CHAPTER 9:

GENERAL DISCUSSION AND RECOMMENDATIONS

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This national survey was implemented with the specific aims of determining the food consumption patterns in children 1 – 9 years of age, their nutrient intake and anthropometric status as well as of identifying a suitable vehicle(s) for food fortification and providing guidelines for nutrition education in South Africa. The purpose of this chapter is to discuss general issues of importance and highlight certain aspects of the study that could not be presented in the preceding chapters, integrate the key findings of the survey, and make recommendations based on the findings of the survey.

GENERAL

Collaboration

Institutional

To the best of our knowledge, this study has established a precedent, not only because it was the first national assessment of this nature in children of this age group using a national probability sample oversampled for the high risk populations in the country, but also because, from its beginning, it represented a multi-institutional effort. While this in itself is not new in the country, the scale of collaboration (nine Universities) was new and led to both new challenges and new opportunities. The academic institutions that formed the consortium for the survey (hereafter referred to as the Universities Consortium), included in alphabetical order, [the Universities of Cape Town, Orange Free State, Medunsa, Natal, North, Potchefstroom, Pretoria, Stellenbosch (Chair; legal entity for the State Tender) and the Western Cape]. This combination of expertise allowed a number of nutritional aspects to be studied simultaneously. The survey design and management was greatly facilitated by modern Information Technology and was enriched by the different knowledge, insights, commitment and approaches contributed by the

personnel from this large variety of institutions. It is unlikely that the comprehensiveness of the current study could have been matched by any

singular effort and it is to be recorded that, in contemplating future national surveys, the inclusion of institutions from all major areas of the country should be included, since, with state-of-the-art Information Technology, distance- and cost-related considerations can be kept to a minimum. Notably absent from the pool of expertise, however, were communication specialists, social scientists, and food manufacturers. The exclusion of the latter was purely due to the nature of the survey and impossibility of accommodating all related and specific interests. Although some recommendations are made within their areas of expertise, this report, by its nature, can neither be comprehensive nor for that matter exhaustive. Rather, the report aims to provide a basic framework of guidelines and recommendations for further discussion and implementation, which must be preceded by a process of due consultation.

Cooperation between Academia and Health Services

The implementation of the survey was delayed considerably because of the unanimous decision by all role players involved in the survey to await the release of the 1996 Census data on which to base the design and sampling of the survey. This was deemed to be crucially important in view of the population shifts that have been experienced in the country since the 1991 Census. The implementation of the survey was also preceded by and was the outcome of lengthy, but necessary, and comprehensive consultations regarding its aims and design. The South African Vitamin A Consultative Group's (SAVACG) recommendations[1] were taken into account and additional needs were identified regarding the nature of the information necessary for the implementation of a successful food fortification programme in the country. One must, therefore, gratefully acknowledge the input of many local and

international scientists. Nevertheless, when the State Tender specifications were published, they appeared inadequate particularly from the point of view of having a nationally representative sample for the survey. In the extensive

discussions that followed on this matter, the Directorate: Nutrition of the Department of Health is to be thanked and acknowledged for its open mindedness and flexibility in realising the singularly important issues under consideration. The net result of these successful discussions is that South Africa, for the first time, has established a pool of important baseline data in the crucially important field of child nutrition, which can be used as a reference in the days to come. One of the most important implications of the successful outcome of these discussions, however, was that the survey sample size had to be increased almost by one half of the original State Tender design with the attendant cost considerations. The Directorate: Nutrition should also be thanked and acknowledged for its unrelenting support in securing the additional finances for the implementation of this national survey as well for its constant support in many other respects during the implementation of the survey.

For the benefit of those who may be called upon to implement any other such surveys in the future, however, it would be appropriate to include a word of caution. Although the survey was, to its largest extent, funded through the Department of Health, the long funding cycle involved in the reimbursement of funds was one of the crucial sources of unhappiness among all participants in the survey. Whereas one recognises the unquestionable need for the strictest of financial controls, such control measures should not be allowed to jeopardise the success of a given approved undertaking. Indeed, the successful implementation of the present survey would not have been possible had the University of Stellenbosch, the relevant officers of which are

duly acknowledged in this report, not made R 600 000 temporarily available to meet the immediate and daily financial needs for the survey. Thus, accepting the role the Directorate: Nutrition wishes to play in stimulating multidisciplinary

national nutrition research, it is hoped that a much more flexible approach can be negotiated with the department of State Expenditure.

Collaboration between Academia and International Agencies

One must assume that the inherent expertise of the Universities consortium together with the prevailing crucial need for data on which a national policy could be formulated and implemented as well as the strongest possible support of the Directorate: Nutrition of the Department of Health must have indeed been significant factors in gaining the equal support, in alphabetical order, of the MICRONUTRIENT INITIATIVE, MOST (The USAID micronutrient programme), and UNICEF for the survey. In this regard, it is unquestionably correct that their support facilitated the successful completion of the present survey. The additional scientific input of the
MICRONUTRIENT INITIATIVE and UNICEF in the formulation of the proposed recommendations on food fortification, which is duly acknowledged in the relevant section of this Chapter of the report, together with the helpful advice from MOST during the fieldwork phase of the survey were also most welcome.

Research Capacity Building

The survey was so designed and implemented as to allow for this important component of it. This became a subsidiary objective of the survey, firstly, because of the State Tender specifications in this regard, secondly because, irrespective of the outcome of the national survey, an intervention following

the study would need to be monitored and its impact evaluated, and thirdly, it may be anticipated that similar studies at local, regional or national level could follow a successfully completed national survey. The research capacity building achieved during this study included the following:

- Sections of the present survey are being used by two coordinators for the completion of their postgraduate studies at the Masters and Doctoral level. Additionally, a sixth questionnaire, the findings of which have not been presented in this report, on migration patterns was included in the survey to enable one of the directors to complete her postgraduate studies at the doctoral level. All three provided their particular expertise and time to the study at either regional or national levels

- The coordinators, team leaders and fieldworkers employed for the survey were from the local communities. The extensive education in research methods and quality control of field data have provided, on occasions for the first time, exposure to research; well over 150 such persons at various levels in the health services have been so engaged. One can reasonably assume that this exposure has been very useful and will be used for similar such surveys in the future

- The sampling frame, methodologies, instruction tools and the questionnaires developed for the present survey can be used, as appropriate for future studies. In this regard, there has already been an increasing demand for their use by various professionals

- The entire experience of this survey, including the financial, at times exasperating, and managerial difficulties encountered and the solutions

found have undoubtedly enriched the expertise of all those who took part in the survey.

Interpretation of the Results of the Study

All attempts have been made to highlight the limitations specific to the individual methodological instruments and/or data analysis methods. These

have been incorporated in the preceding chapters devoted to the specific aims and objectives of the survey. We believe that the results of this survey are accurate, within the framework of the sampling frame used, at the national and provincial levels. This, however, may not be necessarily so at the local level, especially where the number of observations is small. However, the results for all the specific objectives of the study are sufficiently accurate at the national and provincial level to allow firm recommendations to be made.

In compiling this report, the aims have been to complete it as soon as possible and present it in a way that will be understood by the widest possible readership. For this reason, the statistical analysis of the data has been limited to the most important parameters that the Universities Consortium felt it necessary in relation to the recommendations to be made. Further detailed analysis remains to be completed. However, the results of any further analysis are unlikely to have a major influence on the proposed recommendations. It is also planned that the results of the present survey will be published in peer reviewed scientific journals.

Costs of the Survey

An audited cost analysis of this survey will be made available once outstanding expenses have been paid and outstanding sponsorships have been received. The current cost estimate for the survey is estimated at R 1.84

million, which is far in excess of the original budget made available by the Directorate: Nutrition of the Department of Health. This apparent "discrepancy" should not, however, be seen as an overexpenditure for the following reasons:

- A total of 2894 children have been included in the survey instead of the originally planned 2000 children. The additional costs have not only provided answers to the questions originally set by the State Tender, but have also ensured national and provincial representativity

- The complex nature of the questionnaires did not only require intensive training for obvious reasons, but it also necessitated the creation of additional innovative instruction tools in order to ensure uniformity of training and interpretation of the questions to be asked on the questionnaires. In this regard a video was produced which was used throughout the country

- In order to satisfy the State Tender requirement for emphasis on the high risk areas, the random selection of the sampling frame by the CSS yielded a sample which included some of the most extremely remote areas in most provinces but especially so in KwaZulu/Natal. The obvious attendant additional costs in this regard need not be elaborated upon

- It is most unfortunate that the country was, at the time of the survey, experiencing a heightened wave of crime and violence, which impacted adversely not only at the financial but also at the personal safety level. In this regard security officers had to be hired, some Universities refused to allow their vehicles to be used for the survey, to mention but a few consequences with financial implications. Additionally, female

fieldworkers had to be instructed to visit HHs in pairs because of incidents of intimidation and two incidents of attempted rape. The survey team as a whole survived two attempted hijackings, two attempted rapes and one life-threatening incident that had to be resolved by the police. Unpleasant as it no doubt is to record these specific incidents, the purpose of doing so is to pay tribute to the dedication and commitment of the professionals that took part in this survey. One must also at the same time acknowledge the spontaneous willingness of the inhabitants of all the HHs to participate in the survey, and the honesty with which they answered the questions of the survey. It is this very commitment of the country's people that made the successful completion of this survey possible

- The original State Tender did not include the assessment of the anthropometric status of the children in the survey. However, in view of the essential need to study the anthropometric status of these children in relation to their nutrient intake, such an assessment was included. This survey has, therefore, extended the pool of the SAVACG data on this subject (for children younger than six years of age) to children younger than nine years of age on a national basis

- Also in relation to the original State Tender, the analysis of the nutrient intake of these children was not included but was added as part of the discussions with the Directorate: Nutrition of the Department of Health

- The extent, nature and complexity of the survey data together with the gravity of the recommendations that are to be derived therefrom, necessitated a considerable amount of additional analysis (hence the

size of the report) in order to arrive at the recommendations made with a reasonable degree of certainty, and finally

- On reflection and self-criticism, the daily fee for the coordinators and team leaders on which the directors calculated the original budget of the survey proved to be inadequate to attract professionals with the appropriate background and had to be increased.

Framework for Making Recommendations

Initially, the prime objective of this study was to assess the food consumption patterns in children 1 – 9 years of age in South Africa and to make recommendations for a suitable food vehicle(s) for food fortification. The main recommendations in this report would, therefore, have been primarily concerned with this mandate. However, in view of the many crucial additions made to the original aims and objectives of the survey, the framework of the recommendations has been extended to also include other related issues studied.

In general, the process of making recommendations in the forthcoming sections of this Chapter includes due consideration to international experience on key related findings as they apply to those of the present survey, which is by no means meant to be comprehensive or exhaustive, the necessary steps that need to be considered/taken in addressing problems of an immediate nature as well as, given the survey results, the interventions that appear, in the opinion of all the directors of the present survey and other participating experts, to be the most efficacious and implementable in South Africa. The recommendations proposed should be seen in their totality and not simply as they relate to the individual sections of this Chapter. In view of the interlinking

nature of the findings and for the sake of continuity, unavoidable repetition has been kept to the minimum possible. A summary of all recommendations has also been included in the executive summary to this report.

CHAPTER BASED RECOMMENDATIONS

9.1 Socio-Demographic Factors Impacting on Dietary Intake, Household Food Security and Nutritional Status

Background

A very significant percentage of the country's population still lives under adverse socio-economic conditions. Approximately one out of five households had a father who was unemployed, one out of five households had a mother who was the wage earner, one out of ten mothers had no formal education, one third of the households had a monthly income of between R 100,00 and R 500,00, six out of ten households had their own tap water, four out of ten households had a flush toilet, one out of two households had electricity, and one out of two households had both a working radio and a television set. In terms of maternal education, one out of ten mothers of children of all age groups had no formal education and one out of four mothers had attained primary school or high school education. The provinces with the highest percentage of mothers who had no formal education included the Northern Cape, Mpumalanga and the Northern Province. The education level of the caregivers of the children in the survey was overall lower than that achieved by their mothers.

The important and widely recognised role of socio-economic upliftment in the long-term improvement of nutritional status of individuals and communities at large falls outside the aims and objectives of the present survey and/or scope of this report. Suffice it to say, that it is widely accepted and recognised[2] that the benefits of investment in socio-economic upliftment have a long lag phase before they materialise. In the shorter-term, a number of remedial steps need to be introduced in order to prevent the deterioration of the nutritional status of

children against the prevailing high rates of unemployment and poverty recorded in the present survey.

Crucially important as the creation of employment may be, however, other important factors, which are known to impact on the nutritional status of children, should not be overlooked or underestimated. In this regard, and in relation to the level of education of mothers/caregivers, instilling an appropriate attitude and behaviour towards the care of children would also appear to be of considerable importance. In a recent study in rural Chad[3], caregiver behaviour (child feeding practices, level of satisfaction with life, willingness to seek advice during episodes of child illnesses, level of help with domestic task) was associated with stunting. This was the case even after controlling for such socio-economic variables as the amount of harvested cereals, the sources of HH income and the HH being monogamous. Furthermore, it has recently been reported[4] that poor maternal schooling was the most consistent constraint for appropriate child feeding, health seeking and hygiene in relation to good child care practices in Accra, Ghana. Socio-economic upliftment should, therefore, not been seen in isolation but rather in its wider context in relation to quality care and nutritional status.

