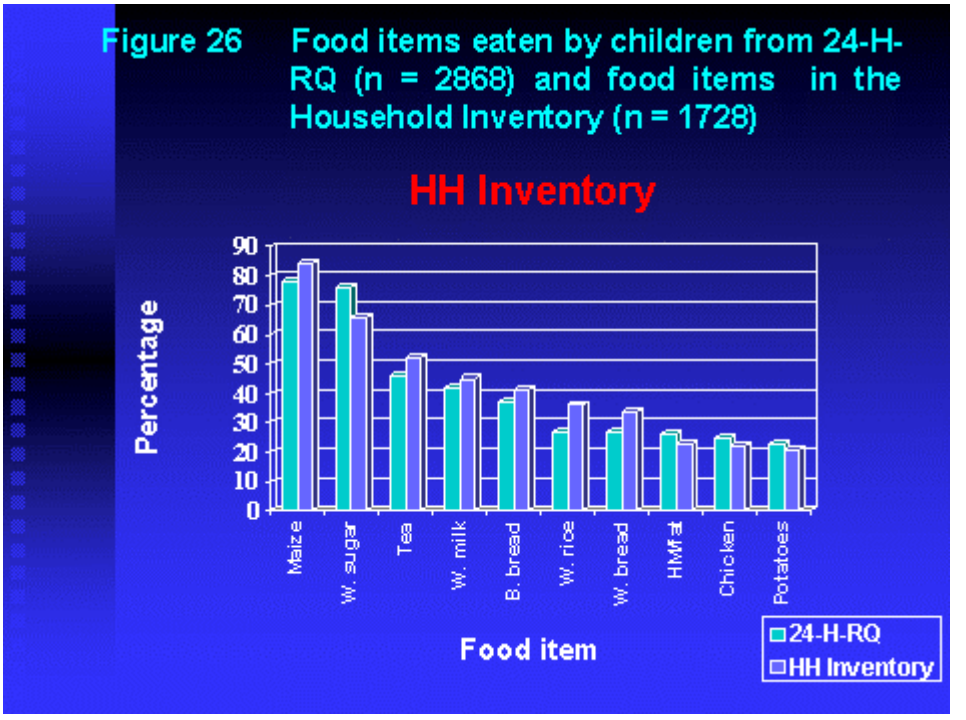
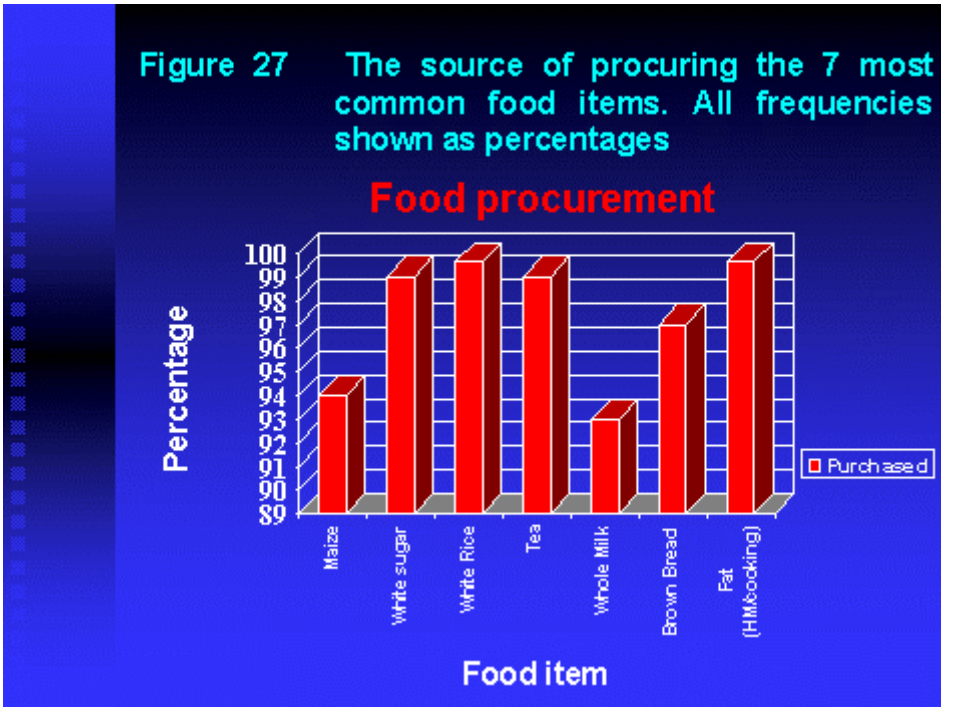


