



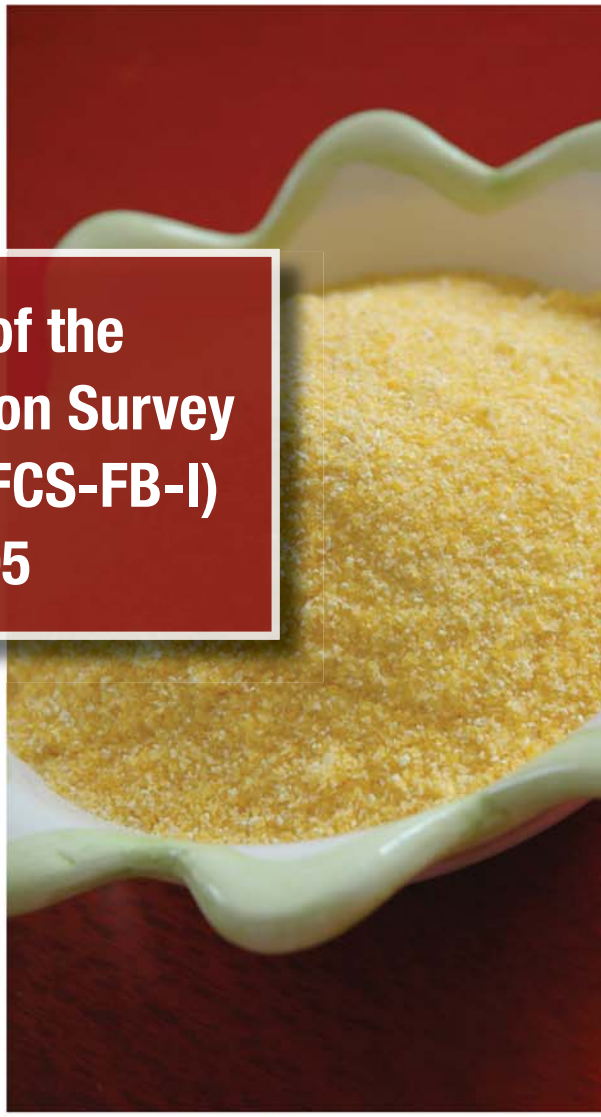

Executive summary of the National Food Consumption Survey Fortification Baseline (NFCS-FB-I) South Africa, 2005



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THE POWER OF PARTNERSHIPS

GAIN congratulates the Government of South Africa, the Department of Health, UNICEF, the Chamber of Milling, the Chamber of Baking, Academicians and Researchers, Development Bank of Southern Africa, Retailers and Consumers on the success of the national wheat and maize flour fortification program.

Executive Summary

National Food Consumption Survey-
Fortification Baseline
(NFCS-FB-I)
South Africa, 2005

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PREFACE

One of the recommendations of the National Food Consumption Survey (NFCS) was that due consideration should be given to initiating a programme of food fortification with a view to addressing micronutrient deficiencies in the country. The Directorate: Nutrition of the Department of Health, following extensive consultations with local and overseas experts, issued a Tender for a national survey with the aim of establishing baseline information on the predisposition of people to food fortification as well as establishing selected blood micronutrient values in children aged 1–9 years and women of child bearing age. The nine universities teaching Nutrition/Dietetics in the country, and the Medical Research Council (MRC), all part of an existing Consortium, the National Food Consumption Survey (NFCS), now named the National Food Consumption Survey (NFCS) – Fortification Baseline (NFCS-FB-I), tendered for the survey and was awarded the Tender. This report summarises the key findings of this national survey. There is potential for additional analysis of the database on many other specific issues within the framework of the available parameters studied. Any such analyses will form part of the survey's capacity building component, additional to the one the survey has already created.

In the report itself, the introduction and the methodology sections are followed by selected key findings in order to impart a global picture of the current situation in the country. The Appendix includes the Training Manual containing the Questionnaires that were developed specifically for and used in the survey, together with the training details that all the coordinators, team leaders and field workers received prior to the implementation of the survey. The directors of the NFCS-(FB) have agreed that the results of the survey will also be published in peer reviewed scientific journals.

The survey had to be stopped in its first week of implementation because, on the basis of clinical grounds, an unusually high number of blood samples received at the African Micronutrient Research Group of the Division of Human Nutrition of the University of Stellenbosch – the central processing laboratory in the Tygerberg Academic Hospital – were found to be haemolysed upon arrival. The Tygerberg Academic Hospital is a public hospital and part of the National Health Laboratory Services (NHLS). Better trained phlebotist nurses were employed and two other (private) central processing laboratories (PathCare and Lancet Laboratories) were appointed for the processing of the samples at the nearest possible laboratory site to that of sample collection. The purpose of these newly appointed laboratories was to decrease the time intervening between the drawing of the blood and its processing. For reasons of logistics, it was not possible to engage the NHLS more extensively in the resolution of this difficulty. These measures proved successful and the survey was restarted within two weeks from the time it was stopped. The survey was completed uneventfully in any other way and as planned. These corrective measures were taken in consultation with and approval of the Tendor. These measures also had financial implications in the sense that the original budget amount tendered for the implementation of the survey was insufficient to cover the additional expenses. The actual implementation of the survey had a long lag time for a number of administrative reasons unrelated to the undertaking of the Consortium to complete the survey fully and write the report in the shortest possible time, bearing in mind the size and nature of the survey.

The appropriateness of the title of the survey (Fortification Baseline) was also debated among the role players involved, since the mandatory food fortification legislation was enacted in April 2003 and implemented in October 2003. The survey was implemented in January 2005. The title was retained on account of the fact that the survey would have been the first of its kind at the national level being implemented after the legislation for mandatory fortification. Additionally, the survey and its title would lend itself to being a reference point and an "expansion/continuation" of the NFCS for any future such surveys, which would form part of the monitoring and evaluation programme of the food fortification policy in the country.

This survey would not have been possible without the excellent community support it has received, or without the commitment, dedication and hard work of the directors, coordinators, team leaders and fieldworkers of the survey, and the personnel of the Directorate: Nutrition of the Department of Health as well as the sponsors. The University Consortium consisted of (in alphabetical order) the Universities of Cape Town, Free State, Limpopo (MEDUNSA and Polokwane campuses), KwaZulu-Natal, North West, Pretoria, Stellenbosch (Chair and legal entity for the Tender) and Western Cape.

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EXECUTIVE SUMMARY

INTRODUCTION

In 1999 the first ever National Food Consumption Survey (NFCS) was undertaken in 1–9 year old children (n = 2894). The mothers/caregivers of the children were interviewed and information was obtained on the children's growth, dietary intake, procurement patterns and food inventories as well as the prevalence of hunger. This study provided the Department of Health (DOH) for the first time with vital information about the nutritional status of children and the foods eaten and purchased by households in South Africa. Based on this, the DOH was able to develop and implement strategies to address malnutrition in children.

The main anthropometric findings of the NFCS were that one in 10 children was overweight and just more than one in five was stunted. Furthermore, and in terms of the prevalence of stunting, younger children (1–3 years) were most severely affected, as were those that lived in the rural areas and on commercial farms in particular. In relation to being overweight, the highest prevalence was documented among children of urban households and whose mothers had tertiary education. Irrespective of the type of malnutrition, the level of maternal education was found to be an important determinant of both nutritional disorders among these children.

Dietary findings indicated that, in general, one out of two children had an intake of approximately less than half of the recommended level for energy as well as of a number of important micronutrients. In fact, the majority of children consumed a diet deficient in energy and of poor nutrient density to meet their nutrient requirements. This pattern of intake was worst in the rural areas. For South African children as a whole, the dietary intake of the following nutrients was less than 67% of the Recommended Dietary Allowances (RDAs): energy, calcium, iron, zinc, selenium, vitamin A, vitamin D, vitamin C, vitamin E, riboflavin, niacin, folic acid and vitamin $B_{6.}$ These data were supported by the findings that, at the national level, one out of two households experienced hunger, one out of four were at risk of hunger and only one out of four appeared to be food secure.

The study also provided the DOH with information on the most commonly consumed foods and the average portion size thereof. At national level, the five most commonly eaten foods included maize, sugar, tea, whole milk and brown bread. With a few exceptions, this pattern appeared to be fairly consistent in all the provinces. This data formed the basis on which decisions on food fortification were made and legislated for in October 2003. Since that date, it is mandatory for manufacturers to add iron, zinc, vitamin A, thiamin, riboflavin and vitamin B_6 to maize and wheat bread flour. Based on the findings of the NFCS, the DOH also developed educational materials for the public based on the food-based guidelines which have been specifically developed for South Africans. For additional perspective on the time frame of events subsequent to the legislated food fortification programme in relation to the present survey, it is generally accepted that fortified staple foods reached the market within six months (i.e. October 2004) of the date of the legislation being enacted (i.e. April 2004). The field work of this national survey was completed between February and May 2005.

In order to maintain the surveillance system of national surveys introduced by the Department of Health as well as to have a base on which the food fortification policy can be monitored and evaluated in the future, the current survey was commissioned early in 2003. For this purpose, therefore, and apart from data on child growth, biochemical analyses of physiological fluids (blood and urine) have been included in the survey. However the final decision to implement the survey was delayed till approximately the middle of 2004 for various reasons regarding the funding for the survey. The survey population was also extended to include women of child bearing age, the second most vulnerable group of the population. Furthermore, it was deemed necessary to also evaluate adults' knowledge, attitudes and practices with regard to food fortification and re-evaluate the prevalence of hunger in the country. The survey can also be seen as a means of obtaining more data in relation to the Millennium Developmental Goals.[1]

This final report therefore provides an overview of trends of the data analyses on the nutritional status of children and women of child bearing age, food procurement and inventory, knowledge, attitudes and practices of women with regard to food fortification, biochemical evaluation of selected micronutrients as well as on the prevalence of the presence at the point of consumption of vitamin A in fortified maize meal. The report encapsulates the key findings of the survey and lends itself to further detailed analysis on specific issues within the framework of its database content.

In this supplement, it is only the Executive Summary of the Report that is published. The Appendix to the Executive Summary imparts an impression of the structure of the full report in which the findings of the survey have been reported more extensively.

1. AIM OF THE SURVEY

The aim of this National Food Consumption Survey – Fortification Baseline (NFCS-FB-I) survey was to define the anthropometric, iron, iodine, zinc, folate and vitamin A status of children aged 1–9 years and women of reproductive age in South Africa as well as to describe the knowledge, attitude and practices with regard to food fortification and fortified food products.