In terms of income generation that enables consumption, the concept[5] of “social capital” is receiving increasing attention in recent years. Distinct from the physical, human and financial capital, which are long recognised as essential for income generation that enables consumption, “social capital”, in its many definitions and components, consists of an individual’s extent of networking with other people (both within and outside the family unit) and his/her participation in civic activities as well as community activities and other groups such as religious, credit and savings or social groups. Two recent studies[6,7] have shown that “social capital” impacts positively and significantly

at the rate of economic growth, and that, at the HH level and after controlling for many other factors, it increases HH level consumption in rural Tanzania. While this concept in relation to consumption will no doubt be more refined in

the coming years, it nevertheless holds the promise of overcoming isolation and of developing into an additional coping skill that may be of value to the vulnerable sections of the population in particular.

Against this background, the directors of the present survey offer their commitment to assist, as appropriate, in the implementation of the following recommendations and related future developments:

Recommendations

9.1.1 Government should accelerate and expand its current policies and programmes on job creation. This is seen as one of the most crucial recommendations in this report, which must be afforded the greatest priority

9.1.2 The Welfare Department should consider immediate steps in increasing the income for the low income HHs in the country, especially in the rural areas and particularly on commercial farms. This could be achieved in close consultation with farmers and take the form of income generation activities rather than “hand outs”. The latter, however, should be considered, at least in the short-term, as part of any such programme in order to achieve a measure of immediate relief. Due consideration should for instance been given to making special loans available to these groups or to developing the social capital aspects related to increased economic growth and consumption

9.1.3 Social security programmes aimed at female headed HHs should be developed, which should incorporate nutrition education and development

9.1.4 Families, but particularly mothers/caregivers and grandparents, should be targeted for any relief and education programmes. Particular emphasis should be placed on the education and empowerment of women

9.1.5 The radio should primarily be used, together with television, for disseminating information on expanded/new relief programmes and nutrition education as well as quality child care programmes

9.1.6 The achievement of these aims should be addressed within the current framework of the Integrated Nutrition Programme (INP) of the Directorate: Nutrition[8]. The Directorate should also re-evaluate its current programmes on development in terms of definition and goals in relation to its core business of nutrition and expertise.

9.2 Antropometric Status

Background

At the national level, stunting remains by far the most common nutritional disorder affecting nearly one out of five children, especially among younger (1 – 3 year old age group) children. On commercial farms, this disorder affects nearly one out of three children, whereas one out of four such children are similarly affected in, collectively, the rural areas as well as in informal urban areas. In terms of other anthropometric parameters, one out of ten children was underweight and one out of twenty was wasted, with a similar rural/urban

distribution. By contrast, the prevalence of overweight was higher in the urban areas, especially among children of mothers/caregivers, who were better educated. Provincially, the prevalence of stunting was the highest in the Northern Cape, the Free State and Mpumalanga, followed by the North West, Northern Province and the Eastern Cape. Overall, the percentage of children

with stunting, underweight and with wasting was consistently higher in all age groups in rural as compared with those living in urban areas, whereas the reverse pattern was found for overweight children.

It is estimated that, in the developing world, approximately 40% of children under the age of five years are stunted and, in unison with the findings of the present survey, this nutritional disorder usually occurs before the age of three years[9,10]. The consequences of stunting in terms of increased risk of delayed motor and mental development as well as of morbidity and mortality are widely accepted as being considerable and significant[9,11]. Stunted children usually become stunted adults with attendant decreased work capacity. Regarding the causes and mechanisms of growth retardation, it is widely accepted that nutrient intake (macro- and micronutrients as well as food safety), maternal-infant interaction (prenatal maternal nutritional status and maternal-child bonding) and infections are of critical importance[11].

Of the macronutrients, energy and protein deficits have been accepted as the major causes of stunting[12-15]. Although it would be inappropriate to revisit in this report the protein fiasco debate[16] of the 70's and 80's, it is important, in the South African context, to emphasise that the current policy in the country of placing almost exclusive emphasis on energy may be misguided and detrimental to reversing stunting. Importantly, what is often overlooked in such an approach is the quality of dietary protein. In this regard, although protein of

plant origin is cheaper and easier to access, it has nevertheless been shown[17] to be less effective in reversing malnutrition after controlling for energy intake. Furthermore, recent findings[18] in Malawi have again highlighted the importance of dietary protein quality in the sense that high quality dietary protein in the form of milk was shown to be superior to a maize based diet in the treatment of severe malnutrition in terms of mortality, weight gain, sepsis

and improvements in gastrointestinal permeability. Certainly, the correlations obtained in the present survey between anthropometric status and the consumption of foods of animal origin and specifically dairy products is supportive of the past and current findings in the literature and should be incorporated in the current framework of the INP[8]. Moreover, earlier data specific to the South African population[19] regarding the importance of dietary quality in the treatment of malnutrition should be incorporated in the current INP policy. It should, however, be made clear that the purpose of this discussion is not to decry the importance of energy as a cause of stunting, since in some populations[20] a low protein intake is not associated with delayed growth. On the contrary, the purpose of this discussion is rather to highlight the need, in relation to the findings of the present survey, for reassessment of current policies and to plea for an all-inclusive, purpose specific policy that takes into account the available scientific evidence in its totality.

In terms of micronutrient deficiencies in relation to stunting, it is increasingly being realised that such deficiencies are also of crucial importance as one of its causes, a realisation that has led to a number of intervention studies[20]. However, in interpreting these, the basic and fundamental principle of nutrition should be borne in mind, namely that an inadequate/poor diet is more likely to be deficient in multiple rather than single micronutrients, as the findings of the

present survey amply demonstrate. Recent evidence[21] would also appear to support this concept. A multi-micronutrient supplement designed to improve the intake of micronutrients known to be deficient in the diet of children younger than five years of age in Mexico and administered over a twelve-month period in a randomised, longitudinal, placebo controlled design, was associated with an additional growth increment of 1 cm in children of medium to low socio-economic status receiving the supplements, when compared with

placebo. The authors go on to point out that stunting, in most cases, is associated with marginal multi-micronutrient deficiencies, and that in such populations the effect of supplementation with single micronutrients on linear growth would not be significant. Also importantly, the multi-micronutrient supplement had no effect on the growth of children of higher socio-economic status, thus underscoring the importance of targeting. In addition, the actual increment in height in the supplemented children was less than the expected potential increment, thus underscoring the importance of the need for a comprehensive nutritional approach in reversing stunting, at least at the early stage in the growth of children. In relation to the latter, the current widely recommended practice in the country of increasing the energy content of a meal by the simple addition of energy dense foods, which are practically devoid of key micronutrients, such as oil or fat, should be urgently reviewed. This practice, in the absence of micronutrient supplements, “dilutes” the micronutrient content of a given meal, since the requirements of certain micronutrients are related to energy intake[22].

With regard to the overnutrition aspects of malnutrition, the findings of the present survey are similar to those reported by the SAVACG survey[1] in 1995. At best, however, these findings should be considered as an underestimate in view of the planned over-sampling for the high-risk, low socio-economic status

population groups in the survey. Of interest, the prevalence of overweight was the highest among children living in urban areas and whose mothers were better educated. These findings, interesting as they are, depict the diversity of the nutritional disorders found among children in the country and are, to a major extent, related to urbanisation and the nutrition transition the country is experiencing[23], an experience common to many developing countries[24]. Apart from the many and difficult challenges that it brings with it in terms of addressing priorities, it will be most unwise to overlook its looming importance,

especially within the South African context of a high prevalence of stunting as found in the present survey. In this regard, recent evidence[25,26] would appear to indicate that stunted children are up to seven times more likely to become obese adults, when compared with children who had normal growth patterns in their childhood. Any policy, therefore, whenever possible and/or appropriate should incorporate key aspects of the health implications of overweight in general and in children in particular.

Against this background, the directors of the present survey offer their commitment to assist, as appropriate, in the implementation of the following recommendations and related future developments:

Recommendations

9.2.1 Stunting should be addressed within the current framework of the INP[8], which is based on an integrated nutrition strategy for South Africa. It is also strongly recommended that the Directorate: Nutrition is provided with the necessary additional and needed resources to attain the aims and objectives of the INP

9.2.2 The findings of the present survey clearly identify the younger child (1 - 3 years of age), as a prime target group for intensified nutritional intervention, and the mother/caregiver for nutrition promotion (i.e. facilitation of healthy feeding practices including complementary feeding, quality child care and decision making) as well as education. At present, both these aims should be concurrently achieved within the existing health facility-based and community-based nutrition programmes

9.2.3 The supplementary foods that are provided with on-going programmes should be re-evaluated/modified and should not simply concentrate on energy content but also on dietary quality and micronutrient composition. The provision of supplementary foods is seen as an interim, but essential measure, in view of the extent of the prevailing poverty and food insecurity. In the longer-term, the need for continued supplementary feeding should be seen an alternative to socio-economic development

9.2.4 The correct management of infectious diseases, especially diarrhoea and HIV/AIDS should form an integral part of any such supplementary feeding programmes

9.2.5 In terms of priorities, all children with anthropometric parameters that fall below -2SDs or exceed +2SDs should be targeted according to prevalence and prevailing provincial priorities

9.2.6 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 provinces, which have a high prevalence of stunting. These facilities should provide quality food, care and education, and could be linked to income generation projects

9.2.7 Similarly, the creation of health facility-based rehabilitation centres should be accelerated for the intensive treatment, supervision and follow-up of severely malnourished children

9.2.8 Mothers/caregivers should be educated according to the prevailing needs of their environment. Both aspects of malnutrition, namely under- and over-nutrition, as well as the importance of micronutrients in child growth should form part of any education programme. In particular, the mothers/caregivers of malnourished children, apart from being educated, should also concurrently have access to and engage in income generating programmes. Additionally, they should be trained in the rehabilitation of their children as home-based rehabilitation is considered to be more cost-effective than facility-based rehabilitation

9.2.9 The Directorate: Nutrition should engage both universities and research organisations to conduct research on the monitoring and evaluation of any such schemes that are implemented. In this regard, particular attention should be given to the long-term benefits afforded to children by such schemes

9.2.10 The Directorate: Nutrition should establish a Consultative Group, such as the National Food Consumption Survey Group, specifically mandated to monitor growth as well as the prevention, identification and treatment of malnutrition

9.2.11 An anthropometric assessment of children in the age range of the present survey should be repeated in three/five years with a view to assessing progress achieved

9.2.12 In terms of nutrition surveillance, the Directorate: Nutrition should reassess/re-evaluate the parameters currently monitored since these do not include those that reflect progress in the commonest nutritional disorder in the country, stunting. Repeated assertions that such measures are difficult to implement are largely based on personal attitudes and the limitations of proposed international policies, which may be inappropriate in relation to the specific needs of the country. Initially, this should be introduced gradually and selectively for children living in the high risk areas as identified by the present survey

9.2.13 The findings of the present survey should be disseminated as soon as possible to all health workers and regional staff.

9.3 Nutrient Intake (24-H-RQ and QFFQ)

Background

This is the first ever survey, which provides estimates on food consumption and the contribution various foods make to the nutrient intake of children age 1 – 9 years using a nationally representative sample. The pattern of the nutrient intake of children as obtained by the two dietary methodologies employed in the present survey was largely similar and indicated that, in

general, at least one out of three children had a nutrient intake of approximately less than half of the recommended level for a number of important nutrients. Indeed, the great majority of children consumed a diet deficient in energy and of poor nutrient density to meet their micronutrient requirements. The nutrient intake of children living in rural and informal urban areas was poorer than that of children living in the urban areas. For South African children as a whole, the average dietary intake of energy, calcium, iron, zinc, selenium, vitamin A, vitamin D, vitamin C, vitamin E, riboflavin, niacin and vitamin B_6 was less than 67% of the Recommended Dietary Allowances (RDAs).

As is invariably the case in the literature[27,28], the QFFQ gave overall a higher mean nutrient intake than the 24-H-RQ. This most probably reflects the inherent differences between the two methodologies and the different time

frames, which the two methodologies addressed, 3 months and one day respectively. It should also be borne in mind that the two methodologies were selected for the purpose of affording greater strength to the dietary data, an aim that was largely achieved, since the patterns at least in nutrient intake that emerged from the two methodologies were largely supportive of each other. Thus, although the absolute values of nutrient intake may differ by between 10% and at times 20%, there can be little doubt on the basis of the similarity of the data obtained from the two methodologies that the diet of the great majority of these children is monotonous and it lacks decidedly in energy and multiple micronutrients.

Food consumption and nutrient intake has been and remains the subject of intense research over the last decade not only because of their importance in children’s growth but also because of the increasing realisation that eating

habits at an early stage in life may be important determinants in the prevention of the so called chronic degenerative diseases[29,30]. The findings of the present survey should, therefore, be seen from the immediate need of improving food and nutrient intake of the country's children and additionally from the longer-term aim of disease prevention. Globally, concerns about what children eat range from high intakes in fat and particularly saturated fat as well as obesity in the developed world[31] to the emerging concept of generalised undernutrition, a concept encompassing multiple nutritional deficiencies[32], in the developing world[20]. With respect to the later, a diet lacking in variety and inadequate in energy and multiple micronutrients in relation to socio-economic status has recently been reported from as far afield as Mexico[33] and China[34]. Within the African context, energy intake and micronutrient status has been reported to be influenced by dietary intake, socio-economic status and morbidity[35], and to be related to maternal intake[36]. Within the South African context, the findings of the present survey not only

confirm those obtained from small-scale regional studies[37], but also extend their relevance in terms of national estimates and food consumption patterns.