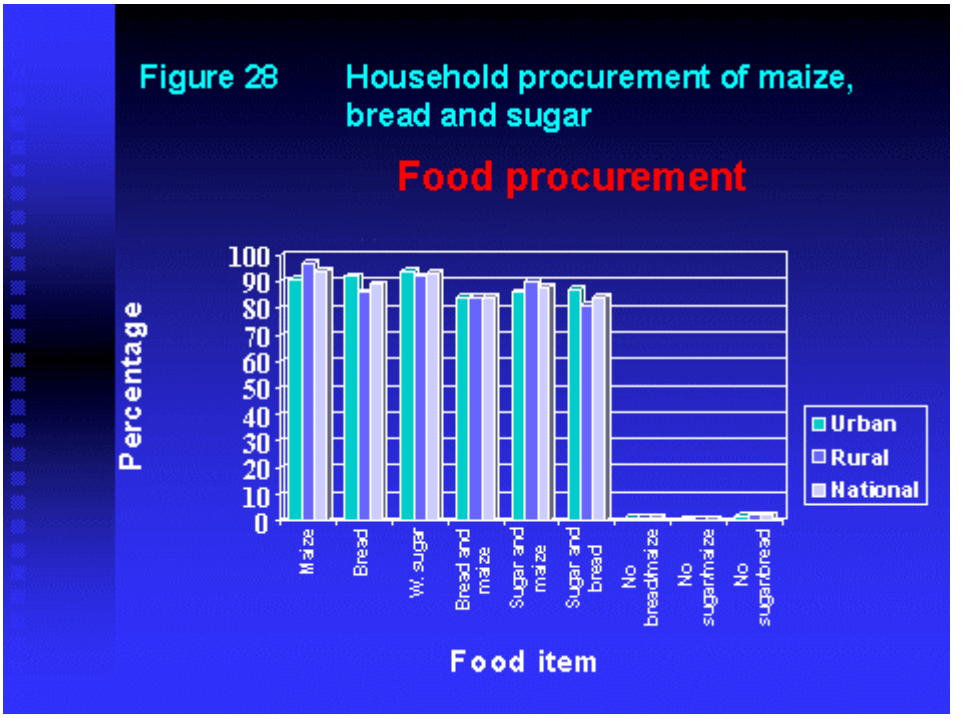
Figure 26 Food items eaten by children from 24-H-RQ (n = 2868) and food items in the Household Inventory (n = 1728)



The procurement patterns of maize meal indicated that, on average, the vast majority (94%) of HHs used maize meal, which was purchased, a pattern that was also very similar for the other 6 commonly consumed food items (Figure 27). These items, in particular the dry store items, were primarily bought in supermarkets and to a much lesser extent in small shops. In terms of frequency of purchase, the dry store items (maize, sugar, tea and fat) were mainly (>70%) purchased on a fortnightly or monthly basis. Brown bread was mainly purchased on a daily or twice a week basis (63%), whereas approximately one third of milk users purchased milk on a daily, weekly or fortnightly basis. Subsistence agriculture is not, therefore, a major source of these foods in the country.



Maize, sugar and brown bread were consistently procured and consumed in all HHs in almost all Provinces irrespective of income. Indeed, the percentage ofHHs, which did not buy any of these food items, singly or in combination (Figure 28), was small (< 3%).



Household income would appear to be a decisive factor in the consumption and procurement of foods. HHs with the lower income procured a significantly lower mean number of food items in all Provinces and all areas of residence when compared with HHs with the higher income (Figure 29). These findings are strongly supported by those of the HH inventory, namely HHs in the lower income group had significantly fewer food items in the house at the time of the interview (Figure 30). Further support, regarding the impact of income on food procurement and HH inventory, is provided by the significantly smaller average number of food items consumed by children as determined by the QFFQ and the 24-H-RQ. It is,

therefore, important to note that all three methodologies employed collectively support the role of income as being decisive in the consumption and procurement of foods.