1.1 Primary Objectives:

Determine in children aged 1–9 years and women of reproductive age (16–35 years) in South Africa, the:

- Anthropometric status.
- Vitamin A, iron, iodine, zinc and folate status.
- Prevalence of the use of food products fortified with vitamin A, thiamin, riboflavin, niacin, folic acid, iron and zinc at the household (HH) level, on the basis of detecting the presence of vitamin A in maize at the point of consumption.
- Prevalence of the use of iodised salt at the HH level.
- Prevalence of the presence of vitamin A in fortified maize at the HH level. This served as a proxy for the prevalence of fortification with the legislated fortificant premix containing vitamin A, thiamin, niacin, riboflavin, folic acid, iron and zinc.
- Prevalence of hunger.
- Knowledge, attitude and practices regarding the use of fortified products as well as awareness of and access to such food products.

1.2. Secondary Objectives:

Using the data from the primary objectives, to propose/ recommend:

- Appropriate nutrition education messages and/or concepts.

2. SURVEY METHODOLOGY

- A cross-sectional survey of a nationally representative sample of children aged 1–9 years in South Africa using the Census 2001 data.
- The survey population consisted of all the children aged 1–9 years (12–108 months) and women of reproductive age (16–35 years) living in the same HH in South Africa. This initial sample was adapted by means of 25% over-sampling to accommodate for children and women who would not be at home at the time of the survey. A total of 226 Enumerator Areas (EAs) were included in the survey, 107 of which were urban-formal, 23 urban-informal, 15 rural-formal and 81 tribal areas. All qualifying EAs for the survey were selected with a known probability. A qualifying HH for inclusion in the survey was defined as any HH with at least one child aged between 1–9 years and at least one woman of reproductive age (16–35 years) in it.
- Validated questionnaires [Socio-demographic, Knowledge Attitude and Behaviour questionnaire (KAB), Food Procurement and HH Food Inventory and Hunger Scale] were administered by trained fieldworkers and a blood and urine sample was taken from the respondents of each HH to assess micronutrient status. Samples of tap water and maize were collected from each HH and tested for iodine and vitamin A respectively, the latter at the HH level. All questionnaires were translated into the country's official languages for use as appropriate.
- A training manual was developed and used for the training of all field personnel engaged in the implementation of the survey.
- Anthropometric status assessment included height and weight.
- Quality assurance measures were employed throughout the survey.

MAIN FINDINGS

3. SOCIO-DEMOGRAPHIC DATA

Findings

- The response rate in the survey was 91%.
- The information for the completion of the questionnaires was predominantly provided by the mother of the child and can therefore be considered reasonably reliable, within the specifications of the methodology employed.
- Nationally, 20.5% of children aged 1–4 years of age (12–59 months) were reported to have received a high dose vitamin A supplement from the health services within the last six months, with 10% of children's respondents not being sure whether the child had received such a supplement.
- Nationally, almost half of the HHs were headed by males (father, husband) with the father (of the woman respondent) heading the HH in almost one third of HHs and the husband and the grandfather being the head of the HH in 17% and 2% of HHs respectively.
- Nationally, more than one in two HHs (55%) had a monthly income between R1–R1000 with urban informal HHs reporting the highest percentage of no income (6%) as well as an income of R1–R500 (35%).

- Six out of ten HHs nationally obtained their water from an own tap, whereas one in four HHs obtained their water from a communal tap. The remainder of the HHs obtained their water either from a river/dam (9%) or a borehole/ well (4%).
- One out of two HHs had both a radio and a television set in working order, with the radio being the most common means of receiving information.
- A very significant percentage of the country's population still live under adverse socio-economic conditions. Although a trend towards an improvement in some of these conditions appears to have occurred since 1999, it is only the long-term socio-economic upliftment of the population that is likely to ensure the improvement of the nutritional status of the community.

Recommendations

On the basis of these findings, and the current literature[2-15]

- Government should accelerate and expand its current policies and programmes on job creation and poverty alleviation, which must be afforded the greatest priority.
- Social security programmes targeted at female headed HHs should be further developed, and should also incorporate developmental approaches.
- Child support grants and old age pensions should be re-evaluated not only in terms of their adequacy in monetary value in relation to the prevailing financial climate in the country but also with a view to broadening the "means tested" qualifying households/mothers/caregivers.
- Families and mothers/caregivers in particular, should be targeted for any relief and educational programmes. Particular emphasis should be placed on the education and empowerment of women.
- The radio should primarily be used, together with television, for disseminating information on nutrition education in general and food fortification in particular.
- Innovative means of communication such as the cell phone should be used to disseminate nutrition education messages. Such a system could also be used for improving the high dose vitamin A supplementation programme.
- A Panel of Experts should be convened to discuss and comprehensively evaluate the current high dose vitamin A supplementation programme in terms of compliance, missed opportunities and the correct implementation of all its components in all provinces including the recording of the supplements in the Road to Health card. The Panel should also recommend what additional analyses of the data base may be necessary, if any.
- The Panel should also discuss and recommend a minimum set of socio-demographic data that need to be collected in national surveys. Intersectoral representation of such experts would be of the essence. The Panel should further provide input to the creation of a nutrition surveillance system as recommended elsewhere in this report.
- Appropriate and comprehensive training should be made available so that personnel of crèches are enabled to administer high dose vitamin A supplements as well as other micronutrient supplements in older children according to prevailing policies.
- National days for single high dose vitamin A supplements should be instituted to support the on-going facility based programme and capture older children whose clinic attendance is unpredictable/inadequate.
- The Road-to-Health card should be formatted with vitamin A supplementation points in a format not dissimilar to that currently used for immunisation.
- The necessary human and financial resources should be made available in order to facilitate the better implementation of the recommended additional programmes.
- The achievement of these aims should be addressed within the current framework of the Integrated Nutrition Programme (INP) of the Directorate: Nutrition.
- The Consortium remains available to the Department of Health for consultation/assistance.

4. ANTHROPOMETRIC STATUS

Findings

- At the national level, stunting and underweight remain by far the most common nutritional disorders affecting almost one out of five and almost one out of ten children respectively.
- By contrast, 10% of children nationally were classified as overweight and 4% as obese.
- At the national level the nutritional status of younger children (12–71 months of age) has marginally but significantly improved in comparison with the 1999 NFCS data. These findings, however, should be seen within the known limitations of comparative analysis and be interpreted with caution.

Recommendations

On the basis of these findings, and the current literature[16-26]

- Stunting should continue to be addressed within the current framework of the INP, which is based on an integrated nutrition strategy for South Africa, and which, in line with

the findings of the present survey, appears to be effective. Nevertheless, it is also strongly recommended that the Directorate: Nutrition is provided with the necessary additional resources to promote child growth with particular emphasis on establishing and strengthening community based growth monitoring and promotion.

- A Panel of Experts should be convened to assess the feasibility and implementation, as appropriate, of a programme which will enable duly trained nursing staff, dietetic assistants, nutritionists and dietitians to measure the length/height of children who are enrolled in the Nutrition Supplementation programme at clinics. Length measuring boards or mats and stadiometers or wall-mounted tapes to measure height should be available at clinics. Standards for height-for-age and body mass index (BMI) for age should also be made available, so that children at risk of becoming stunted or overweight/obese can be identified at an early age. The Panel should also recommend what additional analyses of the data base may be necessary, if any.
- The Panel should further make appropriate recommendations for inclusion in the national nutrition surveillance system as described elsewhere in the report.
- Dietitians or nutritionists should become more involved in the follow-up of children in the Nutrition Supplementation Programme, identifying those who are stunted and providing the necessary nutrition education to promote child growth.
- In terms of priorities, all children who are stunted or overweight should be targeted according to prevalence and the prevailing provincial priorities. Identification, but more importantly follow-up activities should be strengthened and intensified, and should be supervised overall by dietitians/nutritionists. A system whereby patient files or cards are kept at the clinic would be useful and should be strengthened as necessary to ensure follow-up and scheduling of home visits to patients who drop out of treatment programmes.
- Due consideration should be given to accelerating the creation of crèche (child care) facilities within the community and at the work place, especially in provinces with a high prevalence of stunting as well as in disadvantaged communities within the identified provinces which have a high prevalence of stunting. Dietitians and nutritionists could become involved in the training of staff at these child care centres in menu planning, food purchasing and preparation and food hygiene.
- Similarly, the creation of both community and health facility-based rehabilitation centres should be accelerated for the intensive treatment, supervision and follow-up of severely malnourished children. Treatment protocols should be carefully developed, taking cognisance of the risks for overweight.
- Mothers/caregivers should be educated according to the prevailing needs of their environment. Food fortification and both aspects of malnutrition, namely under- and over-nutrition, should form part of any nutritional education programme. Promotion of exclusive breast-feeding up to the age of six months of life, followed by appropriate complementary feeding should be key components of nutrition education. Dietary interventions should also focus on the child made more vulnerable to malnutrition due to HIV/AIDS or other infectious diseases.
- With regard to complementary feeding, the Panel should also assess the nutritional quality of complementary foods used in the Nutrition Supplementation Programme and evaluate their cost-effectiveness specifically in terms of costs in relation to outcomes. The Panel should further specifically evaluate the available evidence, nationally and internationally, which indicates that the consumption of foods of animal origin is more beneficial in the prevention, reversal and management of stunting.
- An anthropometric assessment of children in the age range of the present survey should be repeated in three/five years with a view to monitoring the progress on the findings of the present survey.
- Overweight and obesity among women should be the target of appropriate community based programmes. These should be based on a lifestyle approach that includes dietary interventions as well as an increase in physical activity level, from the sedentary to the more active level. The necessary resources to implement such programmes should be made available for this purpose. Promotion of exclusive breast-feeding may contribute to a lower prevalence of overweight among older children.
- Obesity in children is best addressed at the clinic, crèche, school and home environment.
- In collaboration with the Department of Education, changes in the school environment should include the promotion and/or re-introduction of Physical Education, apart from the necessary dietary interventions at the crèche, school and home. Regulation of school tuck-shops should include control of the sponsoring of school activities as well as a reduced intake of sweetened cold drinks and high-energy-nutrient-poor snacks.

- Appropriate messages should be developed which highlight the health benefits of weight management in relation to the well described morbidity/mortality profiles of those who are overweight or obese.
- The achievement of these aims should be addressed within the current framework of the Integrated Nutrition Programme (INP) of the Directorate: Nutrition.
- The Consortium remains available to the Department of Health for consultation/assistance.