In terms of meal patterns, it was encouraging that the great majority (almost 90%) of children nationally ate breakfast. Although a more detailed analysis of the data is necessary in terms of frequency and quality of food eaten for breakfast, this meal of the day is considered to be of increasing importance in meeting daily nutrient requirements especially those of children. Indeed, available evidence indicates that children who do not consume breakfast are less likely to meet their daily nutrient needs, have a higher intake of fat and a poorer micronutrient status[38-41]. Also encouraging was the finding that the greatest majority of children of all ages (87%) across the country shared the family's main meal. In this regard, children and adolescents who eat dinner

with their families have been reported to consume a healthier dietary pattern and nutrient intake, which includes more fruits and vegetables as well as more fibre and micronutrients[42]. By contrast and of concern is the significant number of children who do not consume in-between meals, one out of three children nationally, as well as the number of children who do not have three meals a day in some Provinces (at least one out of seven children), a pattern that needs to be addressed and corrected. Furthermore, and in relation to the children that ate at school or at a crèche, although the data needs to be analysed further, attention needs to be paid to the types of foods included in the menus not only from the nutritional quality point of view but also from the point of view of the likes and dislikes of children. The importance of the latter is underscored by reports[43] that children who receive lunch at school eat virtually all of what they like “a lot”, approximately half of what they like “a little” and nothing of what they do not like “at all”. Finally on meal patterns, it is also of great concern that the findings of the present survey confirm those of the previous national survey[1], namely a trend for younger children to be breastfed

for shorter periods of time, notwithstanding the retrospective nature of the present survey’s data on this issue. Although the shorter duration of breastfeeding may be a reflection of the effects of urbanisation, which is known to be associated with decreased prevalence of breastfeeding practices[44], it nevertheless remains a concern that needs to be urgently addressed.

The consequences of poor dietary variety together with an inadequate energy intake and micronutrient deficiencies in terms of children’s growth and development have been extensively debated and estimated to be significant, especially early in life[45- 50]. The totality of the available evidence in relation to the findings of the present survey leaves little doubt that South African

children are significantly disadvantaged and in urgent need of additional attention, if they are to reach their full developmental potential. Whereas it is appreciated that radical change in the nutritional status of the country's children can only be achieved by long-term socio-economic development, a number of interim alternatives are known to impact positively on children's health. For instance, a recent intervention in Indonesia[51] in the form of milk (condensed) and a micronutrient supplement (calcium, iron, zinc, vitamins A, C and thiamin) administered to 12 and 18 months old children for a year had a measurable and significant beneficial impact on their energy intake, anthropometric status, skeletal maturation, motor development and motor activity[52-55].

Against this background, the directors of the present survey offer their commitment to assist, as appropriate, in the implementation of the following recommendations and related future developments:

Recommendations

9.3.1 The need to improve the dietary and nutrient intake of children should be addressed within the current framework of the INP[8], which is based on an integrated nutrition strategy for South Africa. It is also strongly recommended that the Directorate: Nutrition is provided with the necessary additional and needed resources to attain the aims and objectives of the INP

9.3.2 Food fortification is a trusted and tested solution to improve the micronutrient status of children and the population at large and should be implemented the soonest possible

9.3.3 The current menus of the Primary School Nutrition Programme, the PEM scheme as well as those of crèches should be reviewed with a view to improving dietary variety and the quality of the foods used

9.3.4 The data of the present survey should be used for the purpose of targeting families for, in the short term at least, supplementing the diet of preschool children. Specific weaning foods should be made available to high risk families with young children

9.3.5 The introduction of a comprehensive nutrition education programme, which together with socio-economic development will impart practical knowledge and sustainable means of improving dietary intake and quality of life, is considered mandatory. It is also recommended that additional finance is made available for this purpose

9.3.6 Nutrition education messages must be tailored to the currently prevailing consumption patterns and the desired changes therein, including the improvement of the nutrient density of children's diets as well as food hygiene and feeding practices, and, when appropriate, home grown crops, and the use of foods of animal origin from domestic animal production

9.3.7 The creation of childcare (day care) and preschool facilities for children in poor areas as well as at the workplace is strongly recommended. These facilities should provide quality food, care and education, especially to children with working mothers in the rural areas and high risk peri-urban areas of the country

9.3.8 The key findings of this survey need to be widely disseminated to the public and health care workers in order to increase awareness of the level and the nature of food and micronutrient insecurity together with its effect on health and well being of individuals and the economic, educational and health care costs to the nation

9.3.9 Within the framework of health care services exclusive breastfeeding for 4-6 months should be promoted and implemented. Furthermore, the introduction of complementary feeding together with breastfeeding for up to two years should form the corner stone in the nutrition of young children. The factors responsible for the documented tendency for younger children to be breastfed for periods shorter than three months should be identified and addressed. In South Africa, these goals should be achieved in close partnership with all relevant role players and with due consideration to and respect for the choice of an informed mother regarding the feeding of her child. The prevalence of exclusive breastfeeding for 4-6 months in the country is largely unknown and should be defined. Breastfeeding practices, including exclusive breastfeeding, should form part of the national surveillance system in order to monitor progress and take corrective steps as appropriate

9.3.10 Food consumption surveys of the nature of the present survey should be repeated every three/five years and be extended to cover the whole population for the purpose of establishing baseline data and for monitoring and evaluation.

9.4 Food Procurement and Hunger

Background

The different methodologies employed in the present survey are substantially supportive of maize and sugar being the two most frequently and consistently consumed foods in the country, followed by tea, whole milk, brown bread, rice and margarine. It is equally important to note that these same six items were also the ones that were found most frequently in the house. Furthermore, most HHs procured these items by purchasing them and subsistence agriculture was not a major source of these foods in the country. These items were primarily bought in supermarkets and to a much lesser extent in small shops. HH income would appear to be a decisive factor in the consumption and procurement of foods. In this regard and at the national level, one out of two HHs experienced hunger, one out of four were at risk of hunger and only one out of four HHs appeared food secure. In the rural areas a significantly higher percentage of HHs experienced hunger when compared with HHs in the urban areas. There was an overall consistent association between the hunger risk classification and anthropometric status as well as food procurement, the number of foods in the HHs and the dietary intake of energy and micronutrients.

These findings are in line with similar findings reported from a rural population in the U.S.A[56] in which the HH availability of all food items including fruits and vegetables decreased significantly with increasing levels of food insecurity to

the extent that a large percentage of that population consumed a diet that was inadequate in meeting the recommended levels of intake for a number of micronutrients as well as energy. Furthermore, urban/rural differences in consumption patterns and nutrient intake have recently been reported in South Africa[23] and a number of other countries[25,57]. Nevertheless, it should be borne in mind that an individual's actual food behaviour and consumption is the outcome of a complex relationship, which reflects interactions among

individuals, their values and culture as well as the society they live in[58]. These considerations are of paramount importance, since despite the reported strong relationship between hunger and income in relation to dietary inadequacies, it is known that many HHs with incomes above the poverty line still experience hunger[59]. In view of the crucially important consequences for the HH and much broader social implications of food insecurity[60], the data of the present survey need to be analysed more extensively in order to elucidate underlying causes and, in any case, the relationship needs to be better defined within the South African context.

Against this background, the directors of the present survey offer their commitment to assist, as appropriate, in the implementation of the following recommendations and related future developments:

Recommendations

9.4.1 Food and micronutrient insecurity should be addressed within the current framework of the INP[8], which is based on an integrated nutrition strategy for South Africa. It is also strongly recommended that the Directorate: Nutrition is provided with the necessary additional and needed resources to attain the aims and objectives of the INP

9.4.2 The creation of employment opportunities should rank among the highest priorities of the government

9.4.3 The data of the present survey should be analysed more extensively with a view to identifying parameters which can be used to target HHs at the highest level of food insecurity

9.4.4 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

9.5 Food Fortification

Background

More than 80 years of experience in a number of developed and developing countries indicates that fortification of commonly consumed foods offers an opportunity to substantially reduce, or even eliminate, the prevalence of vitamin and mineral deficiencies safely and cost-effectively[61]. The food fortification concept was developed in the early part of this century as a means of addressing mineral and vitamin deficiency diseases at the time prevalent in Europe and North America. In the first decades of the 20th century, fortification of margarine with vitamin A played a role in decreasing the prevalence of xerophthalmia in Northern Europe. At the same time, widespread iodisation of salt in Europe and North America in the 1920s all but eliminated goitre and other signs of iodine deficiency disorders. In the United States[62], fortification of flour with niacin coincided with a drop in deaths from pellagra to negligible levels (Figure 9.1). In Newfoundland, Canada, four years after fortification of flour with thiamin and riboflavin the prevalence of deficiency of these nutrients virtually disappeared[63] (Figure 9.2). More recently[64], in Venezuela, two years after implementing fortification of wheat and corn flours with iron in 1992, anaemia levels among children in Caracas decreased by more than 50% (Figure 9.3). In Central America[65], fortification of sugar with vitamin A has virtually eliminated this deficiency as a public health problem.

Figure 9.1 Deaths from niacin deficiency in the U.S.A.

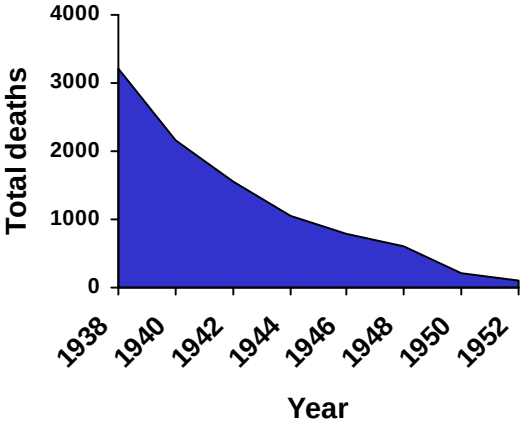


Figure 9.2 The prevalence of thiamin and riboflavin deficiency prior to and following food fortification in Newfoundland, Canada: 1944 - 1948

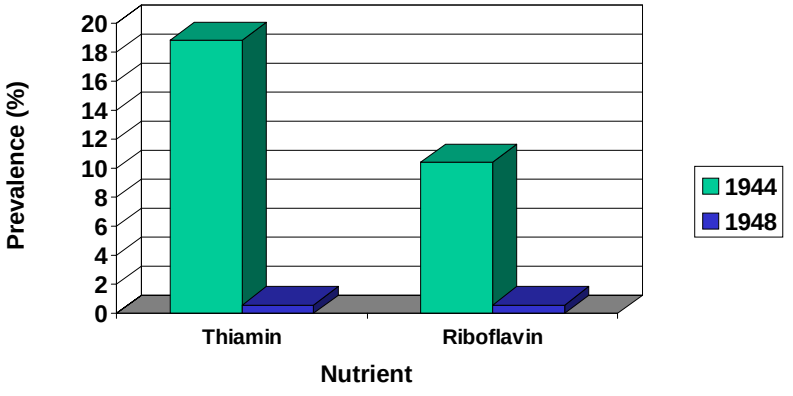
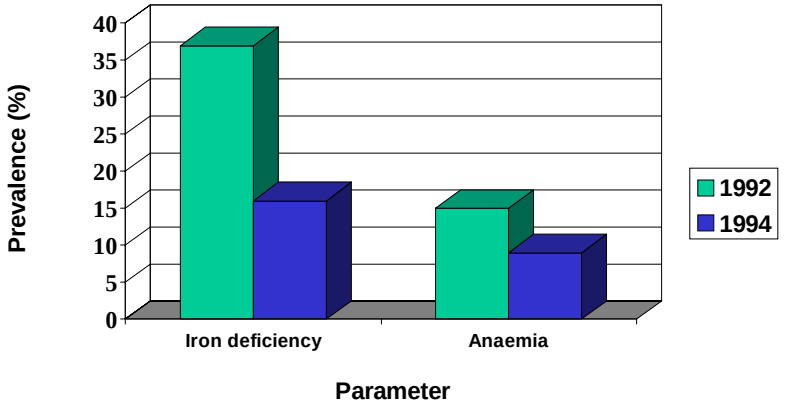


Figure 9.3 The prevalence of iron deficiency and anaemia prior to and following food fortification in Caracas, Venezuela



It should be pointed out, however, that in the improvement of the nutritional status of populations, food fortification is only one of the many strategies necessary to achieve this goal, and that food fortification is to some extent confounded by a number of variables and temporal trends. Nevertheless, the available evidence is strongly supportive of the temporal association between the implementation of food fortification and a decline in micronutrient deficiency states. It should, however, be borne in mind, that teaching the population at large to eat correctly and increase their consumption of fruits and vegetables, difficult as this may be, is accepted as being the best long-term solution to micronutrient deficiencies[61].

It is also important to point out that, contrary to previous beliefs, food fortification is not only for the benefit of populations with a poor dietary intake, but also for the benefit of populations at large. In this regard, it is being increasingly realised that the dietary intake of micronutrients for the prevention of the traditional deficiency states may be entirely different from that necessary for the prevention of the so-called chronic degenerative diseases[66]. For instance, blood levels of homocysteine, an independent risk factor for cardiovascular disease is known to be dependent on the folic acid, vitamin B_6 and vitamin B_{12} status of an individual[67,68]. Furthermore, recent evidence suggests that an increased intake of folic acid may be important in the prevention of neural tube defects[69], to mention but a few examples. Within the South African context, therefore, and in relation to the wide spectrum of nutritional disorders associated with the developing and developed world, food fortification should be seen as a strategy that is likely to deliver potential benefits to the whole population in the country, not just to the disadvantaged ones.