Figure 29 The mean number of food items procured in relation to income as obtained by the sociodemographic questionnaire by province

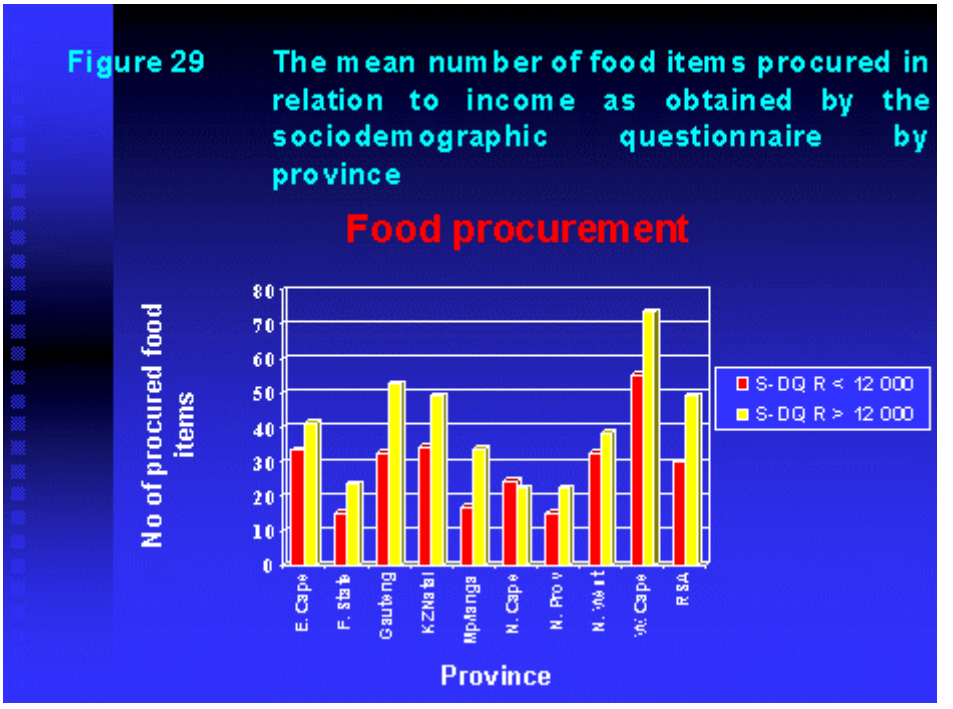
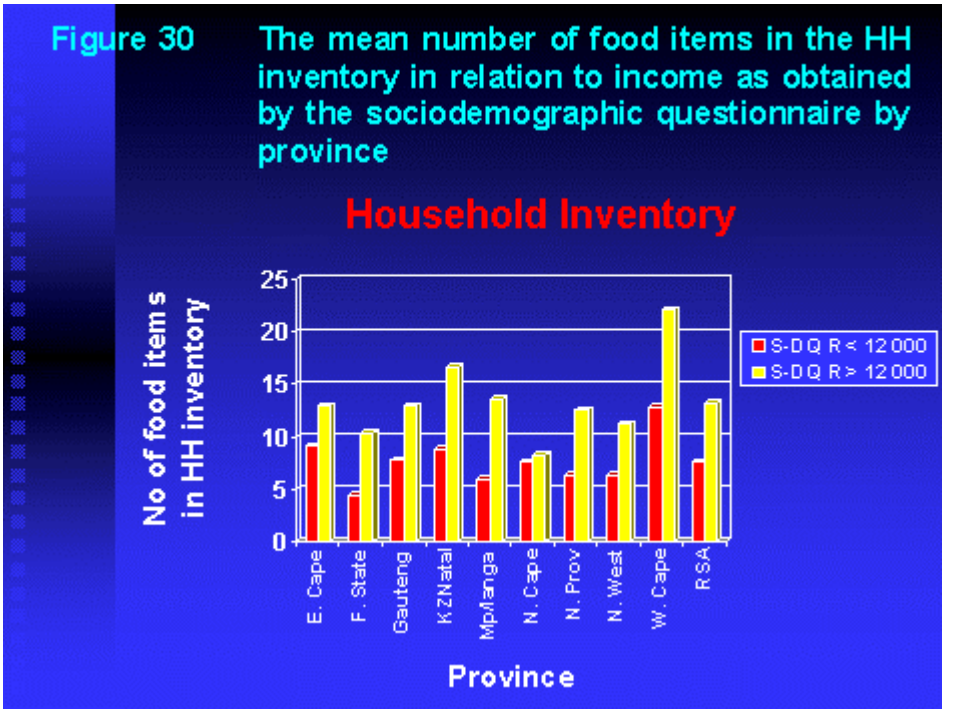