5. KNOWLEDGE, ATTITUDE AND BEHAVIOUR (KAB) ON FOOD FORTIFICATION AND NUTRITION

Findings

- The main domain that was investigated was the awareness of and the intention to purchase fortified foods in a randomly selected group of the population in South Africa. Among the theories used to describe food choice behaviour, the Theory of Planned Behaviour (TPB), an extension and adaptation of the Theory of Reasoned Action (TRA), seemed to provide a good framework for conceptualising, measuring and empirically identifying factors that determine behaviour that impact on health. An adaptation of the expanded TPB model provided the theoretical framework for this survey.
- The findings of the present survey portray an indication of the beliefs, awareness, and intention and attitudes regarding food fortification as well as basic nutrition knowledge (on micronutrients) of women in selected HHs.
- Seven out of ten of the respondents nationally scored highly in their beliefs that adding vitamins and minerals to food was healthy, safe, energy boosting and helped with the growth of children without altering the taste or appearance of the food.
- The health professional, radio/TV and school, but not the husband, exerted strong normative influence on at least 74% of selected women nationally.
- One out of two women respondents indicated that they would buy foods with added vitamins and minerals even if they did not know their benefits. They also indicated that they would buy fortified foods even if they were "a little more" expensive than foods that did have added vitamins and minerals.
- At the national level, nearly four out of ten women knew about the food fortification legislation. This was true in all areas of residence irrespective of the age of the child as well as across all provinces.
- Nationally just under one out of two women respondents included in the survey had previously seen the food fortification logo with the Eastern Cape having the lowest such exposure, but only one out of five women interpreted the logo correctly or had previously heard of the concept of "food fortification".
- The terminology "food fortification" was not easily understood and/or correctly interpreted. The findings on awareness with regard to the food fortification legislation and logo, however, reflected well on the effectiveness of the food fortification awareness campaigns that were implemented in 2004/5. It would, therefore, appear that past efforts on the education of the public on aspects of food fortification have been largely successful.
- Nationally, eight out of ten women respondents indicated their intention to buy fortified maize meal, bread, and wheat flour in the ensuing two weeks, and that they would be looking for the fortification logo as well as reading the label of the food products that they buy to ensure that they were fortified.
- Nationally eight out of ten women respondents included in the survey had a sound to very good basic nutrition knowledge score on vitamins and minerals, except for iodine.
- Nationally and provincially, a positive to very positive attitude with regard to healthful eating was volunteered by at least six out of ten women.

Recommendations

On the basis of these findings, and the current literature[27]

- Current efforts on the education of the public on aspects of food fortification appear to have been largely successful and should be continued and intensified.
- A Panel of experts in education should be convened to create a set of educational messages which will impart, to an already motivated public, instrumental knowledge on the benefits of food fortification and fortified foods. The Panel should also recommend what additional analyses of the data base may be necessary, if any.
- Schools, health facilities, health professionals and the lay press should be afforded a greater opportunity in imparting knowledge on the benefits of food fortification and fortified foods.
- Continued and consistent messages on the benefits of food fortification should be addressed to the public at large to improve on an already excellent coverage as part of the monitoring and evaluation programme on food fortification.

- Special attention ought to be paid to the design of the educational component of the communication campaigns to ensure that the terminology around food fortification is more customer-friendly and is clearly and correctly understood and interpreted.
- The health professional, TV/radio and the school curriculum should be used as a means to a better understanding of the meaning of food fortification as well as the interpretation thereof.
- The achievement of these aims should be addressed within the current framework of the Integrated Nutrition Programme (INP) of the Directorate: Nutrition.
- The Consortium remains available to the Department of Health for consultation/assistance.

6. FOOD PROCUREMENT

Findings

- At the national level, six out ten of the women did not look for the fortification logo when procuring maize, bread or flour products. This finding reflects on past behaviour with regard to food fortification while the KAB (Chapter 5) mainly assessed the intention to modify behaviour once the population had been appropriately sensitised regarding the benefits of such changed behaviour. The latter was found to be positive.
- Nationally, nine out of ten HHs procured maize meal (in descending frequency) of the four main types of maize meal, namely sifted raw (white), special raw (enriched), super raw (white) and special raw (white) for consumption.
- Three quarters of South African HHs procured wheat flour for consumption with relatively little variation by area of residence. However, seven out of ten HHs in the country procured cake flour (which is not fortified by Law) for consumption, and used it for baking bread at home.
- Bread was procured for consumption by eight out of ten HHs in South Africa with brown bread being the choice in seven out of ten HHs.
- In general terms, procurement of maize for consumption tended to decrease with increased HH income and money spent on food, whereas the opposite was the case for wheat flour and bread.
- The most popular bread products consumed in the country were vetkoek followed by steamed bread.
- Almost all HHs in the country had salt in their inventory with little difference across the areas of residence and provinces. At the national level, the brand name of both the iodised coarse and iodised fine salt was identified in six out of ten HHs.
- Overall, the data obtained from the procurement questionnaire were supportive of the information obtained from the inventory section of the questionnaire, thus affording a reasonable degree of certainty regarding procurement patterns.
- At the national level a maize meal sample was obtained from nine out of ten HHs. The fortification logo could be confirmed on the package in six out of 10 of the HHs nationally.
- The presence of vitamin A in maize was detected in seven out of ten of the samples on which the maize was tested nationally indicating, at least on this basis, that the miller industry was complying with current regulations.
- Stability issues of vitamin A in the fortification premixes have been identified and are discussed in Chapter 10 of the report.

Recommendations

On the basis of these findings, and the current literature[28-32]

- Current efforts on the education of the public on aspects of food fortification appear to have been largely successful and should be continued and intensified.
- Continued and consistent messages on the benefits of food fortification should be addressed to the public at large to improve on an already excellent coverage as part of the monitoring and evaluation programme on food fortification. Emphasis in the awareness and education campaigns ought to be placed on the correct use of fortified food products, since it seemed as if unfortified products were preferred for home baking.
- Food and micronutrient insecurity should be addressed within the current framework of the INP and the enacted food fortification programme. Current efforts should be continued and intensified. In addition to food fortification, food diversification may be important in improving micronutrient status in an appropriate setting(s). Current thinking though indicates that "dietary diversification has not produced significant results at scale". Nutrition education, behaviour change alongside crop diversification and the introduction of new crops and use of indigenous foods need to be encouraged. Home gardens should only be encouraged in settings where the feasibility and sustainability of such an activity have been established.
- The on-going good, productive and effective partnership that has been achieved with sectors of the food industry should be maintained and improved in ways that will be conducive to attaining the goal that all HHs in the country have confirmed presence of fortified foods. Particular attention should be afforded to the continued support of the

food industry to the fortification programme, the provision of assistance in the advertising of fortified products and their importance to health as well as their correct intended use, and continued assurance of strict adherence to the legislated fortificant premix.

- A Panel of Experts should be convened to discuss and make recommendations on a monitoring and evaluation programme which must form an integral part of the food fortification programme and the proposed nutrition surveillance system recommended in other sections of the recommendations. The Panel should also recommend what additional analyses of the data base may be necessary, if any.
- The Panel should also revisit the decision not to include cake flour in the fortification legislation with a view to amending the current legislation.
- The vitamin A field test kit, as tested in this survey, should be considered for adoption as a screening tool for monitoring the presence of vitamin A in maize, and could form part of the nutrition surveillance system as recommended in other sections of this report.
- The current component of the INP programme regarding vitamin A supplementation should be retained and resourced to attain greater coverage.
- The Consortium remains available to the Department of Health for consultation/assistance.

7. HUNGER

Findings

- HH food security is defined as the secure and permanent access to foods, sufficient in kinds and amounts to enable all individuals to live a healthy life. HH food security indicators are useful not only for the purpose of estimating the prevalence of food insecurity, but also to assist in better decision-making, resource allocation, household targeting and screening and in the long-term for HH food security monitoring and evaluation. They also facilitate the studying of the effects of food insecurity on health and well-being.
- Within the design framework of the present 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 parameters studied in this survey, but also for providing a reference point in the future for assessing change over time, since such data on children is limited in the South African context. Furthermore, such data would establish the country's current status in relation to the target of the Millennium Development Goals of reducing the number of hungry people by half by 2015.
- A questionnaire-based measure was used to determine domestic hunger similar to the one that has been used in the Community Childhood Hunger Identification Project (CCHIP). This measure (CCHIP hunger index) was also used in the NFCS (1999). CCHIP defines hunger as the mental and physical condition that comes from not eating enough food, due to insufficient family, community and economic resources. This definition of hunger offered by CCHIP, as well as the measurement thereof, focus on food insufficiency and insecurity due to constrained resources. The validation findings of the CCHIP hunger index reported in the literature have shown it to meet internal and external criteria within a theoretical model of domestic hunger. The CCHIP hunger index measured by an additive scale can therefore be regarded as sufficiently sensitive to identify chronic or sub-clinical undernutrition among families, at least as it relates to poor families in the United States of America, as well as in South Africa (NFCS, 1999).
- The CCHIP hunger index is composed of eight questions that investigate whether adults and/or children are affected in the household (HH) by food insecurity, food shortages, perceived food insufficiency or altered food intake due to constraints on resources. In addition, for each aspect of hunger [i.e. in all eight main questions (Q) of the questionnaire], two sub-questions were asked to determine the extent of such food insecurity over a period of 30 days. These questions determined the temporal severity of hunger.
- In this study, factor analysis (Varimax rotation) showed a factor loading which explained 80%, 78% and 79% of the variance respectively at the urban, rural and national level. The corresponding Cronbach's alpha (internal consistency) was 0.918, 0.907 and 0.915 respectively. These values are similar to those obtained in the NFCS (1999), which were 0.94, 0.91 and 0.93 at the urban, rural and national level respectively. It can be concluded that the factor analysis and Cronbach's alpha values indicated acceptable validity of the measurement of the parameters.
- At the national level, one out of two HH (51.6%) experienced hunger as determined by the hunger scale, approximately one out of three was at risk of hunger and only one out of five appeared to be food secure.
- At the provincial level the prevalence of HHs experiencing hunger was highest in the Eastern Cape, Northern Cape and Limpopo (six out of ten HHs per province).
- The prevalence of hunger, at best had not improved since the findings of the NFCS in 1999. These comparative findings, however, should be seen within the known limitations of comparative analysis and be interpreted with caution.