A key consideration to success of any food fortification programme is the identification of an appropriate food vehicle(s). The consumption of such a food(s) must be in a sufficient quantity, widespread, and must reach the great majority of a population, but especially those at the highest risk of having an inadequate intake. Briefly, a number of technical criteria determine whether an added fortificant remains stable or bioavailable during manufacture, distribution, and food preparation. Furthermore, there are issues regarding the ability of the related industry to fortify in a quality assured, safe and cost-effective manner. This includes industry centralisation, technical sophistication, availability of financial resources and a number of market related factors, which make it possible to pass the small incremental costs of fortification on to the consumer. With regard to the findings of the present survey, the four different methodologies employed are substantially supportive of maize and sugar being the two most frequently and consistently consumed foods in the country, followed by tea, whole milk, brown bread, rice and margarine. It is equally important to note that these same six items were also the ones that were found most frequently in the house. Furthermore, most HHs procured these items by purchasing them and subsistence agriculture was not a major source of these foods in the country. These items were primarily bought in supermarkets and to a much lesser extent in small shops. HH income would appear to have been a decisive factor in the consumption and procurement of foods. The six most commonly consumed foods in the country as defined by the present survey are also those known to have a history of successful fortification (Table 9.1), are known to have passed through some relatively central processing industry, and are, therefore, theoretically available for fortification. In order to determine how much of the child's consumption is theoretically available for fortification, the reported daily

consumption based on the 24-H-RQ is multiplied by the proportion of the particular food, which was not home grown or home processed (Table 9.1).

Table 9.1 Average daily intake of children consuming potential food fortification vehicle(s)#

Food	1 - 3 years	7 - 9 years	Not home grown	Maximum available for fortification	
	g/day		%	g/day	
Fats/Margarine	10	16	99.6	10	16
White sugar	19	23	99	19	23
White bread*	41	74	98	40	72.5
Brown bread*	52	86	98	51	84
Whole milk	176	145	93	164	135
Maize*	164	200	96	157	186

* Conversion factors are needed to convert reported consumption to actual flour or maize meal. Conversion from figures reported in the survey are as follows: Dry maize to wet porridge at 250%; White bread to Flour at 64%; Brown bread to Flour at 68%

The amounts used in this Table are based solely on the 24-H-RQ, which was considered to be a preferable indicator for this specific purpose

The level of addition of vitamins and minerals to the food(s) to be fortified must be high enough to make a significant contribution towards the requirements of those most in need, after accounting for losses in processing, storage, distribution and preparation. Those at the highest risk of an inadequate intake are invariably the poor, who also typically purchase less in terms of quantity and variety. Conversely, the chosen fortification level cannot be either so high as to change the organoleptic character of the food product or add an inordinate incremental cost, or provide too high an intake for those who consume larger amounts of a given food or include a wider dietary variety in their diets. For a number of reasons, when deciding on a level of food fortification, the tracking of the impact of vitamin A provides a convenient

indicator of the potential of a food vehicle to deliver vitamins and minerals efficaciously and safely. This is because of the following reasons:

- While relatively stable, vitamin A represents a worst case retention scenario for some foods. Its retention varies from 50% - 80% depending on the vehicle and its characteristic storage and food preparation (Table 9.2)

- Since vitamin A has been used in a variety of staple foods, focusing on it allows for a comparison across a wide range of food vehicles (Table 9.2)

- Because of its significant impact on child mortality, vitamin A is of particular interest to both policymakers and public health professionals, and

- Vitamin A is the most expensive fortificant and, therefore, of most interest to industry and consumers. Hence the stability of vitamin A in staple foods common in Africa is based on experience gained from a number of countries (Table 9.2).

Based on these stability assumptions and international experience, one could assume that the level of maize meal and wheat flour fortification for South Africa could theoretically be selected to be at 33% of the current RDA (Table 9.3) per standard 200g serving, after allowing for losses during production, distribution and preparation.

If all the potential food vehicles found to be commonly consumed by children in the present survey were to be fortified, a significant beneficial impact could be expected, since each food could provide from 1/5th to 2/3rd of RDA at the reported levels of consumption (Table 9.4). However, when considering costs,

legislated and mandatory fortification standards to achieve public health goals as well as other practical issues, a more thorough evaluation and analysis in terms of a smaller range of foods to be fortified needs to be considered. In this regard, not all children included in the survey consumed all the indicated foods (Table 9.5). For all age groups, the most frequently consumed products were maize and sugar. Maize meal was consumed respectively by 81% and 71% of children aged 1 – 3 and 7 - 9 years.

Table 9.2 Presumed stability of vitamins and minerals in food fortification vehicle(s) (%)

Nutrient	Maize[1]	Wheat[2]	Sugar[3]	Fats/Marg[4]	Milk[4]
Thiamin	80	90			
Riboflavin	80	90			
Niacin	80	95			
Folic Acid	50	70			
Vitamin B_6	70	80			
Vitamin A	60	80	50	80	70
Iron	100	100			
Zinc	100	100			

1. Maize porridge stability based on boiling for 60 minutes in tests by Roche and SGS in South Africa
2. Wheat flour/bread stability for vitamin A based on tests on *pan de sal* conducted at the Nutrition Centre for the Philippines. All other vitamin stability data are based on the *Provisional Table on Percent Retention of Nutrients in Food Preparation,* Garsland, S.L., USDA Nutrient Data Research Branch, April, 1984
3. Sugar stability is based on the guidelines in Guatemala stipulating 1/3rd added vitamin A is present after one year of storage. Since some vitamin A is consumed prior to one year, 50% retention is estimated
4. Margarine and milk stability is based on USDA data and tests done by Procter and Gamble on the shelf stability of vitamin A fortified margarine marketed in the Philippines

Sugar consumption was more consistent with about 75% of children across all three age groups consuming it. Bread consumption on the other hand was relatively low during the first three years of life, with only 1/5th of children consuming white bread and about 1/3rd consuming brown bread. However, as

children grew older, bread consumption increased to 44% in the children of the 7 - 9 age group. Conversely, milk consumption was more widespread at the youngest ages. Margarine and fat, consumed by the lowest percentage of children, increased from 23% of children in the 1 - 3 years age group to almost 30% in the older children.

Table 9.3 Fortification levels used in food fortification programmes

Food vehicle(s)	Vitamin A addition level (IU/g)
Maize	9.4
White bread	7.6
Brown bread	7.6
Fats/Margarine[1]	50
White sugar[2]	50
Whole milk[3]	5
Maize	9.4

1. The 50 IU/g selected for the fortification of fats/margarine is somewhat higher than the recommended standards in commercial practice in most countries, but it is similar to the standard used in Guatemala and Brazil (Johnson, Leonard. In: Oils Fats and Margarine: Overview of Technology, Food Fortification to End Micronutrient Malnutrition. Bagriansky J, Ed. Micronutrient Initiative. 1998. A somewhat higher level of 60 IU/g is used by relief agencies in the fortification of cooking oils and margarines
2. The 50 IU/g level used for sugar is based on the level used in Guatemala and other Central American Countries
3. The level for milk is the generally accepted commercial standard used in many countries

Furthermore and from a public health point of view, an effective food vehicle(s) should be consumed evenly across all social and income groups of the population. An ideal vehicle should actually be consumed more frequently and in larger amounts among those at the highest risk, usually the poor. In 1999, the Department of Health commissioned a study by the Bureau of

Market Research[70], which identified the purchase of seven common foods as a function of income. When a ratio is calculated with the consumption of the highest income versus the lowest income group, maize meal and flours seem to offer the most favourable distribution, with the low-income segments of the population purchasing (and presumably consuming) relatively more of it.

Sugar and brown bread fell into a middle group with only a slight skew in favour of the upper income segments of the population. Milk, margarine and white bread reflected a purchasing pattern heavily skewed towards the higher income groups (Table 9.6).

Table 9.4 Projected impact on vitamin A intake of children consuming food vehicles (if 100% of the purchased, donated or "part of pay" product was fortified)*

Food vehicle	Reported consumption (g/day)	Addition level (IU/g)	Stability (%)	Percent fortified (%)	Added Vit A (IU/day)	Amount of the RDA provided (%)
1 - 3 years						
White bread	41	7.6	80	98	244	18
Fats/M/rgarine	10	50	80	99	396	30
Brown bread	52	7.6	80	98	310	23
Whole milk	176	5	70	93	573	43
White sugar	19	50	50	99	470	35
Maize	164	9.4	60	96	888	67
4 - 6 years						
Fats/M/rgarine	15	50	80	99	594	36
White bread	69	7.6	80	98	411	25
Whole milk	167	5	70	93	544	33
Brown bread	78	7.6	80	98	465	28
White sugar	23	50	50	99	569	34
Maize	184	9.4	60	96	996	60
7 - 9 years						
Fats/M/rgarine	16	50	80	99	634	27
White bread	74	7.6	80	98	441	19
Whole milk	145	5	70	93	472	20

Brown bread	86	7.6	80	98	512	22
Maize	200	9.4	60	93	1049	45
White sugar	23	50	50	99	569	24

* The calculation above is as follows: 1.) Consumption for each vehicle in grams per day is multiplied by the IU/g level of fortification. 2.) This figure is then adjusted for losses of vitamin (stability %). 3.) The figure is further adjusted for the proportion of the vehicle which is theoretically available for fortification (% fortified). 4.) The result is total vitamin A presumed to be available for intake in IU/day. 5.) This figure is then divided by the RDA for the appropriate age group to reflect the proportion of the RDA that might be provided by the vehicle

Table 9.5 Percentage of children consuming selected food vehicles

Food vehicle/Age group (n)	Number of children consuming a given food (Total n = 2869)	Children consuming a given food (%)
1 - 3 years (n = 1308)		
White bread	276	21
Fats/Margarine	300	23
Brown bread	426	33
Whole milk	590	45
White sugar	1000	76
Maize	1063	81
4 - 6 years (n = 1083)		
Whole milk	422	39
Fats/Margarine	319	29
White bread	332	31
Brown bread	431	40
White sugar	816	75
Maize	825	76
7 - 9 years (n = 478)		
Whole milk	188	40
Fats/Margarine	142	30
White Bread	163	34
Brown Bread	210	44
White sugar	371	78
Maize	338	71

The findings of the Bureau of Market Research Report are generally in agreement with those of the present survey (Table 9.7), which also indicate that maize is consumed more frequently by the population groups at the highest risk of an inadequate intake of nutrients.

Table 9.6 Monthly expenditure on selected foods by income group in South Africa in 1999[70]

Food item	Monthly expenditure by Annual income (R)			
	Lowest 20% < R 6,867	Middle 20% R 12, – 23,939	Upper 20% R > 52800	High:Low Ratio*
Milk	15	33	129	0.12
Margarine	7	16	49	0.14
White bread	18	47	104	0.18
Brown bread	31	49.5	59	0.54
Sugar	58	64	78	0.74
Maize meal	93	86	77	1.20
Flour[1]	27	25	18	1.51

* The High : Low ratio was obtained by dividing the monthly expenditure of the lowest 20% income group by the expenditure of the highest 20% income group. A ratio of 1 indicates an equal purchasing distribution between the highest and lowest income groups. A ratio of more than 1 indicates that the lower 20% income group purchases more than the more better-to-do income group

1. Flour is treated as a separate item in the Bureau of Market Research study, as opposed to the National Food Consumption Survey where flours were included in the brown bread food group

Vitamin A status is particularly crucial for the health of young children. In order to project the impact food fortification may have on young children and to

obtain a more comprehensive view of its effects, the consumption found in the present survey was multiplied by the percentage of the survey children, which were reported not to be consuming a particular food. Although this approach is known to have a number of limitations, this averaging nevertheless not only corrects for the variation in the consumption of the various food vehicles found in the present survey, but also imparts a reasonable impression of the impact fortification may have on an average or a “composite child”. In considering the

Table 9.7 The mean number of food items found in households by income group

Food item	Annual Income		
	R < 12000	R > 12000	Hi/Low Ratio*
Fats/Margarine	21.40	38.84	0.55
White bread	22.61	38.84	0.58
Whole milk	37.17	55.24	0.67
Brown bread[1]	35.56	41.67	0.85
Sugar	75.09	80.65	0.93
Maize	84.23	57.93	1.45

* The High : Low ratio was obtained by dividing the monthly expenditure of the lowest 20% income group by the expenditure of the highest 20% income group. A ratio of 1 indicates an equal purchasing distribution between the highest and lowest income groups. A ratio of more than 1 indicates that the lower 20% income group purchases more than the more better-to-do income group

1. Flour is treated as a separate item in the Bureau of Market Research study, as opposed to the National Food Consumption Survey where flours were included in the brown bread food group

impact of vitamin A fortification by the most commonly consumed food vehicles within the said limitations (Table 9.8), maize and white sugar remain the carriers of vitamin A that have the greatest effect, together delivering more than ¾ of the RDA for the 1 - 3 year old children and about ½ of the RDA for the 7 - 9 year olds. White and brown bread, milk and margarine offer only a fraction of the vitamin A impact of maize and sugar. As children grow older, the projected coverage declines relative to the RDA, which is largely due to the increasing nutritional requirements with age in relation to a relatively constant consumption. For example, while the 7 - 9 year olds consume about 20% and 10% more maize than the 1 – 3 and 4 – 6 year olds, the RDA rises by 57%, from 1333 to 2333 IU/day.

On the basis of the average or composite child, it can be estimated (Table 9.9) that total bread and flour fortification would provide an average of 11 - 18% of the RDA for children in the three age groups. Indeed, bread and flours would be the only vehicles with a significant increase in consumption from the ages of 1 - 3 to 7 - 9 and, therefore, the only vehicle providing a larger share of the RDA to these older children. Total cereal fortification (bread, flours and maize) would provide between 47% - 62% of the RDA. With the addition of fortified sugar, the combined impact would provide nearly 90% of the RDA in the 1 - 6 year old groups but only 65% of the requirements of the 1 - 9 year olds.