Figure 30 The mean number of food items in the HH inventory in relation to income as obtained by the sociodemographic questionnaire by province



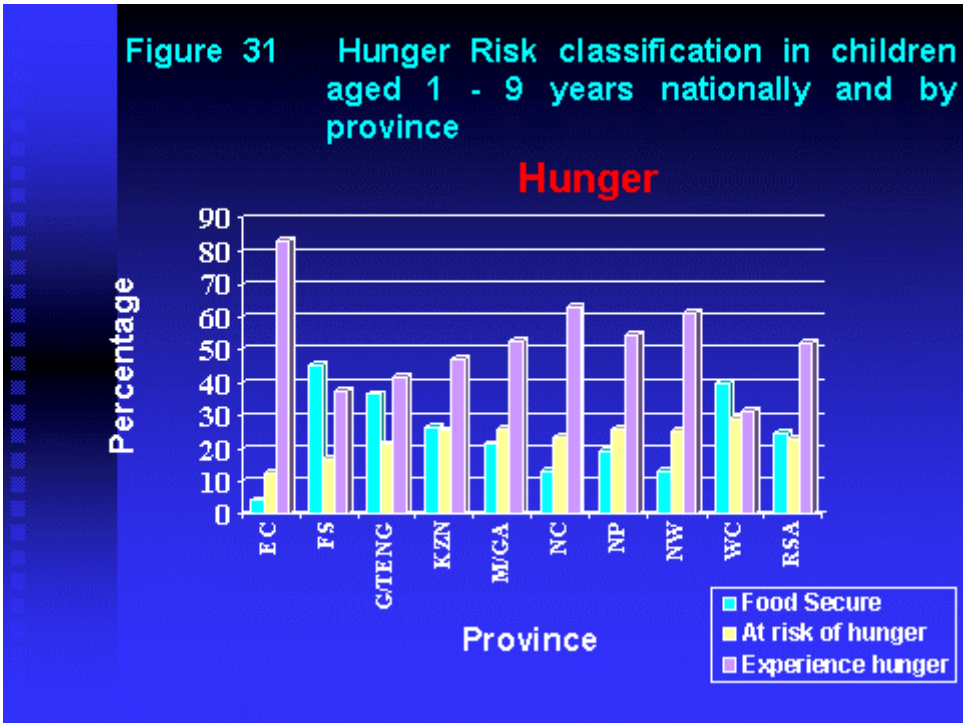
In summary on food procurement and HH inventory, at the national level and in general terms, the different methodologies employed in the survey are substantially supportive of maize and sugar being the two most frequently and consistently consumed foods in the country, followed by tea, whole milk, brown bread and margarine. It is equally important to note that these same six items were also the ones that were found most frequently in the house. These items were primarily bought in supermarkets and to a much lesser extent in small shops. Furthermore, most households procured these items by purchasing them and

subsistence agriculture was not a major source of these foods in the country. Income plays a decisive role on food consumption patterns in the country.