- There was an overall consistent association between the hunger risk classification and anthropometric status.
- HHs at risk of hunger or experiencing hunger procured a smaller number of fortified foods. Additionally and in general terms, 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

On the basis of these findings, and the current literature[33-41]

- Food and micronutrient insecurity should be consistently addressed within the current framework of the Integrated Food Security Strategy for South Africa and the INP including the enacted food fortification programme in order to reduce the incidence of hunger and risk of hunger successfully.
- Specific measures addressing the predictors of food insecurity (HH income, employment status, the presence of children in the HH and a history of homelessness/informal dwelling) must be prioritised for meeting the Millennium Development Goals of halving poverty and hunger. Such measures should include the creation of employment opportunities which should rank among the highest priorities of the government.
- The data of the present survey should also be communicated to other relevant sectors within government, especially the agricultural sector, in order to highlight the importance and extent of the food and micronutrient insecurity in the country, and to increase partnerships among different role players to ensure sustainable interventions within the context of vulnerable communities.
- A Panel of Experts should be convened to establish active and on-going collaboration with the Department of Agriculture, the HSRC and other relevant role players to collate, analyse, integrate, and interpret nationally available data on food security with the aim of establishing an appropriate methodology for evaluating food security at the household and individual level. The Panel should also recommend what additional analyses of the data base may be necessary, if any.
- The Panel should further make appropriate recommendations for inclusion in the national nutrition surveillance system as described elsewhere in the report.
- The on-going good, productive and effective partnership that has been achieved with sectors of the food industry should be maintained and improved in ways that will be conducive to attaining the goal of all HHs in the country having the confirmed presence of fortified foods.
- The current component of the INP regarding micronutrient supplementation should be retained, reassessed and resourced to attain greater coverage by consistently monitoring the appropriate implementation thereof.
- The Consortium remains available to the Department of Health for consultation/assistance.

8. IODINE STATUS

Findings

- At the national level almost all (97%) of the HHs had salt containing a significant (>2 ppm) amount of iodine and with almost eight out of ten HH having salt with a higher (>15 ppm) iodine content.
- Both at the national and provincial levels there has been a consistent increase since 1998 in the percentage of HHs using salt with an iodine content in excess of 15 ppm.
- The mean iodine concentration in drinking water was significantly higher in Limpopo (64.8 µg/L) and even higher in the Northern Cape (196.6 µg/L) when compared with the other provinces, an issue that needs to be addressed urgently at least in the Northern Cape.
- The highest median Urinary Iodine (UI) concentration was recorded in the Northern Cape. This finding raises issues of serious concern and needs to be addressed on an urgent basis, despite the small number of HHs from that province that were included in the survey.
- Four out of 10 women and five out of ten children nationally had a UI concentration in the excessive category of iodine status.
- At the provincial level children's UI concentration was in the excessive range in six out of the nine provinces with the highest such prevalence in the Northern Cape (children 95%; women 83.3%).
- Essentially, based on the median UI of women and children, South Africa has achieved the virtual elimination of Iodine Deficiency Disorders (IDD).

Recommendations

On the basis of these findings, and the current literature[42-54]

- The Department of Health should convene a Panel of Experts, which should include medical experts, to reassess its current salt iodation programme with a view to making recommendations on the current level of iodation, as well as assessing the safety of the current iodine status primarily, but not exclusively, of the inhabitants of the

Northern Cape. The Panel should also recommend what additional analyses of the data base may be necessary, if any.

- The Panel should take cognisance of the trends in median UI concentrations since the enactment of the legislation on salt iodation.
- The Panel should further develop a strategy, building on the good progress until now, to further strengthen the national salt iodation programme and to ensure the sustainability of the virtual elimination of iodine deficiency in South Africa.
- The Panel should also make appropriate recommendations for inclusion in the national nutrition surveillance system as described elsewhere in the report.
- The iodine situation in the Northern Cape needs to be investigated with reference to the iodine concentration in household salt, drinking water and the iodine status in a bigger sample of children and women.
- The Panel of Experts should, in view of the high water iodine content and the excessive (if not toxic) median values documented in the survey, justify the continued consumption of iodised salt in the Northern Cape.
- The high median UI concentrations should be reported to the IDD Network as well as the WHO with a view of South Africa playing a leading role not only in the interpretation of the data but the safety aspects of such high median concentrations.
- Current efforts should be continued and strategies strengthened to ensure accurate iodation of table salt, for example the monitoring of iodine in salt and the training of salt producers in the titration method.
- Compliance measures of salt iodation should be strictly monitored to ensure adherence to current legislation.
- Micronutrient supplements should be reassessed for their iodine content, especially those intended for women of child bearing age.
- The achievement of these aims should be addressed within the current framework of the Integrated Nutrition Programme (INP) of the Directorate: Nutrition.
- The Consortium remains available to the Department of Health for consultation/assistance.

9. SELECTED MICRONUTRIENT STATUS

VITAMIN A:

Findings

- Two out of three children and one out of four women nationally had a poor vitamin A status.
- Provincially, six out of 10 women respondents in KwaZulu-Natal had a poor vitamin A status, the highest in the country. This was also reflected in the prevalence of a poor vitamin A status in the children.
- The presence of infection/inflammation did not contribute significantly to the low blood vitamin A concentration.
- The prevalence of a poor vitamin A status in children in the country appears to have increased when compared with previous national data and is indeed a cause of grave concern. This comparison, however, should be interpreted with great caution and with due consideration to the known limitations of such comparisons.
- The pattern of increased prevalence in poor vitamin A status appeared uniform, irrespective of the area of residence, age and province.
- Stability issues of vitamin A in the fortification premixes have been identified and are discussed in Chapter 10 of the report.

Recommendations

On the basis of these findings, and the current literature[55-72]

- The food fortification programme must continue to be a milestone in the current INP programme while other approaches (education, consumption of vitamin A rich foods, food diversification, supplementation) to address the poor vitamin A status of children and women of reproductive age should be concurrently strengthened.
- A Panel of Experts should be convened to discuss and comprehensively evaluate the current high dose vitamin A supplementation programme in terms of compliance, missed opportunities and the correct implementation of all its components in all provinces including the recording of the supplements in the Road to Health card. The Panel should also recommend what additional analyses of the data base may be necessary, if any.
- The Panel should also make appropriate recommendations for inclusion in the national nutrition surveillance system as described elsewhere in the report.
- The Panel should further assess emerging trends in infant and maternal supplementation with a view to revising the approach of the current programme.
- The vitamin A content of the high vitamin A capsules at the point of consumption should be evaluated for compliance with the prescribed specifications and their storage at the level of dispensing should be assessed.
- Complementary feeding practices should be re-evaluated and strengthened to ensure adequacy of vitamin A intake. At the same time, the supplementary foods that are currently

provided in the Nutrition Supplementation Programme should not simply concentrate only on energy content but also on dietary quality and adequate micronutrient composition.

- Innovative means of communication such as the cell phone should be used to disseminate nutrition education messages. Such a system could also be used for improving the high dose vitamin A supplementation programme.
- The Panel should assess the feasibility of providing appropriate and comprehensive training so that personnel of crèches are enabled to administer high dose vitamin A supplements as well as other micronutrient supplements in older children according to prevailing policies.
- The Panel should also assess the feasibility of introducing national days for single high dose vitamin A supplements in addition to the on-going facility based programme in order to capture older children whose clinic attendance is unpredictable/inadequate.
- The Panel should further identify methods other than serum vitamin A for the detection of improvements in vitamin A status at an earlier stage than serum vitamin A levels allow. A rapid assessment study should be carried out in 2008 using the methodology the Panel identifies. Such a study could also be clinic based as a means of evaluating the current supplementation programme.
- The emerging option of community level fortification with vitamin A should be explored both in terms of feasibility and safety.
- All mothers should receive a single high dose vitamin A supplement within the first month postpartum during one of the postnatal visits. This practice should be assessed and reviewed in the context of exclusive breast-feeding practices as well as the current HIV guidelines on Nutrition.
- A second Panel of Experts should be convened to investigate the identified stability issues of vitamin A in the final fortified product.
- The industry manufacturing premixes should police itself in terms of strict compliance with current legislation and ensure, in collaboration with the millers, that the correct amount of vitamin A reaches the consumer at the household level.
- The micronutrient component of the INP programme should be strengthened, expanded in expertise and appropriately resourced to address current and urgent issues of the food fortification programme.
- The Consortium remains available to the Department of Health for consultation/assistance.

IRON:

Findings

- Almost one third of women and children were anaemic on the basis of Hb concentration, with moderate and severe anaemia being relatively uncommon.
- At the national level, one out of five women and one out of seven children had a poor iron status.
- The provinces worse affected by poor iron status were Gauteng, Mpumalanga and Limpopo in the case of women, and the Free State, Mpumalanga, Limpopo and the Western Cape in the case of the children.
- The prevalence of a poor iron status in children in the country appeared to have increased when compared with previous national data and is indeed a cause of concern. This comparison, however, should be interpreted with caution and with due consideration to the known limitations of such comparisons.
- The presence of infection/inflammation did not contribute significantly to the prevalence of anaemia but may have masked inadequate iron status.

Recommendations

On the basis of these findings, and the current literature[73-92]

- The food fortification programme must continue to be a milestone in the current INP programme while other approaches (education, consumption of iron rich foods, food diversification, supplementation) to address the poor iron status of children and women should be concurrently strengthened.
- A Panel of Experts should be convened to discuss and comprehensively evaluate the current micronutrient supplementation components of the nutrition supplementation programme in terms of compliance, missed opportunities and the correct implementation of all its components in all provinces.
- The Panel should also assess emerging trends in infant and maternal supplementation with a view to revising the approach of the current programme.
- The Panel should further make appropriate recommendations for inclusion in the national nutrition surveillance system as described elsewhere in the report.
- The Panel should also identify a minimum set of the most appropriate indicators for the assessment of iron status at a national level in the future. A rapid assessment study should be carried out in 2008 using the indicators the Panel identifies. Such a study could also be clinic based as a means of evaluating the current supplementation programme. The

Panel should also recommend what additional analyses of the data base may be necessary, if any.

- An iron sulphate syrup supplement distribution programme should be instituted for a period of three years primarily for all children in the 6–23 months age group.
- Current practices at the antenatal level regarding iron supplements should be assessed both in terms of approach, the type and dose of the iron supplements dispensed as well as compliance.
- Iron supplements should only be dispensed to children with confirmed iron deficiency anaemia, especially malnourished children, during the period of convalescence from illness as the safety of routine iron supplements is currently being debated and may be ill advised.
- Current intrapartum practices relating to umbilical cord clamping in the context of preventing and/or delaying the onset of iron deficiency in the infant should be reassessed in collaboration with the Directorate: Maternal and Child Health, and be so adapted to be in line with emerging trends and recommendations.
- Complementary feeding practices should be re-evaluated and strengthened to ensure adequacy of iron. At the same time, the supplementary foods that are currently provided in the Nutrition Supplementation Programme should not simply concentrate on energy content only but also on dietary quality and adequate micronutrient composition.
- Innovative means of communication such as the cell phone should be used to disseminate nutrition education messages. Such a system could be used for improving the current nutrition supplementation programme.
- The Panel should also assess the feasibility of providing appropriate and comprehensive training so that personnel of crèches are enabled to administer iron supplements as well as other micronutrient supplements in older children according to prevailing policies.
- The emerging option of community level fortification with iron should be explored both in terms of feasibility and safety.
- The industry manufacturing premixes should police itself in terms of strict compliance with current legislation and ensure, in collaboration with the millers, that the correct amount of iron reaches the consumer at the household level.
- The micronutrient component of the INP programme should be strengthened, expanded in expertise and appropriately resourced to address current and urgent issues of the food fortification programme.
- The Consortium remains available to the Department of Health for consultation/assistance.