In general, the goal of any fortification program is not to provide 100% of the RDA through the addition of nutrients to a given food but rather to minimise any deficits in the intake of nutrients. Nevertheless, on the theoretical level of 33% of the RDA fortification, total grain fortification would provide an adequate intake of vitamin A for children aged 1 – 6 years who have a vitamin A intake close to the median. The youngest children with a current vitamin A intake of 587 IU/day would receive an additional vitamin A intake of 148 IU/day and 677 IU/day respectively from bread and maize meal, which, together with the current vitamin A intake, would exceed the RDA (Figure 9.4). Similarly, children aged 4 – 6 years with a current vitamin A intake of 603 IU/day would have their vitamin A increased by 300 IU/day from bread and 710 IU/day from maize, which would also exceed the RDA (Figure 9.4). The inclusion of sugar fortification would bring the average vitamin A intake well above the RDA in children of these two age groups. However, because of the higher vitamin A requirements of the oldest age group of children in the present survey, total grain (i.e. bread and maize) fortification would provide only about 75% of the requirements of these older children. The inclusion of sugar as a vitamin A

fortification vehicle would provide an additional intake of 437 IU/day, which would meet about 93% of RDA of children in this age group (Figure 9.4). More importantly though, it is only the inclusion of sugar that will ensure an adequate vitamin A intake for children of all the age groups surveyed, whose current intake lies in the lowest quintile, especially so for the 7 – 9 year olds (Figure 9.5).

Table 9.8 Impact of fortification of different food vehicles on the average or composite child: actual consumption adjusted to average by the percentage of children not consuming a particular food#

Food vehicle	Percentage of children consuming	Actual Consumption (g/day)	Adjusted or average	Assumed industry coverage	Added vitamin A (IU/day)	Percentage of the RDA
1 - 3 years RDA						1333 IU/day
Whole milk*	45	176	79	33	92	4
Hard margarine	23	10	2	95	87	6.5
White bread	21	41	9	95	50	4
Brown bread	33	52	17	95	98	7
White sugar	76	19	15	98	356	27
Maize	81	164	133	90	677	51
4 - 6 years RDA						1667 IU/day
Whole milk*	39	167	65	33	75	4.5
Hard margarine	29	15	4	95	168	10
White bread	31	69	21	95	122	7
Brown bread	40	78	31	95	179	11
White sugar	75	23	17	98	425	25.5
Maize	76	183.6	140	90	710	43
7 - 9 years RDA						2333 IU/day
Whole milk*	39	145	57	33	66	3
Hard margarine	30	16	5	95	181	8
White bread	34	74	25	95	146	6
Brown bread	44	86	38	95	218	9
White sugar	78	23	18	98	437	19
Maize	71	200	141	90	718	31

The calculation above is as follows: 1.) Actual consumption measured in the survey is multiplied by the percent of children who reported consuming each particular vehicle to indicate consumption for an average child in g/day 2.) This is adjusted by multiplying the estimated proportion, which is not home grown, is purchased and therefore available for industry coverage 3.) This adjusted figure is further adjusted for assumptions of fortification level and stability to obtain theoretical total IU/day available in the diet 4.) This is in turn divided by the indicated RDA to obtain theoretical percentage of the RDA delivered by each food vehicle

Note: The industry coverage assumptions take into account the market and industry situation and are different from the "consumption theoretically available to fortify" as indicated in Table 9.4

*A projection of 33% for whole milk is an uncertain estimate

Table 9.9 Composite impact of fortification of different food vehicle mixes on the average or composite child*

Food vehicle	Average consumed (g/day)	Added vitamin A (IU/day)	Percentage of the RDA delivered
1 - 3 years RDA			1333 IU/day
Total Flours	26	151	11
Total Cereals	159	828	62
Cereals and Sugar		1180	89
4 - 6 years RDA			1667 IU/day
Total Flours	35	301	18
Total Cereals	175	1011	61
Cereals and Sugar		1436	86
7 - 9 years RDA			2333 IU/day
Total Flour	42.5	364	16
Total Cereal	60.4	1082	46
Cereal and Sugar		1519	65

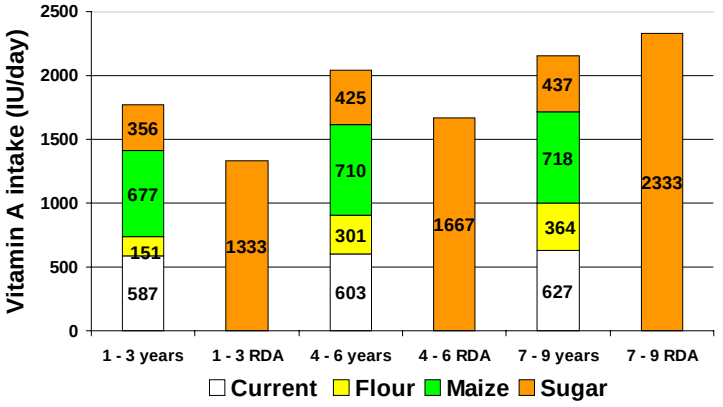
*The above results are obtained from the results of Table 9.8 as follows: 1.) Sum the results for white flour and brown flour 2.) To this sum add the results for maize to arrive at total cereals figure 3.) Combine results for white and brown flours, maize meal and sugar

Similar considerations and assumptions for the average or composite child indicate that total grain fortification with iron would ensure an adequate intake for children of all age groups, irrespective of intake quintiles (Figures 9.6 – 9.7).

It should, however, be borne in mind that the intake of dietary iron, is not always a good indicator of impact, especially in population groups that consume diets high in cereals and low in animal products as well as vitamin C, and are associated with a low iron absorption. Estimates of the impact of

total grain fortification on the median absorbed iron requirements of children who have an iron intake in the lowest iron intake quintile indicate that absorbed intake will be increased from less than the current 20% of median daily needs to the 50% - 65% range. It should be noted that because of the higher bioavailability of iron in bread than in maize meal, bread fortification with iron essentially doubles the current iron intake, whereas maize would provide ¼ - 1/3rd of the median absorbed requirements (Figure 9.8).

Figure 9.4 The combined impact of total grain and sugar fortification on the daily intake of vitamin A in children of the median intake quintile



Similarly and with regard to other micronutrients proposed for fortification (Table 9.10), maize would increase intake by 13% - 44% assuming an

average daily consumption of 137 g, and bread by 9% - 22% assuming a daily consumption of 85 g (Table 9.11). The combined impact on intake by total cereal fortification (excluding cake flour) would be significant and would range from 22% - 45% (Table 9.12).

Figure 9.5 The combined impact of total grain and sugar fortification on the daily intake of vitamin A in children of the lowest intake quintile

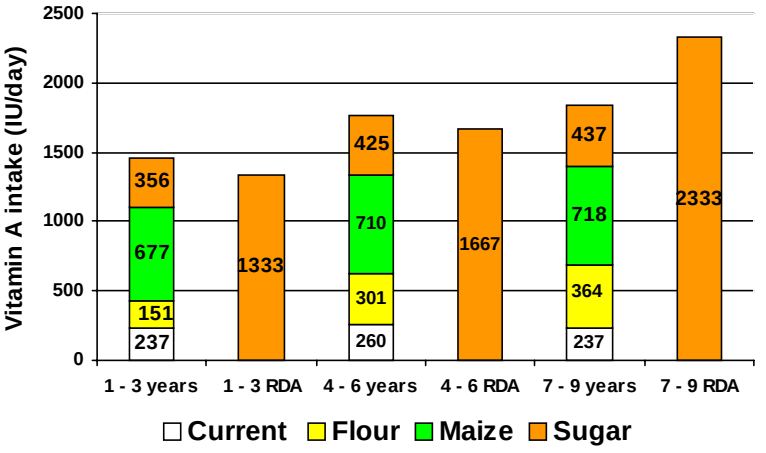


Figure 9.6 The impact of total grain fortification on the daily intake of iron in children of the median intake quintile

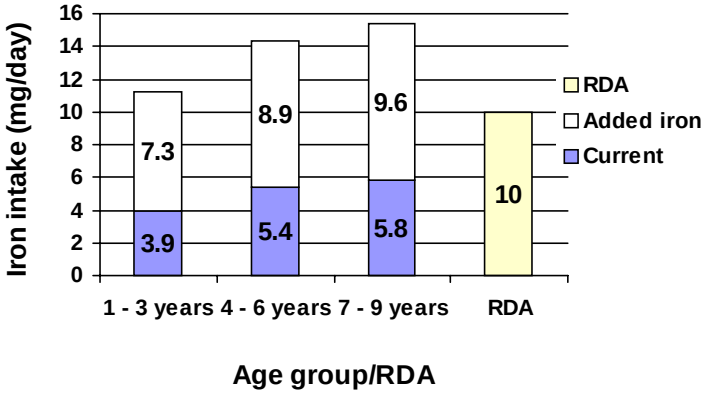


Figure 9.7 The impact of total grain fortification on the daily intake of iron in children of the lowest intake quintile

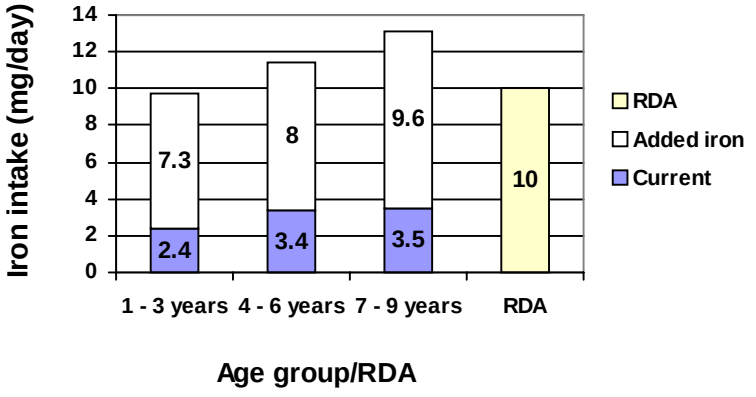


Figure 9.8 The impact (%) of total grain fortification on absorbed iron in children of the lowest intake quintile (assumed absorption: maize 3%, brown bread 3%, white bread 5% and lowest quintile intake 3%)

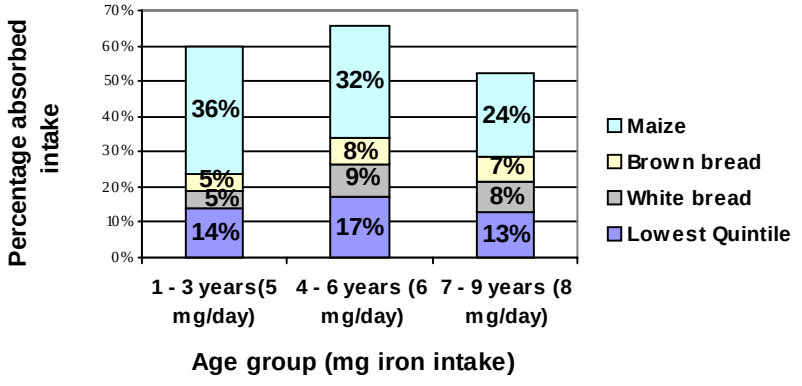


Table 9.10 Percentage of the RDA to be delivered to the consumer with an average consumption of 137 g/day[#] of fortified maize*

Nutrient	Units	Addition level	Units added	RDA	RDA (%)
Thiamin	mg/kg	3.2	0.31565	1.4	23
Riboflavin	mg/kg	3.45	0.34031	1.6	21
Niacin	mg/kg	39	3.84696	18	21
Folic acid	mg/kg	1.5	0.09248	0.4	23
Vitamin B_6	mg/kg	5	0.43155	2	22
Vitamin A	IU/kg	9426	697.335	3333	21
Iron**	mg/kg	50	6.165	14	44
Zinc	mg/kg	16	1.9728	15	13

As with previous calculations it is assumed that only 90% of this 137 g/day will be fortified

* The above calculation is obtained as follows: 1.) Maize consumption in g/day is multiplied by the level of added fortificant to obtain a gross figure of micronutrient added to each gram of maize 2.) This figure is adjusted for stability of the particular micronutrient as indicated in Table 9.2 as well as for the 90% assumed available for fortification 3.) This provides a figure for Units of micronutrient added to the diet through the intake of maize meal 4.) This is then divided by the RDA to obtain the % of RDA

** Measuring iron is limited by differential absorption according to type of iron, iron status of the individual and other factors in the diet

The health benefits of food fortification for those at risk of micronutrient malnutrition, at the level being discussed, can be delivered with little or no realistic risk of overdose or toxicity. The No Observed Adverse Effects Level (NOAEL) of the recently published Dietary Reference Intakes[71,72] offers a conservative measure of safety. NOAEL is defined as the level of dietary intake of a given nutrient that can be consumed by the whole population without a meaningful risk of undesirable side effects and represents an intake for which data in man is adequate to establish safe longer-term use (Table 9.13). In essence, the average consumption of maize meal and wheat flour at the level of fortification being discussed amounts to less than 1% of NOAEL for most vitamins up to a maximum of 18% for iron and folic acid. Practically

Table 9.11 Percentage of the RDA to be delivered to the consumer with an average consumption of 85 g/day[#] of fortified bread*

Nutrient	Units	Addition level	Units added	RDA	RDA (%)
Thiamin	mg/kg	2.7	0.20655	1.4	15
Riboflavin	mg/kg	3.1	0.23715	1.6	15
Niacin	mg/kg	32.4	2.6163	18	15
Folic acid	mg/kg	1.5	0.08925	0.4	22
Vitamin B_6	mg/kg	4.4	0.2992	2	15
Vitamin A	IU/kg	7560	514.08	3333	19
Iron**	mg/kg	50	4.25	14	30
Zinc	mg/kg	16	1.36	15	9

[#] As with previous calculations it is assumed that only 90% of this 137 g/day will be fortified

* The calculation above is made similar to Table 9.10 taking the appropriate stability figures for wheat flour from Table 9.2 and assuming that 95% of wheat flour is fortified

** Measuring iron is limited by differential absorption according to type of iron, iron status of the individual and other factors in the diet

Table 9.12 Percentage of the RDA to be delivered to the consumer by combined wheat flour and maize fortification*

Nutrient	RDA from maize fortification (%)	RDA from flour fortification (%)	Total contribution towards the RDA (%)
Thiamin	23	15	38
Riboflavin	21	15	36
Niacin	21	15	36
Folic Acid*	23	22	45
Vitamin B_6	22	15	37
Vitamin A*	21	19	40
Iron**	44	29	71
Zinc	13	9	22

* The above figures are obtained by summing the results of Tables 9.10 and 9.11

** Measuring iron is limited by differential absorption according to type of iron, iron status of the individual and other factors in the diet

speaking, even if an individual was to consume more than 5 times the average amount eaten as reported in the present survey (i.e. more than 1.1 kg of dry flour and maize meal or more than 2.5 kg per day of bread and maize porridge), such consumption would still represent little realistic danger of approaching the NOAEL. Similarly, the combined additional vitamin A intake from fortified bread, maize and a daily intake of 50g/day of sugar relative to the NOAEL would amount to approximately one quarter of the Low Observed Adverse Effect Level (LOAEL) (Table 9.14). In order to reach the NOAEL, an individual would have to consume 400% the average amount consumed as reported in the present survey.