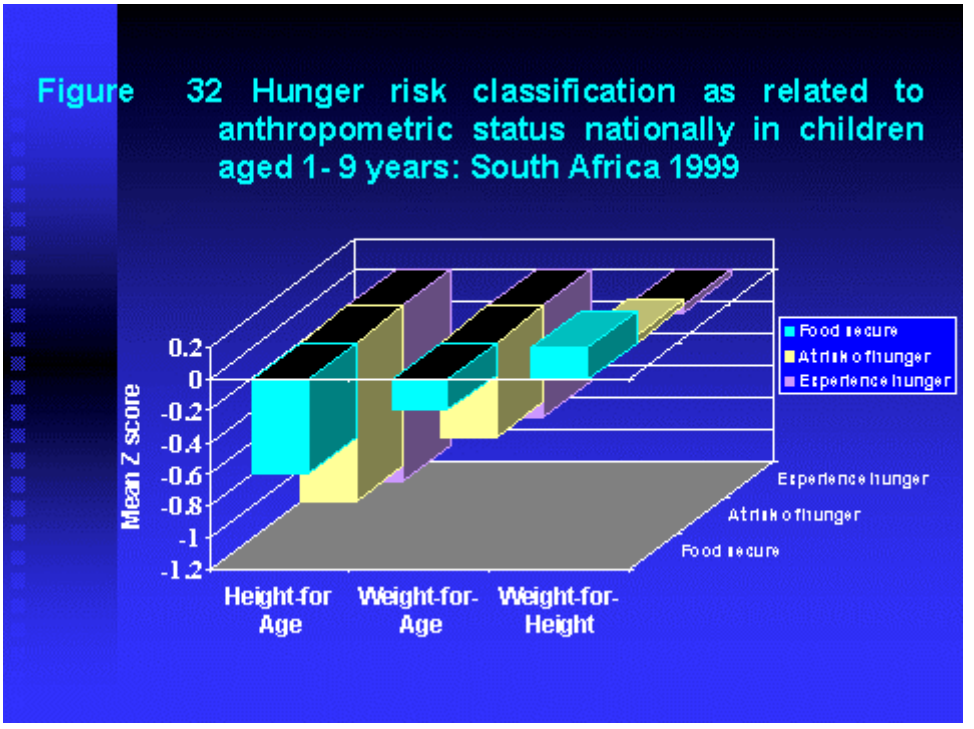
Hunger

Within the design framework of the survey, it was deemed necessary to include a means of estimating hunger and food insecurity not only for the purpose of having some additional indirect means of reflecting on the dietary as well as on the food procurement and HH inventory data of the survey, but also because no such data are available in children on a national basis. A questionnaire-based insrument was used to determine domestic hunger using the data from the Community Childhood Hunger Identification Project (CHHIP)[5] as part of the survey.

At the national level, two out of four HHs (52%) experienced hunger, one out of four (23%) were at risk of hunger, and only one out of four HHs (25%) appeared food secure. In the rural areas a significantly (Chi-square; $p < 0.001$) higher percentage (62%) of HHs experienced hunger when compared with HHs in the urban areas (41%). HHs in informal urban and tribal areas as well as on commercial farms were the worse affected. The prevalence of hunger or being at risk of hunger was similar in all HHs irrespective of the age of the child. At the provincial level, HHs in the Eastern Cape had the highest percentage of hunger (83%), followed by the Northern Cape (63%), North West (61%), Northern Province (54%) and Mpumalanga (53%) (Figure31). The differences in the prevalence of hunger between Provinces were significant ($p < 0.001$).



The HSQ data was further analysed in relation to the anthropometric data as well as to selected dietary intake, food procurement and HH inventory data, and to selected parameters in the socio-demographic questionnaire (SDQ). In this regard, at the national level, a significantly ($p<0.001$) poorer anthropometric status was found in HHs at risk of hunger and/or experiencing hunger as determined on the basis of the interviewee's response (Figure 32). This trend was significant for stunting for HHs in urban and formal urban areas as well as for HHs on commercial farms. In the case of underweight and wasting, this trend was significant for HHs in urban and formal urban areas only.



At the national level, the energy intake of children was the lowest in the HHs that experienced hunger (Figure 33). This was the case in all areas of residence. Children in such HHs in the rural areas had a lower energy intake, the lowest of which was recorded in children living in HHs on commercial farms. Similarly, inhabitants of HHs that experienced hunger procured a smaller number of food items and had a smaller number of such items found in the HH inventory (Figure 33).

A similar trend in relation to hunger risk classification was seen for the intake of vitamins A, vitamin C as well as for iron and zinc (Figure 34). Overall, the lowest energy and micronutrirent intake was recorded for children in HHs that experienced hunger, irrespective of age or Province.

Figure 33 Hunger Risk classification as related to food procurement, HH inventory and energy intakes of children aged 1 – 9 years nationally.