FOLIC ACID:

Findings

- On the basis of mean serum and red blood cell folate concentrations, folic acid status would appear to be adequate uniformly throughout the country.
- Respondents from provinces with better consumption of green leafy vegetables tended to have higher serum and red blood folate concentrations, when compared to respondents from other provinces with a lesser such consumption.
- It is possible that the normality of folate status in the country may be the first indication that, for a water soluble vitamin, the food fortification programme is associated with a beneficial outcome.

Recommendations

On the basis of these findings, and the current literature[93-116]

- The food fortification programme must continue to be a milestone in the current INP programme.
- A Panel of Experts should be convened to discuss and comprehensively evaluate the current micronutrient supplementation components of the Nutrition Supplementation Programme in terms of dispensing folic acid supplements in all provinces.
- The Panel should also reassess and make recommendations on the current level of folic acid fortification. The Panel should moreover assess the need to include vitamin B_{12} in the fortification premix. It is recommended that the approach relating to the considerations of the risk to benefit ratio must be biased in the favour of risk rather than benefit, since there is no evidence that high serum and red blood folate concentrations are associated with any additional health benefits (but may indeed be detrimental) and the food fortification programme is of a long term nature.
- The Panel should further engage the micronutrient supplements industry with a view to rationalising current practices regarding the folic acid and vitamin B_{12} supplements available in the country. The possibility of standardising such supplements to one formulation of a maximum content of 400 µg with the single indication for pregnancy should be seriously considered. The Directorate: Food Control and the Medicines Control Council should be engaged for collaboration and guidance as appropriate/necessary. Furthermore, the content and dose of vitamin B of such over-the-counter supplements should be discussed and

recommendations should be made. The Panel should also recommend what additional analyses of the data base may be necessary, if any.

- The Panel should make appropriate recommendations for inclusion in the national nutrition surveillance system as described elsewhere in the report.
- A rapid assessment study should be carried out in 2008 which can be clinic based.
- The assessment of vitamin B_{12} status of the population should be included in any future surveys since there is a paucity of such data at the national level.
- Current practices at the antenatal level regarding folic acid supplements should be reassessed. The reassessment should include the need, type and dose of the folate supplements currently dispensed at antenatal clinics. The discontinuation of such supplements should be seriously considered.
- The appropriate Chief Directorate(s) within the Department of Health should be engaged to coordinate and interpret the available data on folic acid status in relation to the reported reduction in the incidence of neural tube defects in the country following the introduction of the food fortification programme. Current practices should be reassessed and strengthened with a view to continued monitoring of neural tube defects.
- Innovative means of communication such as the cell phone should be used to disseminate nutrition education messages.
- The industry manufacturing premixes should police itself in terms of strict compliance with current legislation and ensure, in collaboration with the millers, that the correct amount of folic acid reaches the consumer at the household level. Overcompliance, as apparently is the practice at present, should be discouraged and discontinued.
- The Department of Health should approach the relevant laboratories in the private sector and the National Health Laboratory Services with a view to standardising the reporting of blood folate and vitamin B_{12} concentrations as well as the cut off points for the definition of a state of deficiency.
- The micronutrient component of the INP programme should be strengthened, expanded in expertise and appropriately resourced to address current and urgent issues of the food fortification programme.
- The Consortium remains available to the Department of Health for consultation/assistance.

ZINC:

Findings

- Nationally, 45.3% of children had an inadequate zinc status and children of this age group (1–9 years) should be considered to be at risk of zinc deficiency.
- Inadequate zinc status was more prevalent among the youngest children and those living in rural formal and urban formal areas.
- Provincially, the Western Cape had the highest prevalence of inadequate zinc status.
- These findings should be interpreted within the context of the sample sizes which appear in the relevant section of the report.

Recommendations

On the basis of these findings, and the current literature[117-131]

- The food fortification programme must continue to be a milestone in the current INP programme while other approaches (education, consumption of zinc rich foods, food diversification, and supplementation) to address the poor zinc status of children should be concurrently strengthened.
- A Panel of Experts should be convened to discuss and comprehensively evaluate the current micronutrient supplementation components of the Nutrition Supplementation Programme in terms of compliance, missed opportunities and the correct implementation of all its components in all provinces. The Panel should also recommend what additional analyses of the data base may be necessary, if any.
- The Panel should also make appropriate recommendations for inclusion in the national nutrition surveillance system as described elsewhere in the report.
- The Panel should further identify a minimum set of the most appropriate indicators for the assessment of zinc status at a national level. A rapid assessment study should be carried out in 2008 using the indicators the Panel identifies. Such a study could also be clinic based as a means of evaluating the current supplementation programme.
- The Panel should assess the feasibility of providing appropriate and comprehensive training to personnel of crèches to administer zinc supplements as well as other micronutrient supplements in older children according to prevailing policies.
- Complementary feeding practices should be re-evaluated and strengthened to ensure adequacy of zinc. At the same time, the supplementary foods that are currently provided

in the Nutrition Supplementation Programme should not simply concentrate only on energy content but also on dietary quality and adequate micronutrient composition.

- Innovative means of communication such as the cell phone should be used to disseminate nutrition education messages. Such a system could also be used for improving the current nutrition supplementation programme.
- The emerging option of community level fortification with zinc should be explored both in terms of feasibility and safety.
- The industry manufacturing premixes should police itself in terms of strict compliance with current legislation and ensure, in collaboration with the millers, that the correct amount of zinc reaches the consumer at the household level.
- The micronutrient component of the INP programme should be strengthened, expanded in expertise and appropriately resourced to address current and urgent issues of the food fortification programme.
- The Consortium remains available to the Department of Health for consultation/assistance.

10. RELATED RECOMMENDATIONS

NUTRITION SURVEILLANCE IN SOUTH AFRICA

Background

The understanding of the role of nutrition in health and the implementation of appropriate policies to improve nutritional status ultimately depends on accurate data and the dissemination of correct information based on such data. The very purpose of a Food and Nutrition Surveillance (FNS) programme is to collect population based information, interpret it and disseminate information on nutrition. Such information must be population based, decision and action oriented, sensitive and accurate, timely, relevant and communicated effectively.

Recommendations

On the basis of the needs that arise from these findings, other related considerations and the current literature[132-140]

- The current efforts on nutrition surveillance in the country should be reassessed, strengthened and formalised. The periodic reviews and surveys of the currently used indicators of nutritional status should be retained and improved.
- A new monitoring FNS unit/centre should be created within the Directorate: Nutrition to collate, disseminate and promote on an on-going basis the use of correct nutrition information on the current nutrition situation in the country.
- The appointment of dedicated personnel who will be responsible for Nutrition Surveillance at all levels (national, provincial, district, municipal) should be afforded top priority. The appointed personnel should have the necessary expertise and skill, and training should be provided where needed and on an on-going basis.
- A Panel of Experts should be convened to discuss and make recommendations on the creation of a national nutrition surveillance system which should be implemented independently or as a greater part of the District Health Information System or the annual General Household Surveys.
- The Panel should also consider the feasibility of annual facility based surveys/assessments of all children and adults who visit such facilities in a time framework that will complement the data obtained from other national surveys.
- The Panel should have wide, but relevant, representation from all sectors, to ensure that data already available from all sectors is collated, interpreted, and appropriate structures are created for the purposes of on-going research to create the necessary/missing knowledge using the most suitable sectors.
- The creation of institutional mechanisms for the dissemination of correct nutrition information in the relevant fields of nutrition should be created.
- The desegregation of nutrition surveillance data should reflect the nutritional status of the vulnerable groups in relation to time and should not only include the lifecycle but also the human rights approach.
- A minimum set of nutrition surveillance data should be created and implemented with the collaboration of all relevant and appropriate sectors.
- A specialised section within the proposed FNS system should be created to manage all aspects of the legislated food fortification programme.
- The INP programme should be strengthened, expanded in expertise and appropriately resourced to address current and urgent issues of the FNS system.
- The Consortium remains available to the Department of Health for consultation/assistance.

HUMAN RESOURCES OF THE INTEGRATED NUTRITION PROGRAMME

Background

The findings of the present survey highlight some of the commendable successes, and disappointing failures, of the current efforts to improve the nutrition situation in the country. Clearly, the policies in place, when correctly implemented, are associated with successful and desirable outcomes. When policies fail they appear to do so because of constraints primarily of the human resource type. The latter need was clearly identified and flagged for urgent attention in the report of the Nutrition Committee to the Minister of Health in 1994 in which the projected human resource needs for the successful implementation of the INP were identified, and norms were even recommended for implementation. Further recommendations that this issue is urgently addressed were made in the NFCS report to the Minister. It is, therefore, regrettable that insufficient progress has been made in this aspect of the INP over the past years, a situation that has hampered progress and the more extensive attainment of planned essential deliverables. The importance of human resources for successful outcomes, which perhaps has been overlooked and at times neglected, has recently been highlighted in the WHO 2006 report. The report is categorical on the "chronic shortage of well-trained health workers. The shortage is global, but most acutely felt in the countries that need them most. For a variety of reasons, such as the migration, illness or death of health workers, countries are unable to educate and sustain the health workforce that would improve people's chances of survival and their well-being". Of course the importance of this complex issue of human resource does not simply refer to "numbers" but equally to the appropriate utilisation and welfare of the available human resource at any one given time. It may, therefore, be seen as unfortunate that there has not been a national audit of the available human resource for nutrition and the utilisation thereof, a need that should be urgently addressed as part of the identified priorities and recommendations in this report.

Recommendations

- The current human resource component of the INP should be retained, assessed and strengthened.
- A national audit of dedicated and supporting nutrition personnel in the country should be undertaken as a matter of urgency.
- The audit should, as a minimum, incorporate the assessment of current staffing levels, nutrition personnel categories, location, placement, qualifications and skills of current staffing and nutrition personnel expenditure in relation to the declared aims and deliverables of the INP.
- A human resource strategy for Nutrition in the public health sector should be formulated, formalised and implemented.
- The INP programme should be strengthened, expanded in expertise and appropriately resourced to address current and urgent issues in human resource requirements.
- The Consortium remains available to the Department of Health for consultation/assistance.