Table 9.13 Estimated proportion of NOAEL reached through the average and greater than average consumption

Nutrient	Unit	Added micronutrient at combined average maize and flour consumption*	NOAEL	% NOAEL at average intake	% NOAEL at 5 times the average consumption
Thiamin	mg/kg	0.51	50	1.0	5.1
Riboflavin	mg/kg	0.57	200	0.3	1.4
Niacin	mg/kg	6.33	1500	0.4	2.1
Folic Acid	mg/kg	0.18	1	18	89
Vitamin B_6	mg/kg	0.72	200	0.4	1.8
Vitamin A	IU/kg	1186	10,000	12	59
Iron	mg/kg	10.20	65	16	78.5
Zinc	mg/kg	3.26	30	11	54.5

* Sum of additional intake calculated in Tables 9.10 and 9.11

Table 9.14 Combined vitamin A intake from three food vehicles relative to NOAEL

Food Vehicle	Average Consumed	Added Vitamin A	% NOEL at average consumption	% Average daily consumption to reach NOAEL
	g/day	IU/day	%	%
Cereals	222	1186	12	843
White sugar	50	1237.5	12	808
Total		2423.5	24	

In practical terms, sugar satisfies most of the defined criteria for a successful fortification vehicle. Consumption among children is widespread with little skew in the economic distribution (not including sugar used in processed foods). Sugar is well targeted to younger children below 5 years of age, particularly the 1 - 3 year age group who are the most at risk. Moreover, fortification of sugar is industrially feasible with a centralised, modern and technically sophisticated industry. However, certain challenges to the successful implementation of sugar fortification should be borne in mind. Firstly, approximately 30% of South Africa's sugar production is destined for the food processing industry. Such processed foods have a much lower consumption among low-income groups than retail sugar. Furthermore, during processing into value-added foods, vitamin A is lost on exposure to heat and light. Therefore, about one-third of all sugar production will have both low retention and poor targeting. In order to minimize this inefficient use of vitamin A, several Central American countries have promulgated regulations exempting industrial sugar from fortification. However, preventing industrial sugar from "leaking" into the retail market has presented regulatory and

enforcement difficulties[73]. Sugar fortification in South Africa will also be challenged by the relatively low cost sugar producers in surrounding countries. These producers, despite legal restrictions, may continue to import

their less expensive and unfortified sugar in the country. A regional strategy for sugar fortification may, therefore, be necessary to overcome these considerations. In this regard, a regional consultation of governments, sugar producers and international agencies was held in Swaziland 1999 and the joint declaration issued recommended that a regional approach to fortification utilising appropriate mechanisms representing both the public health and industry sectors should be established with a view to implementing a regional policy uniformly.

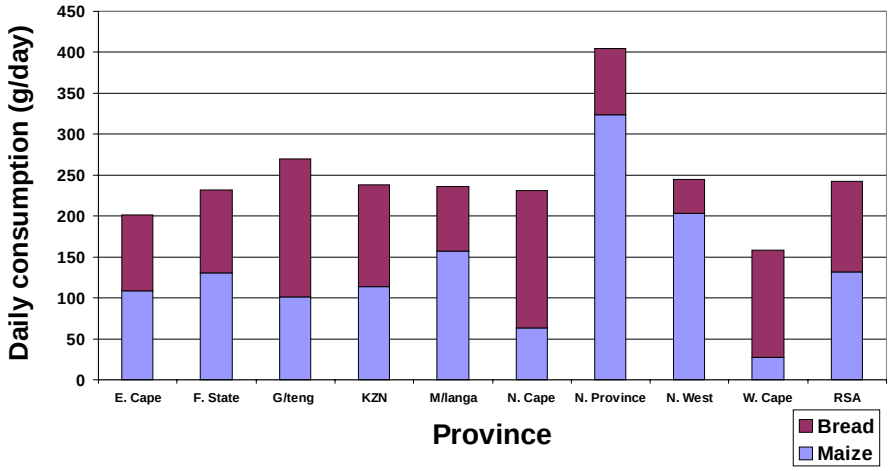
With regard to maize, maize meal offers the best potential to deliver multiple vitamins and minerals to the widest spectrum of the population, including the lowest income groups. The consumption among children is high, particularly among 1 - 3 year olds. While the findings of the present survey indicate that a small percentage of maize is home grown and home processed, 96% of it is purchased. Additionally, maize production is relatively centralized, with 90% of all maize produced by companies in the organized sector.

Similarly, white and brown bread satisfy most of the criteria for effective food fortification vehicles. Flour products have a long history and experience as proven carriers for a range of micronutrients worldwide. Moreover, the wheat milling industry in the country is more highly centralised than maize. The industry is highly organized with most producers being members of the National Chamber of Milling. Some products are already fortified with selected vitamins and minerals. While the findings of the present survey indicate that the consumption of both white and brown bread is relatively low among

younger children who are at greater risk of vitamin A deficiency, bread consumption does increase more steeply than any other food as children grow, a consumption pattern that continues into adulthood. The average flour consumption of white and brown flours (excluding cake and other special

flours) for South Africa as a whole is estimated at 85 g/day as opposed to an average of 60 g/day found in 7 - 9 year olds in the present survey. For the successful delivery of such micronutrients as iron and folic acid to adults and especially to women of child bearing age, the addition of micronutrients to flour would be considered as critical. Indeed, population-wide coverage cannot be achieved without fortification of both wheat flour and maize meal. Available data from National Association of Maize Millers and the National Council of Millers indicates that in provinces where maize consumption is lower, wheat flour consumption tends to be higher and visa versa. Although more maize than wheat flour is consumed in the country as a whole, in four of nine provinces (Western Cape, Northern Cape, Gauteng and Kwazulu/Natal, more bread is consumed than maize meal (Figure 9.9).

Figure 9.9: Reported bread and maize consumption nationally and by province



Cake flours, which reportedly account for nearly 25% of all flour produced in the country, would appear not to be a useful vehicle, from the public health

point of view, since it retails at a significant premium, in comparison to white and brown flours, and it is less frequently consumed by the poor who are at the greater risk.

From a wider perspective in relation to the findings of the present survey, it is generally accepted that the purchase of food from a commercial source entails that the product has gone through some format of packaging and/or processing. Consequently, such a product lends itself, theoretically at least, to fortification. However, the relative scale and sophistication of the processing and packaging are of critical importance. In general terms, larger organisations usually tend to be more technically sophisticated, thus easing the integration of fortification technology and quality assurance. It is also

generally accepted that larger organisations also offer greater efficiencies of scale in production and purchasing. Centralisation of production and management suggest that public communication, monitoring and regulation can be effectively established. In this regard, consultations with the food industry[74] indicate that maize is produced primarily by seven large companies in South Africa, and, provisionally, 90% of maize can be fortified within the immediate to medium term. A similar situation applies to wheat flour, wheat products, margarine and sugar, 95% to 98% of which can be fortified in the immediate to medium term. The only exception would appear to be milk and dairy products, for which, although production is controlled by a handful of dairy cooperatives, there are more than 850 distributors and a very considerable number of farms that sell directly to local retailers and consumers. This would indicate that fortification of liquid milk would be difficult to initiate, quality assure and monitor. However, the findings of the present survey in relation to anthropometric status together with an estimated 33% industry coverage as well as other important nutritional considerations (low calcium and riboflavin intake for the great majority of children) would support

the recommendation that milk is afforded a niche in the overall strategy of addressing the disorders of undernutrition.

In terms of costs, the fortification of all Super, Special and Sifted maize meal at the fortification levels under discussion would entail an estimated annual national investment of approximately R 44,493,008 (Table 9.15). This estimate is based on a premix cost of R 20/metric ton (MT), which includes the costs for amortised capital investment in microfeeders and other equipment, ongoing in-plant quality assurance costs, and costs relating to government monitoring and regulatory issues. In per capita cost, maize fortification is estimated at just over R 1 per person per year (Table 9.15). The

premix cost for the Universal Flour Fortification, excluding cake flour, would amount to R 24.2 million or just under an estimated cost of R 0.6 per person per year. This estimate is based on a premix cost of R 17.45/MT flour and includes the indicated additional costs (Table 9.16). Corresponding costs for the fortification of sugar at the retail level would amount to R 1.04 per person per year (Table 9.17).

The prerequisite regarding the cost-effectiveness of any proposed programme dictates that any defined goal is achieved maximally at the minimum possible cost. The most significant cost component of the proposed fortification program is the addition of vitamin A, which accounts for more than 60% of the total multi-micronutrient premix costs under consideration. In comparative terms, the component cost for niacin, the second most costly fortificant in the proposed premix package, is approximately 12% of the total. Potential savings to be accrued by adjusting the levels of micronutrients other than vitamin A would therefore, be insignificant. Consequently, any cost-benefit analysis

Table 9.15 Cost estimates for fortification of all super, special and sifted maize meals

Food item/additional costs	% contribution to RSA total production	Metric Tons Maize	Costs of Premix at R 20.00/MT
Super maize: Fortificant Total @ R 20.00 MT	36.7%	880,456	17,609,117
Special maize: Fortificant Total @ R 20.00 MT	35.5%	851,667	17,033,342
Sifted maize: Fortificant Total @ R 20.00 MT	12.1%	290,287	5,805,731
TOTAL FORTIFICANT PREMIX	84.3%	2,022,409	40,448,189
ADDITIONAL COST ESTIMATES			
5%* Plant capital expenditure			2,022,409
5%* Government monitoring			2,022,409
Total cost of program			44,493,008
Cost per person per year (RSA population: 40,583,573)			R 1.096

* These are rough estimates. Actual investment will vary according to the processes, financing and accounting procedures of particular mills

Table 9.16 Cost estimates for fortification of all white and brown bread flours, excluding cake flour

Food item/additional costs	% contribution to RSA total	Metric Tons Flour	Costs of Premix at R 17.45/MT
White Flour: Fortificant package at R 17.45/MT	41.4%	751,026	13,105,404
Brown Flour: Fortificant package at R 17.45/MT	28.1%	509,755	8,895,225
TOTAL FORTIFICANT PREMIX	69.5%	1,260,781	22,000,628
5%* Plant capital expenditure			1,100,031
5%* Government monitoring			1,100,031
Total cost of program			24,200,691
Cost per person per year			R 0.596

(RSA population: 40,583,573)			

Table 9.17 Cost estimates for the fortification of retail white sugar

Total RSA Sugar Production	**1,278,015MT**
less industrial sugar	352,494MT
less brown sugar	148,025MT
Total to be fortified	767,495MT
Vitamin A US $8.00 (R 48.00)	R 36,839,760
15% Plant costs	R 5,525,964
Total costs	R 42,365,724
Cost Per Person Per Year (RSA population: 40,583,573)	R 1.044

must essentially focus on how efficiently vitamin A is delivered in relation to its impact on at risk individuals, essentially children aged 1 - 5 years. Much of the costs for the addition of vitamin A will be due to the overages necessary to compensate for the 60% loss during processing, storage and preparation of the food vehicle(s) under consideration. It would, therefore, be prudent to select the most stable form of vitamin A for the purpose of fortification.

One might have thought that, since flour fortification involves two products, white and brown flour, the fortification of only one of these two food items might offer the opportunity for achieving a reduction in costs. Indeed, the pattern of consumption of white and brown flour differs among target groups. The findings of the present survey indicate that, while not consumed as much as maize, brown flour is well targeted to children in the lower income groups, and young children consume little white flour. Moreover, the low income groups consume less white flour than the higher income segments of the population. Additionally, since white flour represents 41% of total flour production in the country, compared to 28% for brown flour, the projected

costs of fortifying white flour would be higher than those for brown flour. However, it should be borne in mind that total flour consumption, including

white flour, increases with age, and its relative contribution amounts to approximately 25% of the vitamin A to be delivered to the oldest age group of children.

With regard to sugar, there can be little doubt that it will be the most expensive component of the suggested multi-vehicle programme, since it will also entail capital investment, and regulatory costs may also be higher. However, sugar consumption is relatively uniform among all income groups and has particularly high penetration among the youngest children who are at greatest risk of the consequences of vitamin A deficiency. Furthermore, sugar would provide approximately 25% of the RDA for children 1 - 6 years of age. Meaningful protection against vitamin A deficiency of the most economically disadvantaged and the most at-risk children is not therefore, possible without this component, which should form an integral part of any adopted strategy.