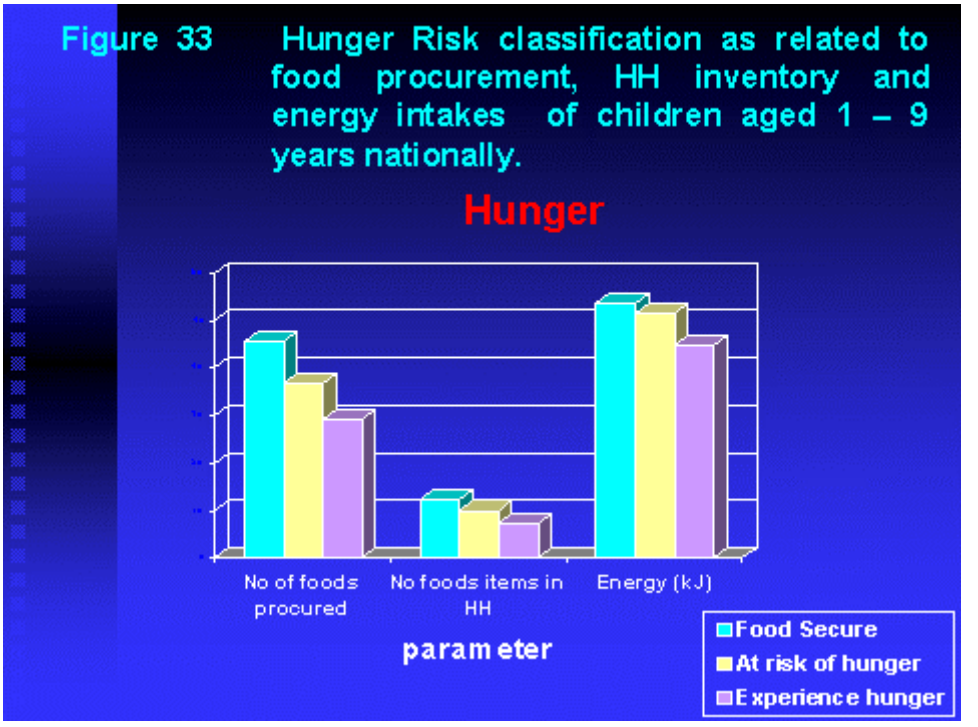
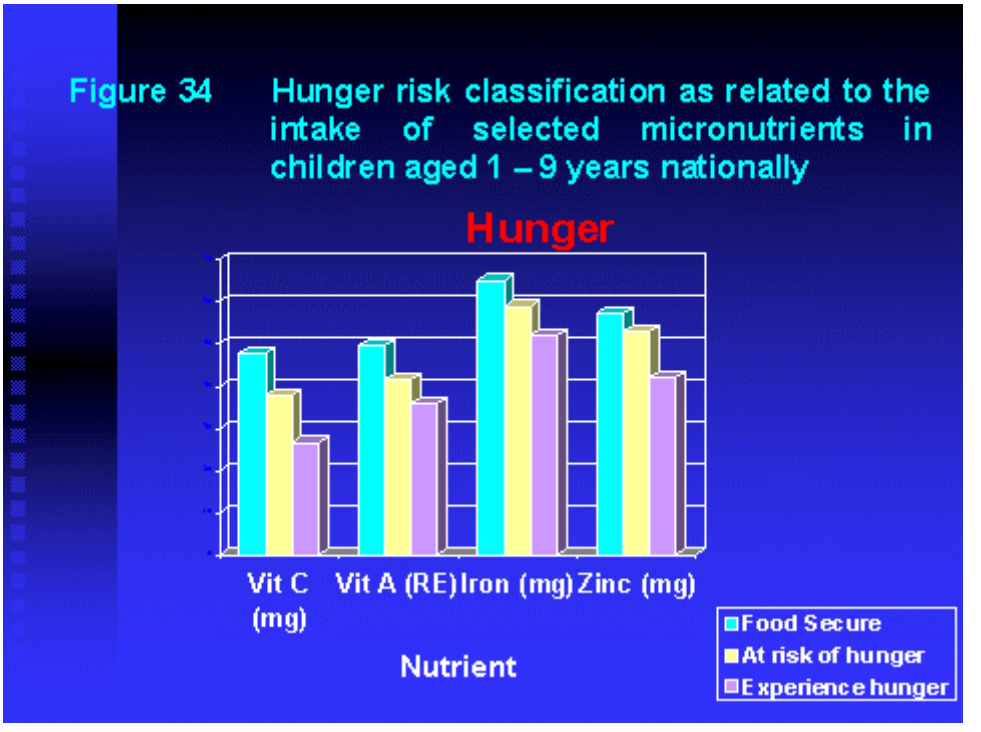