11. GENERAL RECOMMENDATIONS

- Socio-economic upliftment is considered essential for the sustainable reduction of micronutrient deficiencies and undernutrition in general. It is important to note that these particular nutritional disorders, because of their intimate link to socio-economic status and dietary intake, may be used as medium-term indicators in assessing the success of the currently implemented national nutrition programmes.
- In order to achieve a sustainable solution in the reduction of micronutrient deficiencies and other dietary inadequacies, it is essential to develop a comprehensive strategy that will address such issues in the immediate- and medium-term, i.e. until such time that socio-economic upliftment can achieve a sustained reduction. For immediate- and medium-term solutions to be effective, several different aspects of adequate micronutrient intake need to be addressed at a national level, which should include campaigns to:
  - Increase consumer awareness of adequate micronutrient intake.
  - Increase awareness and understanding of the food fortification programme in relation to micronutrient health.
  - Increase awareness of the importance of exclusive breast-feeding up to the age of six months of age and continued breast-feeding with appropriate and safe complementary feeding up to the age of two years or beyond.
  - Use of the Food Based Dietary Guidelines for nutrition education.
- Improve health worker training in respect of stunting as well as healthful eating and food choices including the importance of micronutrients.
- The further analysis of the survey's database should be used for additional capacity building.

- A survey to monitor the progress of the food fortification programme should be planned for implementation in three years from the date of this report.

In summary, this national survey, an extension/continuation of the National Food Consumption Survey (NFCS) in 1999, elicited an overall excellent participation of respondents, and documented the following:

- A significant proportion of the population still lives under adverse socio-economic conditions despite some meaningful improvements in certain such parameters over the past six years.
- An apparent improvement in the anthropometric status (stunting) of children 1–9 years of age (NFCS 1999 comparison).
- The virtual elimination of IDD in the country with urinary iodine concentrations in the excessive range in some areas.
- An adequate folate status in both children and women of child bearing age, which is perhaps the first early indication of the benefits to be accrued from the legislated food fortification programme.
- An apparent deterioration in the vitamin A status of children aged 1–5 years (SAVACG 1994 comparison).
- An apparent deterioration in the iron status of children aged 1–5 years (SAVACG 1994 comparison).
- A high prevalence of poor zinc status among children 1–9 years of age.
- A high prevalence of poor iron and vitamin A status in women of child bearing age.
- A positive knowledge, attitude and behaviour among the respondents towards food fortification.
- The wide purchase and use of fortified products at the household level.
- The confirmation that at the household level, maize does contain vitamin A thus providing an indirect measure of compliance with the Food Fortification legislation.
- The persistence and possible worsening of the prevalence of hunger (NFCS 1999 comparison).

The effect of HIV/AIDS on the parameters measured in this survey is not known, since the survey was not designed to address this relationship and the HIV status of the respondents was not determined or known.

12. IN CONCLUSION

The findings of the present survey build on those of the SAVACG and the previous National Food Consumption Survey in helping to create a better and evidence based environment for the improvement of the nutritional status of the country's population, thus helping to reduce the burden of nutrition related disorders and complications. The Directors of the survey believe that this has been a very successful and much needed survey in both providing baseline data for future reference and also in helping to inform policy makers of areas that need special/urgent attention. The Directors of the survey also wish to express their sincere gratitude to all the subjects who volunteered to participate in the survey as well as to those who made the survey possible and successful. They are so acknowledged in the appropriate Chapters of the report.

REFERENCES

1. The Millennium Development Goals: Report 2006. United Nations. New York. 2006
2. Statistics South Africa. Census 2001: Primary tables South Africa. Census '96 and 2001 compared. Pretoria: Statistics South Africa. 2004. Available [Online} www.statssa.gov.za. Accessed 27/7/2007.
3. Labadarios D. (editor), Steyn NP, Mauner E, MacIntyre U, Swart R, Gericke G, Huskisson J, Dannhauser A, Vorster HH, Nesamvuni AE. The National Food Consumption Survey (NFCS): children aged 1-9 years, South Africa, 1999. Pretoria: Department of Health, 2000. www.sahealthinfo.org/nutrition/nfcs/chapter4. Accessed December 7, 2005.
4. Census '96: Preliminary Estimates of the Size of the Population of South Africa; Central Statistical Services. June1997.
5. Woolard I. Impact of Government programmes using administrative data sets. Social assistance grants. Project 6.2 of the Tender Review Research Programme. 2nd draft. 2003. Available [Online] http://www.sarpn.org.za/documents/d0000946/P1041-Woolard_10year_June2003.pdf. Accessed 27/7/2007
6. Statistics South Africa. General Household Survey 2005. Pretoria: Statistics South Africa. 2006. Available [online] www.statssa.gov.za. Accessed 27/7/2007.
7. Rosa S, Meintjes H. Extending the Child Support Grant to children under 18. Fact sheet – September 2004. Alliance for Children's Entitlement to Social Security. Children's Institute, University of Cape Town. Annual Report 2003 - 2004. Available [Online]. http://www.ci.org.za/depts/ci/pubs/pdf/general/annual/report04/annualrprt04.pdf. Accessed 27/7/2007.
8. Goldblatt D, Rosa S, Hall K. Implementation of the Child Support Grant. A study of four provinces and recommendations for improved service delivery. Children's Institute University of Cape Town and Centre for Applied Legal studies University of Witwatersrand. 2006. Available [Online] http://www.sarpn.org.za/documents/d0001950/Child_support_grant_Jan2006.pdf. Accessed 27/7/2007.
9. Leatt A. Grants for children: A brief look at eligibility and take up of the Child Support Grant and other cash grants. Children's Institute Working paper no.5, University of Cape Town. 2006. Available [Online]. http://ci.org.za/depts/ci/pubs/pdf/poverty/workpap/Grantsfor children.pdf. Accessed 27/7/2007.

10. Department of Health. Immunisation Awareness Campaign 2001. Directorate Nutrition Fact Sheet: Vitamin A. Pretoria. Department of Health. Available [Online] www.doh.gov.za/ . Accessed 27/7/2007.
11. Department of Health. Statistics of clinic-based vitamin A supplementation for 2004. Personal Communication, B. Shikakane. 2007.
12. District Health Information System Database. National Department of Health. Available [Online] http://www.healthlink.org.za/healthstats/227/data. 2006. Accessed 31/08/07.
13. Braa J.; Hedberg C. The Struggle for District-Based Health Information Systems in South Africa. The Information Society, 2002; 18: 113-127.
14. Department of Health. South Africa Demographic and Health Survey, 2003. Department of Health, Medical Research Council, OrcMacro. South Africa Demographic and Health Survey 2003. Pretoria. 2007.
15. Netshitenzhe J. Development indicators mid-term review. The Presidency: Republic of South Africa. Policy Coordination and Advisory Services (PCAS). 2006.
16. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ 2000; 320:1240-1243.
17. Miech RA, Kumanyika SK, Stettler N, et al. Trends in the Association of Poverty With Overweight Among US Adolescents, 1971-2004. JAMA. 2006;295: 2385-2393.
18. Drewnowski A, Specter SE. Poverty and obesity: the role of energy density and energy costs. Am J Clin Nutr 2004; 79: 6–16.
19. Zhang X, ShuX-O, YangG, et al. Abdominal Adiposity and Mortality in Chinese Women. Arch Intern Med. 2007; 167: 886-892.
20. Popkin BM. Global nutrition dynamics: the world is shifting rapidly toward a diet linked with non-communicable diseases. Am J Clin Nutr.2006; 84: 289 –98.
21. Adams TD, Gress RE, Smith SC, et al. Long-Term Mortality after Gastric Bypass Surgery. N Engl J Med 2007; 357: 753-61.
22. Bray GA. The Missing Link: Lose Weight, Live Longer. N Engl J Med 2007; 357: 818-819.
23. Pretorius PJ, Hansen JD, Davel JGA, Brock JF. Skimmed milk and kwashiorkor. S Afr Med J 1956; 33: 447–450.
24. Golden BE, Golden MH. Plasma zinc, rate of weight gain, and the energy cost of tissue deposition on children recovering from severe malnutrition on a cow's milk or soya protein based diets. Am J Clin Nutr 1981; 34: 892–899.
25. Brewster DR, Manary MJ, Menzies IS, et al. Comparison of milk and maize base diets in kwashiorkor. Arch Dis Childhood 1997; 76: 242–248.
26. Rich-Edwards JW, Ganmaa D, Pollack MN, et al. Milk consumption and the prepubertal somatotropic axis. Nutrition Journal 2007, 6:28. doi:10.1186/1475-2891-6-28.
27. Obayashi S, Bianchi IJ, Song WO. Reliability and validity of nutrition knowledge, social-psychological factors, and food label use scales from the 1995 diet and health knowledge survey. J Nutr Educ Behav.2003; 35:83-92.
28. Hannon EM, Kiely M, Flynn A. The impact of voluntary fortification of foods on micronutrient intakes in Irish adults. Br J Nutr. 2007; doi: 101017/S0007114507669207. Accessed 22/07/07.
29. Sanghvi T, Dary O, Houston R. How can vitamin and mineral deficiencies be reduced? Implementing proven interventions at scale. Food Nutr Bull 2007;28: S182-S196.
30. Darnton-Hill I, Nalubola R. Fortification strategies to meet micronutrient needs: successes and failures. Proc Nutr Soc. 2002; 61: 231-241.
31. Fiedler J, Saunders M, Sanghvi T. What are the costs of interventions? Program costs vary by type of intervention, country setting, and methodology. Food Nutr Bull 2007;28; S197-S203.
32. Sanghvi T, Dary O, Houston R. How can vitamin and minral deficiencies be reduced: Implementing proven interventions at scale. Food Nutr Bull 2007; 28(suppl): S182-S196.
33. Orbinski J, Beyrer C, Singh S. Health and Human Rights 4. Violations of human rights: health practitioners as witnesses. Lancet 2007; 370: 698–704.
34. Cohen R, Kim M, Ohls J. Hunger in America, 2006. National report prepared for America's second Harvest. Final report, MPR Reference No.: 6100-500. Mathematica Policy research, Inc. March 2006.
35. Rose D, Charlton KE. Prevalence of household food poverty in South Africa: results from a large, nationally representative survey. Public Health Nutrition 2001; 5: 383-389.
36. De Klerk M, Drimie S, Aliber M, et al. Position Paper: Food Security in South Africa: Key Policy Issues for the Medium Term. Human Sciences Research Council: Integrated Rural and Regional Development. Pretoria. 2004.
37. Davids YD. Poverty in South Africa: Extent of access to food and income. Human Sciences Research Council Review, Volume 4, Number 4. Pretoria. December 2006.
38. Statistics South Africa. General household survey: July 2005. Statistical release P0318. Statistics South Africa, Private Bag X44, Pretoria 0001. 2006.
39. Department of Agriculture. Monthly food security bulletin. Food Security Statistics. Directorate Agricultural statistics. Accessed at http://www.nda.agric.za 25 September. Pretoria. 2007.
40. Rule S, Aird R, Drimie S, et al. Report on survey in Sekhukhune to pilot the development of a food insecurity and vulnerability modelling system (FIVIMS) for South Africa. Unpublished Final Report. Department of Agriculture. Pretoria.2005
41. Schwabe CA. Personal Communication. Human Sciences Research Council: GIS Centre. Pretoria. 2006
42. Harris MJ, Jooste PL, Charlton KE. The use of iodated salt in the manufacturing of processed foods in South Africa: bread and bread premixes, margarine, and flavourants of salty snacks. Internatl J Food Sci Nutr 2003; 54:13-19.
43. Delange F, Lecomte P. Iodine Supplementation: Benefits Outweigh Risks. Drug Safety 2000; 22: 89-95.
44. Kotwal A, Priya R, Qadeerb I. Goitre and Other Iodine Deficiency Disorders: A Systematic Review of Epidemiological Studies to Deconstruct the Complex Web. Arch Med Res 2007; 38: 1-14.