In unison with the findings of the present survey, past experience and reports[75] indicate that sporadic outbreaks of overt clinical deficiencies such as pellagra have occurred as well as deficiencies at the biochemical level for thiamin, vitamin C, vitamin B_6, folic acid, zinc and calcium have been documented. These reported findings would, therefore, justify the addition of these micronutrients to the food vehicles to be proposed, since their addition would have a minimal impact on the total cost of a fortification programme. Furthermore, and from the public health point of view, the addition of these micronutrients as part of a fortification programme, apart from increasing their dietary intake in the population at large, may impact favourably upon the health of the more affluent segments of the population.

Against this background, the directors of the present survey offer their commitment to assist, as appropriate, in the implementation of the following recommendations and related future developments:

Recommendations

9.5.1 Maize (sifted, special, super), white and brown wheat flour and white retail sugar should be the vehicles for fortification on a mandatory basis, henceforth collectively referred to as food vehicles

9.5.2 The micronutrients that should be used for fortification should be:

- Vitamin A
- Thiamin
- Riboflavin
- Niacin
- Folic acid
- Vitamin B_6
- Iron
- Zinc, and
- Calcium

9.5.3 The food vehicles should be fortified at the level designed to deliver 33% of the current RDAs per serving at the point of consumption taking into account the inherent content of these micronutrients in the food vehicles, the anticipated losses of these micronutrients during production, distribution and food preparation as well as the limitations that may arise from organoleptic considerations of such additions,

especially with regard to riboflavin, folic acid, iron, zinc and calcium

9.5.4 Sugar should be fortified with vitamin A only at the level of 50 IU/g, and the portion size for calculation purposes for maize and wheat flours should be 200g

9.5.5 Encompassing legislation which must include all aspects of the necessary monitoring and evaluation of a fortification programme should be enacted and implemented

9.5.6 The on-going discussions with the relevant sectors of the food industry should be continued and expanded with a view to reaching mutually acceptable solutions on issues relating to costs, product quality and acceptability as well as any other related issues likely to impact on the proposed fortification programme

9.5.7 The current food fortification task group within the Directorate of Nutrition should be transformed into a permanent committee on food fortification with a clear mandate to monitor and coordinate all aspects of the proposed food fortification programme

9.5.8 Current voluntary practices regarding the addition of fat soluble vitamins to margarines should be retained

9.5.9 The current component of the INP regarding vitamin A supplementation should be retained and should be targeted to children at the highest risk for vitamin A deficiency

9.5.10 The current component of the INP regarding multi-micronutrient

supplementation (other than vitamin A) should be retained and should be targeted to children at the highest risk for such deficiencies. All such supplements should be reassessed in terms of composition and posology

9.5.11 Foods, especially those consumed by children older than 6 months of age, which are currently fortified on a voluntary basis, should be reassessed with a view to harmonising the proposed framework of fortification. The necessary negotiations with the relevant manufacturers should be concluded prior to the enacting of legislation on fortification. Additionally, any fortified products currently used in the PSNP and PEM schemes should be re-evaluated

9.5.12 Any future proposals by food manufacturers regarding the fortification of additional food vehicles should be first discussed with and approved by the Directorates of Nutrition and Food Control with a view to assessing their impact and safety within the framework of the proposed fortification programme

9.5.13 With regard to cow's milk and in view of the findings of the present survey, negotiations should be initiated with the relevant sectors of the dairy industry in order to investigate the feasibility of fortifying milk with selected fat soluble micronutrients

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

9.5.15 No health claims other than those approved by the Directorate of Food

Control should be allowed for any of the food fortification vehicles

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

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

9.6 Nutrition Education

"Education isn't teaching people to know what they don't know. It is teaching them to behave as they don't behave"

Mark Twain

Background

The secondary objectives for the National Food Consumption Survey were to use the baseline data of the survey to develop appropriate nutrition education material. The picture that emerged from the NFCS data is that of a majority of people living in poverty, having a small amount of disposable income to spend on food and being dependant on labour intensive sources of fuel for cooking. Only 60% of the children surveyed were cared for by their parents and the rest were cared for by caregivers. The majority of mothers/caregivers (65%) had an education level lower than secondary school. More than 50% of HHs had access to both television and radio (80% and 60% had access to a radio and television in working order respectively). One in ten of all children aged 1 - 9 years were underweight and just more than one in five were stunted, a nutritional disorder that was more prevalent among the younger children

(aged 1 - 3 years of age) living in rural areas and on commercial farms. The majority of children had a very poor nutrient intake and little dietary variety with very few foods available in their HHs, primarily staple foods such as maize and bread. With regard to the government's schemes, which include supplementary feeding components for children, this survey showed that overall there was only a relatively small contribution of the Primary School Nutrition Programme (PSNP) and the Protein Energy Malnutrition (PEM) scheme to the dietary intake of these children (within the limitations of the age range of the survey). As a reminder, only 12% of the children sampled ate at a feeding scheme on the day preceding the interview; 63% of these children ate at the PSNP, 28% at a crèche and 4% were fed by the PEM scheme. Perhaps on a more positive note, a lot of home based crop and animal production were still taking place particularly in rural areas and even in informal urban areas. Although this was not the main source of people's food, it could make an important contribution to the children's diet where only small amounts of foods are needed to improve their diet.

Nutrition education [defined as learning experiences designed to facilitate the voluntary adoption of eating and other health related behaviours that contributes to the public's well-being and health][76,77] can be successful as a tool to prevent and control nutrition related disorders[76-78]. However, it is of utmost importance that one should also realise its limitations. In this regard, it has been pointed out[78] that nutrition education is most successful in addressing issues of dietary intake where it is a question of choice, but it is much less successful and often inappropriate where individual and household resources are being used optimally. Within the context of poverty of course the reality of "they do not get enough because they do not have enough" cannot be overemphasised. In order to have a real impact on hunger and poverty, nutrition education should not take place in isolation, but be linked and closely related to programmes that address the underlying socio-

economic and political causes to these disorders[80]. The education messages, methods and materials should take cognisance of the multiplicity of factors involved (food behaviour related as well as social issues) in order to be applicable to daily life. Involvement of people from the low-income groups of the population in the development and implementation of any such education programmes might assist in the latter. Furthermore, nutrition education

messages should be reinforced at different levels and augmented by other opportunities for learning such as those within the environment or through food provision. Sequential, multi-year programmes, which include active behaviour oriented methods should be implemented to try and bring about change(s) decided upon[81-84].

For any nutrition programme to succeed there is a need for nutrition education to form an integral part of that programme. The definition of the role of the nutrition educator to be the "one who helps people of whatever social, economic or political circumstances to meet their need for nutritious food" necessitates that nutrition education strategies should go beyond communication activities in order to address the factors which are considered to be the main determinants of eating patterns. This implies the inclusion of programmes that would be aimed at promoting and enhancing nutritional health. The reason for this broader approach arises from the changing context for nutrition education in terms of design, planning and promotion activities for the public (Figure 9.10). In this regard, an additional framework (Decision, Development and Dissemination) has been proposed (Figure 9.11) for guidance in the approach and implementation of national large-scale nutrition education programmes.

A number of key principles for nutrition education programmes have been elucidated and include the following:

- The programme should depend on a comprehensive and systematic approach for conceptualisation, implementation and evaluation
- The support of policy-makers and health care workers is essential, and
- The use of multi-media approach including face-to-face communication and other traditional communication methods should form an integral part of any such programme

In addition, close collaboration with target audiences is also of crucial importance, especially because the successful implementation of any communication strategy would need to address the following questions[85]

- To whom should the message(s) be directed?
- What message(s) should be communicated?
- How can the message(s) best reflect the target audience's attitudes and beliefs?
- Which media should be used?
- What settings are most appropriate for effective communications?
- What times are best suited to successful communications?

Figure 9.10: Framework for planning nutrition promotion and education programmes for the public[86]

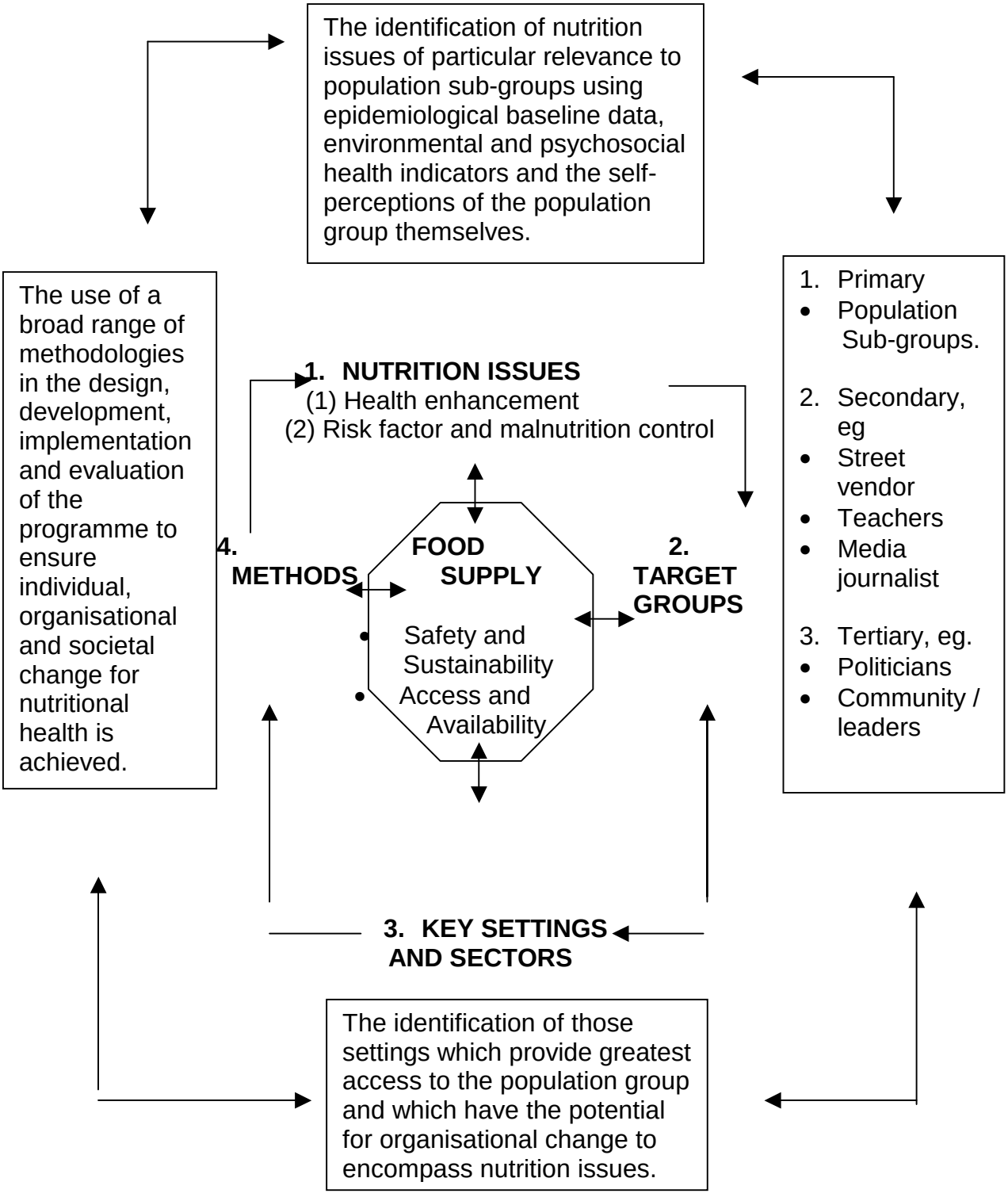
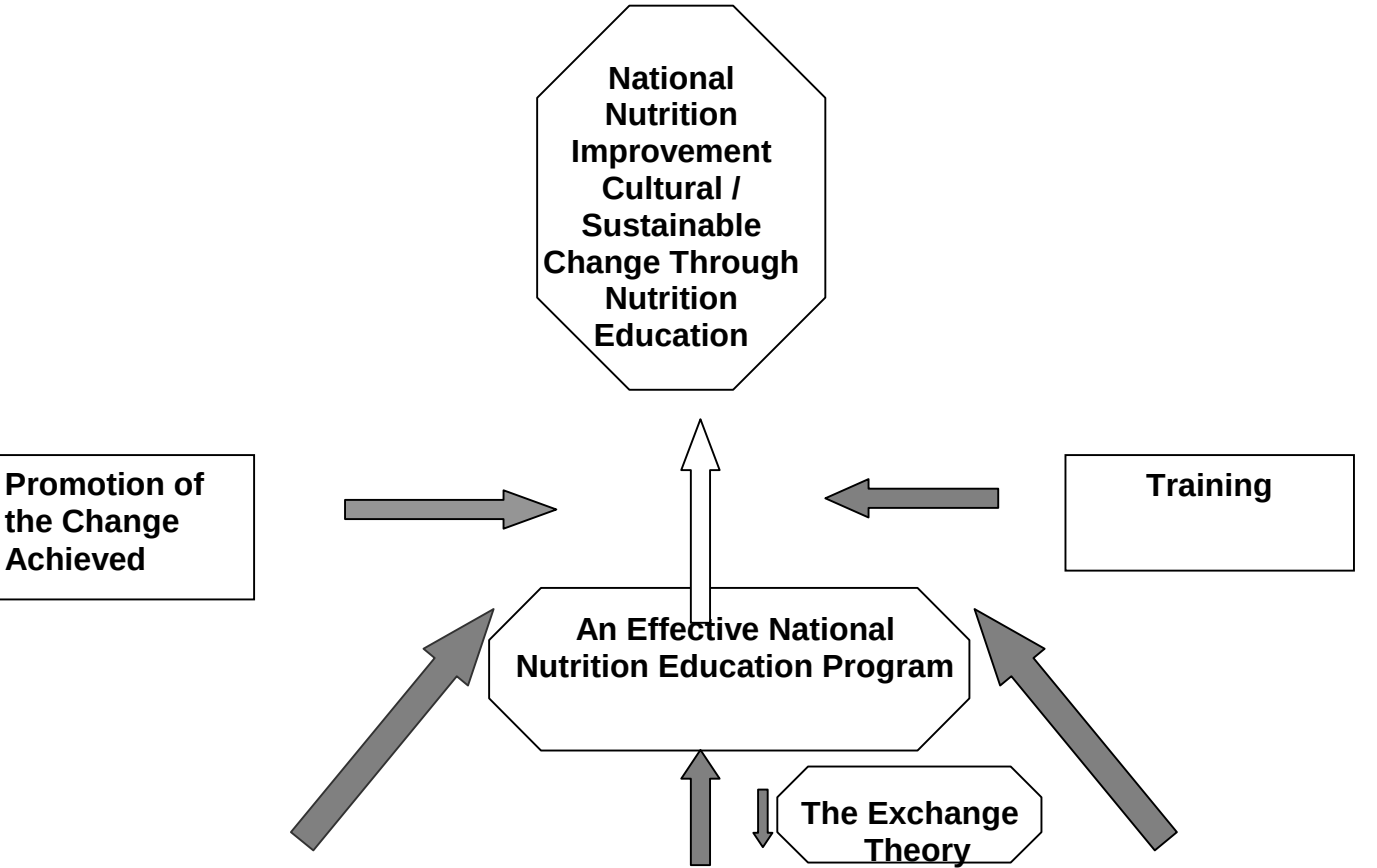