Figure 34 Hunger risk classification as related to the intake of selected micronutrients in children aged 1 – 9 years nationally



In summary, at the national level, two out of four HHs experienced hunger, one out of four were at risk of hunger and only one out of four HHs appeared food secure. In the rural areas a significantly higher percentage of HHs experienced hunger when compared with HHs in the urban areas. There was an overall consistent association between the hunger risk classification and anthropometric status. A similar association was found with energy intake and the intake of micronutrients. HHs at risk of hunger or experiencing hunger procured a smaller number of food items and had a similarly smaller number of food items in the HH inventory. Additionally, HHs at risk of hunger or experiencing hunger tended to be of the informal dwelling type, had the lowest

monthly income and spent the lowest amount of money weekly on food. The mothers of such HHs also had a lower standard of education.

Recommendations relating Food Fortification:

1. Maize (sifted, special, super), white and brown wheat flour and white retail sugar should be the vehicles for fortification on a mandatory basis, henceforth collectively referred to as food vehicles
2. The micronutrients that should be used for fortification should be:
    - Vitamin A
    - Thiamin
    - Riboflavin
    - Niacin
    - Folic acid
    - Vitamin B_6
    - Iron
    - Zinc, and
    - Calcium
3. The food vehicles should be fortified at the level designed to deliver 33% of the current RDAs per serving at the point of consumption, taking into account the inherent content of these micronutrients in the food vehicles, the anticipated losses of these micronutrients during production, distribution and food preparation as well as the limitations that may arise from organoleptic considerations of such additions, especially with regard to riboflavin, folic acid, iron, zinc and calcium
4. Sugar should be fortified with vitamin A only at the level of 50 IU/g, and the portion size for calculation purposes for maize and wheat flours should be 200g
5. Encompassing legislation, which must include all aspects of the necessary monitoring and evaluation of a fortification programme, should be enacted and implemented
6. The on-going discussions with the relevant sectors of the food industry should be continued and expanded with a view to reaching mutually acceptable solutions on issues relating to costs, product quality and acceptability as well as any other related issues likely to impact on the proposed fortification programme
7. The current food fortification task group within the Directorate of Nutrition should be transformed into a permanent committee on food fortification with a clear mandate to monitor and coordinate all aspects of the proposed food fortification programme
8. Current voluntary practices regarding the addition of fat soluble vitamins to margarines should be retained
9. The current component of the INP regarding vitamin A supplementation should be retained and should be targeted to children at the highest risk for vitamin A deficiency
10. The current component of the INP regarding multi-micronutrient supplementation (other than vitamin A) should be retained and should be targeted to children at the highest risk for such deficiencies. All such supplements should be reassessed in terms of composition and posology
11. Foods, especially those consumed by children older than 6 months of age, which are currently fortified on a voluntary basis, should be reassessed with a view to harmonising the proposed framework of fortification. The necessary negotiations with the relevant manufacturers should be concluded prior to the enacting of legislation on fortification. Additionally, any fortified products currently used in the PSNP and PEM schemes should be re-evaluated
12. Any future proposals by food manufacturers regarding the fortification of additional food vehicles on a national basis with vitamin A and/or iron should first be discussed with and agreed upon by the Directorates of Nutrition and Food Control with a view to assessing their impact and safety within the framework of the proposed fortification programme
13. With regard to cow's milk and in view of the findings of the present survey, negotiations should be initiated with the relevant sectors of the dairy industry in order to investigate the feasibility of fortifying milk with selected fat soluble micronutrients

14. The inclusion of milk in the menus of the Primary School Nutrition Programme and in crèches should be seriously considered and implemented

15. No health claims other than those approved by the Directorate of Food Control should be allowed for any of the food fortification vehicles

16. With regard to Trade considerations, negotiations should be initiated with neighboring countries with a view to achieving regional standards for fortified food items for import/export purposes

17. he impact of the proposed fortification programme on the country's population should be evaluated during the programme's third/fifth year of implementation. Such an evaluation should form an integral part of the regular evaluation of the "monitoring and evaluation" component of the programme.

In conclusion, this has been a very successful and much needed survey in both providing base line data for future reference and also in formulating policy on a number of aspects of food fortification in the country. The Directors of the survey wish to express their sincere gratitude to all those who made the study possible and successful.

2000. The National Food Consumption Survey (NFCS), Stellenbosch, South Africa.

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