45. Pedersen KM, Laurberg P, Nøhr S, et al. Iodine in drinking water varies by more than 100-fold in Denmark. Importance for iodine content of infant formulas. Eur J Endocrinol 1999; 140 400-403.
46. Pearce EN, Gerber AR, Gootnick DB, et al.Effects of chronic iodine excess in a cohort of long-term American workers in West Africa. J Clinl Endocrinol Metabol 2002; 87: 5499 5502.
47. Zhao J, Wang P, Shang L, et al. Endemic Goitre Associated With High Iodine Intake. Am J Public Health. 2000 90: 1633–1635.
48. Pedersen IB, Knudsen N, Jørgensen T, et al. Large differences in incidences of overt hyper- and hypothyroidism associated with a small difference in iodine intake: A prospective comparative register-based population survey. J Clin Endocrinol Metabol 2002; 87:4462-4469.
49. Jooste PL, Weight MJ, Kriek JA, LouwAJ. Endemic goitre in the absence of iodine deficiency in schoolchildren of the Northern Cape Province of South Africa. Eur J Clin Nutr 1999; 53: 8-12.
50. Zois C, Stavrou I, Kalogera C, et al. High prevalence of autoimmune thyroiditis in schoolchildren after elimination of iodine deficiency in Northwestern Greece. Thyroid. 2003; 13: 485-489.
51. Teng W, Shan Z, Teng X, et al. Effect of Iodine Intake on Thyroid Diseases in China. N Engl J Med 2006; 354: 2783-93.
52. Premawardhana LDKE, Parkes AB, Smyth PPA, et al. Increased prevalence of thyroglobulin antibodies in Sri Lankan schoolgirls - is iodine the cause? Eur J Endocrinol 2000; 143: 185-188.
53. Laurberg P, Pedersen IB, Knudsen N, et al. Environmental iodine intake affects the type of nonmalignant thyroid disease. Thyroid. 2001; 11: 457-469.
54. Nishiyama S, Mikeda T, Toshihisa Okada T, et al. Transient hypothyroidism or persistent hyperthyrotropinemia in neonates born to mothers with excessive iodine intake.Thyroid 2004; 14: 1077-1083.
55. West KP, Jr. Extent of vitamin A deficiency among preschool children and women of reproductive age. J Nutr. 2002; 132(Suppl 9):2857S-2866S.
56. Rahmathullah L, Tielsch JM, Thulasiraj RD, et al. Impact of supplementing newborn infants with vitamin A on early infant mortality: Community based randomized trial in southern India. Brit Med J 2003; 327:254-259.
57. Klemm, R, Harvey P, Palmer A, West, KP, Jr. Gap analysis: Defining the issues for vitamin A. USAID and AED. 2007.
58. Dary O, Mora JO. Food Fortification to Reduce Vitamin A Deficiency: International Vitamin A Consultative Group Recommendations. J Nutr 2002; 132: 2927S-2933S.
59. Arroyave G, Mejia LA, Aguilar JR. The effect of vitamin A fortification of sugar on the serum vitamin A levels of preschool Guatemalan children: a longitudinal evaluation. Am J Clin Nutr 1981; 34: 41-49.
60. Ribaya-Mercado JD, Solomons NW, Medrano Y, et al. Use of the deuterated-retinol-dilution technique to monitor the vitamin A status of Nicaraguan schoolchildren 1 y after initiation of the Nicaraguan national program of sugar fortification with vitamin A. Am J Clin Nutr 2004; 80: 1291-1298.
61. Chavez JF. Enrichment of precooked corn flour and wheat flour in Venezuela: a successful experience. In: Food Fortification to End Micronutrient Malnutrition. State of the Art, pp. 62–65. The Micronutrient Initiative, International Development Research Centre, Ottawa, Canada. 1997.
62. Solon FS, Klemm RDW, Sanchez L, et al. Efficacy of a vitamin A–fortified wheat-flour bun on the vitamin A status of Filipino schoolchildren. Am J Clin Nutr 2000; 72: 738-744.
63. Nesamvuni AE, Vorster HH, Margetts BM, Kruger AM. Fortification of maize meal improved the nutritional status of 1–3-year-old African children. Public Health Nutrition 2005; 8: 461-467.
64. Olson JA. Serum levels of vitamin A and carotenoids as reflectors of nutritional status. J Natl Cancer Inst 1984; 73: 1439-1444.
65. Labadarios D, Van MiddelKoop A. Children aged 6 – 71 months in South Africa, 1994: Their anthropometric, vitamin A, iron and immunisation coverage status. The South African Vitamin A Consultative Group (SAVACG). Isando: Johannesburg. 1995.
66. Faber M, Benade AJS. Nutritional status and dietary practices of 4–24-month-old children from a rural South African community. Public Health Nutrition 1999; 2: 179-185.
67. Coutsoudis A, Maunder EMW, Ross F, et al. WHO multicountry study on improving household food and nutrition security for the vulnerable: South Africa. A qualitative study on food security and caring patterns of vulnerable young children in South Africa. WHO. 2000.
68. Faber M. Complementary foods consumed by 6–12-month-old rural infants in South Africa are inadequate in micronutrients. Public Health Nutrition 2004; 8: 373 381.
69. Randall P. Personal communication. 2007.
70. Randall P. Investigation into various technical aspects of the South African food fortification programme. Technical report. UNICEF. Pretoria. 2005.
71. Idindili B, Masanja H, Urassa H, et al. Randomized controlled safety and efficacy trial of 2 vitamin A supplementation schedules in Tanzanian infants. Am J Clin Nutr 2007; 85:1312 1319.
72. Varma JL, Das S, Sankar R, et al. Community-level micronutrient fortification of a food supplement in India: a controlled trial in preschool children aged 36-66 months. Am J Clin Nutr 2007; 85: 1127 1133.
73. Zimmermann MB, Hurrell RF. Nutritional iron deficiency. Lancet 2007; 370: 511 520.
74. Mannar MGV. Successful food-based programmes, supplementation and fortification. J Pediatr Gastroenterol Nutr 2006: 43:S47–S53.
75. Dary O. Staple food fortification with iron: a multifactorial decision. Nutr Rev 2002; 60: S34 S41.
76. Andang'o PEA, Osendarp SJM, Ayah R, et al. Efficacy of iron-fortified whole maize flour on iron status of schoolchildren in Kenya: a randomised controlled trial. Lancet 2007; 369: 1799 1806.
77. Greiner T. Fortification of processed cereals should be mandatory. Lancet 2007; 369: 1766 1768.
78. Darnton-Hill I, Nalubola R. Fortification strategies to meet micronutrient needs: successes and failures. Proc Nutr Soc 2002; 61: 23 1 241.