Figure 9.11: The Decision-Development-Dissemination approach as a generic framework for nutrition education for the public[86]



DECISION		DEVELOPMENT			DISSEMINATION	
KEY ACTORS: DECISION MAKERS/ CHANGE INITIATORS		KEY ACTOR: CHANGE AGENTS			KEY ACTORS: CHANGE AGENTS CHANGE INITIATORS/ DECISION MAKERS	
CAUSE(S)	CHANGERS	ASSESSMENT	ANALYSIS	CREATIVE ACTION	MANAGEMENT / CONTROL	MONITORING / EVALUATION
Relevant Perceived Causes Reasonable investment	• Pro-active Change Initiators • Quality change agents	• Formative Research • Appropriate Research Methods	• The food supply • Nutrition issues • Target groups • Key settings	• Communication / Education for changers • Communication / Education for target audiences	• Supportive staff • Good collaborators • Flexibility • Leadership style • Intensive intervention for the less advantaged sector	
		Communication collaboration concentration				

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Within the wider context of a national nutrition education policy, the limitations of the present survey must be pointed out. The survey will contribute, significantly, towards the identification of nutritional as well as some environmental and social issues relevant to children of a defined age group, namely 1 - 9 years. A national policy on nutrition education would also require similar information for other population groups as well as additional health and disease related data, which should be obtained from other surveillance and/or monitoring systems in the country. Furthermore, the data from the present survey can inform on the choice of target groups for nutrition education, key settings and sectors, and methods to provide the context within which nutrition education should take place. However, an analysis of each of these aspects needs to be carried out in the Provinces before the implementation of any such policy. Moreover, it was not within the scope of the present survey to provide information on parental attitudes to children's growth and development or on the role which nutrition plays in it or on parents' understanding of what children should be eating or their understanding of food categorisation and any taboos and hindrances to eating certain foods. Nevertheless, the survey data indicate a strongly positive attitude towards food fortification, since 72% of respondents thought that foods fortified with vitamins and minerals were healthier, 38% indicated that they would buy enriched foods even if they were more expensive, and 36% thought dietary supplements would improve the health of the child.

Finally in terms of background information, the findings of this survey must be considered in relation to nutrition programmes, which are already in place in the country. The Integrated Nutrition Programme (INP) affords a high priority to reducing the prevalence of malnutrition in children and ensuring optimal

growth in infants and young children. Intervention programmes for younger children (up to 6 years of age) are proposed to occur through Health Facilities

Based Programmes in the form of nutrition education, micronutrient supplementation, food supplementation through the Protein-energy-malnutrition (PEM) scheme, and growth monitoring and promotion. Younger children are also a target group for the Community Based Nutrition Programme through community based nutrition surveillance, nutrition education/promotion and involvement in crèches. Older children are the target group of the Primary School Nutrition Programme. In addition to government initiatives, another proposed intervention is targeted at children older than 5 years of age as well as adults, namely the development of preliminary Food Based Dietary Guidelines (FBDG)[87,88]. The latter have been developed by a task team, which included food and nutrition specialists as well as government representatives.

Against this background, the directors of the present survey offer their commitment to assist, as appropriate, in the implementation of the following recommendations and related future developments:

Recommendations

9.6.1 An in-depth analysis of the economic implications and needs for a national nutrition education programme should be conducted prior to finally selecting the most cost-effective and appropriate nutrition education strategy on fortification and/or supplementation

9.6.2 A national consultative group on nutrition education should be constituted in order to ensure that nutrition messages and nutrition education/promotion campaigns are consistent and globally

supportive, that duplication is prevented and that the targeting of such messages/campaigns is prioritised in relation to the findings of the present survey. This consultative group by necessity must include government (all sectors) as well as industry and NGO's involved in providing nutrition and nutrition related information to the public. Alternatively, a smaller consultative group could coordinate activities in the different sectors

9.6.3 All relevant role players (families, communities, health, social, agricultural, educational workers, policy makers and politicians) should be informed that the critical dietary inadequacies in terms of dietary variety and nutrient intake in general and micronutrients in particular affects the majority of the children population in the country and impacts severely and adversely on their growth and overall development

9.6.4 A government-food industry partnership must be established and should work in unison in enhancing the already favourable perception of the public at large regarding the benefits of consuming fortified foods. The primary guide of such a crucial partnership must be for the benefit of the people rather than for market share

9.6.5 Families and communities, especially mothers/caregivers must be informed that micronutrient deficiencies can be prevented by consuming fortified foods as well as by consuming, within their financial means, a variety of foods especially legumes, fruits, vegetables and, when possible, foods of animal origin. In this regard, the concept of "budgeting for good nutrition" should be introduced and disseminated together with "nutrition wise", "good value for

money" food choices

9.6.6 In conjunction with recommendation 9.6.5, Health- and Community-Based Facility Programmes should become more specifically involved in educating mothers/caregivers on the importance of micronutrients and correct nutrition in the growth of their children. Health Facility Based Programmes should also educate mothers/caregivers on the importance of compliance when micronutrient supplements are dispensed

9.6.7 Families, mothers/caregivers should be educated on the importance of regular clinic visits to ensure that their children grow adequately because of the subtle nature of stunting. The concept that many children who look apparently healthy may not be growing to their full potential needs to highlighted and emphasised

9.6.8 Health workers involved in feeding schemes should be educated on the choice of micronutrient rich foods and should also be made the conduit for strengthening the messages on the importance of micronutrients. This should also be the case for all personnel working in day care facilities especially in relation to purchasing and preparation of food for young children

9.6.9 The importance of exclusive breastfeeding for the first 4 – 6 months of life in ensuring an adequate micronutrient intake early in life as well as the important contribution breast milk can make up to two years of life in meeting micronutrient requirements should be included and be more emphasised as part of the programme on promotion and protection of exclusive breastfeeding. However, one should guard

carefully against creating a feeling of false security in the mother in relation to breast milk being adequate to meet the nutrient requirements of the older child, which is clearly NOT the case

9.6.10 Families, mothers/caregivers, health workers should be educated on the importance of and need for younger children to have small and frequent meals for adequate growth. Monitoring and evaluation should specifically focus on the facilitating factors and barriers to improving young child feeding with energy- and nutrient-dense foods

9.6.11 The important slogan of “clean hands, clean food and a clean home protect children against diseases and ensures optimal child growth” should be promoted and disseminated to all individuals concerned with the care of young children

9.6.12 In dealing with malnourished children (under- and over-weight), their mothers/caregivers should be provided with nutrition information relevant to the prevailing needs of their environment and in relation to home based rehabilitation

9.6.13 The concept of “child health begins before birth” in relation to planned parenthood (age, child spacing, nutritional and prenatal care), the importance of micronutrient supplementation during pregnancy (iron, folate) and preparation for choice of infant feeding (breastfeeding promotion) should be promoted to all women of child bearing age

9.6.14 In rural or other appropriate settings, the important role home based crops and livestock can make to the children’s diet should be strengthened and promoted as feasible and appropriate

9.6.15 The recommended Nutrition Education activities should, when applicable to children older than five years of age, follow the FBDG as follows:

- Enjoy a variety of foods
- Be active!
- Make starchy foods the basis of most meals
- Eat plenty of fruits and vegetables every day
- Eat legumes regularly
- Foods from animals can be eaten every day
- Use fat sparingly
- Use salt sparingly
- Drink lots of clean, safe water
- If you drink alcohol, drink sensibly

9.6.16 Dietary guidelines for children younger than five years of age should be developed

9.6.17 The proposed Nutrition Education Programme should be specific and sensitive to provincial differences with regard to available household appliances, prevailing circumstances and cultural requirements. Equally, nutrition education materials on the chosen topics should be relevant to prevailing environmental circumstances. Such a programme should capitalise on existing good practices

9.6.18 The primary target groups for the proposed Nutrition Education Programme should not only be all the mothers/caregivers of children and the children themselves (depending on age) but also their

grandparents, and specifically the poor (limited financial and other resources) with relative low formal educational levels in rural areas especially on commercial farms. Furthermore, the same nutrition programme/messages need to be extended to the urban areas in view of the high rates of urbanisation, and also to pregnant women

9.6.19 The secondary target groups should include day care workers, the food production and marketing sector, teachers and schools (pre-primary, primary and secondary), as well as all health workers including all private health practitioners. The low schooling level of mothers also part of the regression analysis suggests additional secondary targets for information i.e. schoolchildren

9.6.20 The tertiary target groups should include decision-makers, administrators and politicians at the national, provincial and community level. This group needs to be involved in a number of alternative strategies such as advocacy, regulation (food labelling, food fortification, supplementation), organisational change (health promoting schools and healthy cities), legislation (input on minimum wages of farm workers from the nutrition sector)

9.6.21 The multiple causality of nutritional disorders demands that any Nutrition Education Programme (like all other nutrition relevant activities) must be of a multi-sectoral nature. The primary target groups should be reached where they “work, live and play” as well as through the education and health system, and agriculture

9.6.22 The radio and/or television should be the primary communication medium for the Nutrition Education Programme but not at the

exclusion of other means and modes of communication such as printed material, the broader media, and, importantly, face-to-face activities at every possible opportunity

9.6.23 The content of the education material must be sensitive to the prevailing low level of education of the primary target groups and cater for language and cultural prerequisites

9.6.24 In relation to 9.6.23, any education material must be developed within the current framework and all components of the Integrated Nutrition Programme of the Directorate: Nutrition of the Department of Health

9.6.25 The overall monitoring and evaluation of the proposed Nutrition Education Programme should form an integral component of the programme. This should be achieved by establishing the level of knowledge of the public at large on basic nutrition issues in any future national surveys, and finally

9.6.26 The findings of the present survey should be made available to all health workers, the media and the public at large in order to increase awareness of the scale and nature of the most prevalent nutritional disorders in the country.

In conclusion of this section of the recommendations, epidemiological studies confirm the increasing realisation that moderate malnutrition leads to significant costs and burdens for society and for the individual, especially children. Micronutrient deficiencies have been shown to incur both health and developmental costs. In this regard, the use of fortified foods, a better diet as well as micronutrient supplements have been shown to reduce mortality and

morbidity in children[61]. Nutrition education is an important part of these initiatives. Undoubtedly, the design and content of the Nutrition Education programme must receive the highest priority and be implemented the soonest possible. Its success will depend to a significant extent on whether it is implemented in a culturally sensitive and culturally appropriate framework[89,90].

9.7 Recommendations of a General Nature

9.7.1 Since very significant delays were encountered and a considerable time was spent on designing and drawing a national probability sample of children, every effort should be made in future health surveys to share sampling resources with other organisations conducting national health surveys. An example of such an organisation is the Central Statistical Service, which conducts annually the October household survey. Given that the current emphasis of the Directorate of Nutrition is correctly placed on the improvement of child health, it is recommended that the Directorate should investigate the feasibility of establishing and maintaining a national valid sampling frame for children

9.7.2 Socio-economic upliftment is considered essential to sustainable reduction of micronutrient deficiencies and undernutrition in general. A detailed discussion of this subject falls outside the scope of this report. Nevertheless, it is important to note that these particular deficiencies, because of their intimate link to socio-economic status, may be used as medium-term indicators in assessing the success of the currently implemented national nutrition programmes. Such findings should be incorporated into the national Health Information System

9.7.3 The findings of the present survey indicate that the four most seriously affected provinces were the Eastern Cape, the Northern Cape, the Northern Province and Mpumalanga. The Directorate of Nutrition should establish whether further assistance, other than fund allocations, would be required in terms of expertise to ensure the capability to implement the recommendations in this report in these Provinces

9.7.4 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 sustained reduction. For an immediate- and medium-term solution 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 of the importance of breastfeeding
- Improve health worker training in respect of stunting, micronutrients, and breastfeeding.

Finally, the findings of the present survey are largely confirmatory of those of the recently published report on poverty[91] in country in terms of the socio-economic determinant of malnutrition including income. Importantly and in relation to HIV/AIDS, nutritional status is considered of the utmost importance in delaying the progression of the disease, reducing the incidence of complications related to the disease, reducing overall health care costs and improving quality of life[92]. On these and other considerations, therefore, it can

be argued strongly that the nutritional rehabilitation of those at risk must be given the highest priority.

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

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