79. Hurrell RF. How to ensure adequate iron absorption from iron-fortified foods. Nutr Rev 2002; 60: S7 S15.
80. Naude CE. Fruit and vegetable consumption by South African children, aged 12 to 108 months: A secondary analysis of the National Food Consumption Survey data. Thesis: M Nutrition. University of Stellenbosch. Stellenbosch. South Africa. 2005.
81. Modjadji SEP, Alberts M, Mamabolo RL. Folate and iron status of South African non-pregnant rural women of childbearing age, before and after fortification of foods. S Afr J Clin Nutr 2007; 20 (3) In Press.
82. Hurrell R, Bothwell T, Cook JD, et al. The usefulness of elemental iron for cereal flour fortification: a SUSTAIN Task Force report. Nutr Rev 2002; 60: 391 394.
83. Sun J, Huang J, Li W, et al. Effects of wheat flour fortified with different iron fortificants on iron status and anemia prevalence in iron deficient anemic students in Northern China. Asia Pacific J Clin Nutr 2007: 6: 116-121.
84. Zimmermann MB, Winichagoon P, Gowachirapant S, et al. Comparison of the efficacy of wheat-based snacks fortified with ferrous sulfate, electrolytic iron, or hydrogen-reduced elemental iron: randomized, double-blind, controlled trial in Thai women. Am J Clin Nutr 2005; 82:1276 1282.
85. Menon P, Ruel MT, Loechl CU, et al. Micrornutrient sprinkles reduce anaemia among 9– to 24-mo-old children when delivered through an integrated health and nutrition programme in rural Haiti. J Nutr 2007; 137: 1023-1030.
86. Ahmed F, Khan MR, Akhtaruzzaman M, et al. Efficacy of twice-weekly multiple micronutrient supplementation for improving the hemoglobin and micronutrient status of anemic adolescent schoolgirls in Bangladesh. Am J Clin Nutr 2005; 82: 829-835.
87. Giovannini M, Sala D, Usuelli M, et al. Double-blind, placebo-controlled trial comparing effects of supplementation with two different combinations of micronutrients delivered as sprinkles on growth, anemia, and iron deficiency in Cambodian infants. J Pediatr Gastroenterol Nutr. 2006; 42: 306-312.
88. Sazawal S, Black RE, Ramsan M, et al. Effects of routine prophylactic supplementation with iron and folic acid on admission to hospital and mortality in preschool children in a high malaria transmission setting: community-based, randomized, placebo-controlled trial. Lancet 2006;367: 133-143.
89. Tielsch JM, Khatry S, Stoltzfus R, et al. Effect of routine prophylactic supplementation with iron and folic acid on preschool child mortality in Southern Nepal: community-based, cluster-randomised, placebo-controlled trial. Lancet 2006; 367: 144-152.
90. Ianotti LL, Tielsch JM, Black MM, Black RE. Iron supplementation in early childhood: health benefits and risks. Am J Clin Nutr 2006; 84: 1261-1276.
91. Chaparro CM, Neufeld LM, Alavez GT, et al. Effect of timing of umbilical cord clamping on iron status in Mexican infants: a randomised controlled trial. Lancet 2006; 367: 1997 2004.
92. Weeks A. Umbilical cord clamping after birth: Better not to rush. BMJ 2007; 335: 312-313.
93. Lucock M. Is folic acid the ultimate functional food component for disease prevention? BMJ 2004; 328: 211- 214.
94. Lucock M, Yatesa Z, Glanvillea T, et al. A critical role for B-vitamin nutrition in human developmental and evolutionary biology. Nutr Res 2003; 23: 1463-1475.
95. Bazzano LA, Reynolds K, Holder KN, He H. Effect of Folic Acid Supplementation on Risk of Cardiovascular Diseases: A Meta-analysis of Randomized Controlled Trials. JAMA 2006; 296: 2720-2726.
96. Van Guelpen B, Hultdin J, Johansson I, et al. Folate, vitamin B12, and risk of ischemic and hemorrhagic stroke: a prospective, nested case-referent study of plasma concentrations and dietary intake. Stroke. 2005; 36: 1426-1431.
97. Ulrich CM. Folate and cancer prevention: a closer look at a complex picture. Am J Clin Nutr 2007; 86: 271-273.
98. Ulrich CM, Potter JD. Folate and cancer—timing is everything. JAMA 2007; 297:2408-2409.
99. Lopez-Camelo JS, Orioli IM, da Graca Dutra M, et al. Reduction of birth prevalence rates of neural tube defects after folic acid fortification in Chile. Am J Med Genet A 2005; 135: 120-125.
100. Williams LJ, Mai CT, Edmonds LD, et al. Prevalence of spina bifida and anencephaly during the transition to mandatory folic acid fortification in the United States. Teratology 2002; 66: 33-39.
101. De Wals P, Tairou F, Van Allen MI et al. Reduction in neural-tube defects after folic acid fortification in Canada. New Engl J Med 2007; 357:135-142.
102. Choumenkovitch SF, Jacques PF, Nadeau MR, et al. Folic acid fortification increases red blood cell folate concentrations in the Framingham study. J Nutr 2001; 131: 3277 3280.
103. Ray JG, Vermeulen MJ, Boss SC, Cole DE. Increased red cell folate concentrations in women of reproductive age after Canadian folic acid food fortification. Epidemiology 2002; 13: 238-40.
104. Pfeiffer CM, Johnson CL, Jain RB, et al. Trends in blood folate and vitamin B-12 concentrations in the United States, 1988–2004. Am J Clin Nutr 2007; 86: 718-727.
105. D Bourne. Personal communication. 2007.
106. Cornel MC, Smit DJ, de Jong-van den Berg LT. Folic acid—the scientific debate as a base for public health policy. Reprod Toxicol 2005; 20: 411-415.
107. Eichholzer M, Tonz O, Zimmermann R. Folic acid: A public health challenge. Lancet 2006; 367: 1352-1361.
108. Cole BF, Baron JA, Sandler RS, et al. A randomized trial of folic acid for the prevention of colorectal adenomas. JAMA 2007; 297:2351 2359.
109. Xu X, Gammon MD, Wetmu JG, et al. A functional 19-base pair deletion polymorphism of dihydrofolate reductase (DHFR) and risk of breast cancer in multivitamin users. Am J Clin Nutr 2007; 85: 1098-1102.
110. Ray JG, Vermeulen MJ, Boss Sc, Cole DE. Increased red cell folate concentrations in women of reproductive age after Canadian folic acid food fortification. Epidemiology 2002; 13: 238-40.
111. Quinlivan EP, Gregory JF III. Effect of food fortification on folic acid intake in the United States. Am J Clin Nutr 2003; 77: 221-5.

112. Liu S, West R, Randell E, et al. A comprehensive evaluation of food fortification with folic acid for the primary prevention of neural tube defects. BMC Pregnancy Childbirth 2004; 4: 20 29.
113. Morris MS, Jacques PF, Rosenberg IH, Selhub J. Folate and vitamin B-12 status in relation to anemia, macrocytosis, and cognitive impairment in older Americans in the age of folic acid fortification. Am J Clin Nutr 2007; 85: 193-200.
114. Smith AD. Folic acid fortification: the good, the bad, and the puzzle of vitamin B-12. Am J Clin Nut 2007; 85: 3-5.
115. Wright AJA, Dainty JR, Finglas PM. Folic acid metabolism in human subjects revisited: potential implications for proposed mandatory folic acid fortification in the UK. Br J Nutr 2007; 98: 667 675.
116. Allen LH, Bailey LB, Chavez GF, et al. Recommended levels of folic acid and vitamin B12 fortification: Conclusions. Nutr Rev 2004; 62: S62 S66.
117. Bryce J, Boschi-Pinto C, Shibuya K, et al. WHO estimates of the causes of death in children. Lancet 2005; 365; 1147 1152.
118. International Zinc Nutrition Consultative Group (IZiNCG). Technical Document #1. Assessment of the Risk of Zinc Deficiency in Populations and Options for Its Control. Hotz C, Brown KH. Guest editors. Food and Nutrition Bulletin, 2005; 25(supplement 2); S94 S123.
119. Esrey SA, Feachem RG, Hughes JM. Interventions for the control of diarrhoeal diseases among young children: improving water supplies and excreta disposal facilities. Bull World Health Organ 1985; 63: 757 772.
120. Bhutta ZA, Black RE, Brown KH, et al. Zinc Investigators' Collaborative Group. Prevention of diarrhea and pneumonia by zinc supplementation in children in developing countries: pooled analysis of randomized controlled trials. J Pediatr 1999;135: 689 697.
121. Müller O, Becher H, van Zweeden AB, et al. Effect of zinc supplementation on malaria and other causes of morbidity in West African children: Randomised double blind placebo controlled trial. BMJ 2001; 322:1567-1571.
122. Umeta M, West CE, Haidar J, et al. Zinc supplementation and stunted infants in Ethiopia: a randomised controlled trial. Lancet 2000; 355: 2021-2026.
123. Brooks WA, Yunus M, Santosam M, et al. Zinc for severe pneumonia in very young children: Double blind placebo controlled trial. Lancet 2004; 363: 1683-1688.
124. Sazawal S, Black RE, Ramsan M, et al. Effect of zinc supplementation on mortality in children aged 1-48 months: a community-based randomised placebo-controlled trial. Lancet. 2007; 369: 927-934.
125. James M Tielsch, Subarna K Khatry, Rebecca J Stoltzfus, et al. Effect of daily zinc supplementation on child mortality in southern Nepal: a community-based, cluster randomised, placebo-controlled trial. Lancet 2007; 370: 1230-1239.
126. Smuts CM, Dhansay MA, Faber M, et al. Efficacy of multiple micronutrient supplementation for improving anemia, micronutrient status, and growth in South African infants. J Nutr. 2005; 135: 653S-659S.
127. Oelofse A, Van Raaij JM, Benade AJ, et al. Disadvantaged black and coloured infants in two urban communities in the Western Cape, South Africa differ in micronutrient status. Public Health Nutr. 2002; 5: 289 294.
128. Oelofse A, Van Raaij JM, Benade et al. The effect of a micronutrient-fortified complementary food on micronutrient status, growth and development of 6- to 12-month-old disadvantaged urban South African infants. Int J Food Sci Nutr. 2003; 54: 399-407.
129. Faber M, Kvalsvig JD, Lombard CJ, Benadé AJS. Effect of a fortified maize-meal porridge on anemia, micronutrient status, and motor development of infants. Am. J Clin Nutr 2005; 82: 1032-1039.
130. Brown KH, López de Romaña D, Arsenault JE, Peerson JM, Penny ME. Comparison of the effects of zinc delivered in a fortified food or a liquid supplement on the growth, morbidity, and plasma zinc concentrations of young Peruvian children Am J Clin Nutr 2007; 85: 538 547.
131. Zlotkin S, Arthur P, Schauer C, et al. Home fortification with iron and zinc sprinkles or iron sprinkles alone successfully treats anemia in infants and young children. J Nutr 2003; 133: 1075-1080.
132. Jerome NW, Ricci JA. Food and Nutrition Surveillance: an international overview. Am J Clin Nutr 1997; 65(suppl):1198S-1202S.
133. Department of Health. White paper for the transformation of the health system in South Africa. Chapter 6: Nutrition. http://www.doh.gov.za/search/index.html. Accessed 12 October 2007.
134. Fincham R, Gibson C, Ross F, Zondi M. Development of a Nutrition Surveillance strategy and a plan of action for implementation. Final Report. Department of Health. 1996.
135. Department of Health. The Integrated Nutrition Programme. http://www.doh.gov.za/ search/index.html Accessed 12 October 2007.
136. South African Human Right Commission. Socio-economic rights in South Africa. Brand D, Heyns C. Eds. 2006. http://books.google.com/books, Accessed 12 October 2007.
137. Webb KL, Rutishauser IH, Marks GC, et al. Nutrition surveys or surveilance. Med J Austr 2006; 185: 248-249.
138. World Health Organisation. World Health Report 2006: Working together for Health, World Health Organisation. WHO. Geneva. 2006.
139. Mason J, Hunt J, Parker D, Jonsson U. Studies of Asian and Pacific Economic Issues: Investing in Child Nutrition in Asia Asian Develop Rev 1999; 17: 1-32.
140. Mukantwali C, Maunder EMW, Paterson M, Gibson C. Impact of the special training of community health workers on breastfeeding counselling and support in Kwazulu-Natal. S Afr J Clin Nutr 2006; 19: 29-36.

NCM

National Chamber of Milling
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"The South African Milling Industry supports the Food Fortification Programme in South Africa"

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National Food Consumption Survey-Fortification Baseline (NFCS-FB-I):

The knowledge, attitude, behaviour and procurement regarding fortified foods, a measure of hunger and the anthropometric and selected micronutrient status of children aged 1–9 years and women of child bearing age:

SOUTH AFRICA, 2005

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Chapter 3: General and socio-demographic factors impacting on nutritional status
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