

# Research in applied nutrition in developing countries: Challenges and expectations

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## Summaries

### 1. Food fortification as a strategy to combat iron deficiency / iron deficiency anaemia in developing countries

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Iron deficiency anaemia is the most widespread public health problem affecting millions of people, primarily infants, children and women in developing countries. The negative impact of anaemia on health, which includes reduced growth and increased morbidity, is well known, and is in fact an important issue to resolve as indicated by the United Nations and their different agencies. However, there was virtually no progress achieving successful intervention programmes for infants and children. Fe food fortification is currently considered the most cost-effective approach to combat Fe deficiency. Different potential fortificant compounds including ferrous sulfate, ferrous fumarate, ferric pyrophosphate, elemental iron, and Na<sub>2</sub> EDTA, have been investigated. However, while Fe fortification programmes have been relatively successful in industrialized countries, little development has been made in developing countries. It is assumed that the success of food fortification programmes may be limited because of high prevalence of low gastric acid output, high phytate content in diet and low intake of ascorbic acid in those populations. Therefore, there is a need to find out suitable iron compounds that would be well absorbable in populations with low gastric output without causing unwanted sensory changes in selected food. There would be a need also to overcome the barriers of inhibitor of Fe absorption, *i.e.* phytic acid in the food vehicle, or in the diet with which such fortified compounds would be consumed. Effective and sustainable iron fortification programmes could contribute in achieving the goal of reducing by one third the prevalence of anaemia by 2010, which the United Nations General Assembly adopted as its special session on children in 2002.

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### 2. Nutrition planning at the district level in Uganda: Challenges and expectations

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Malnutrition remains a common problem in Uganda, particularly among young children. Under decentralization, resource allocation to nutrition activities has increased through direct support to district-based programmes by both the central government and international development agencies. Efficient and equitable use of resources is however

impeded by poor planning at the district and sub-district level. The main problems are related to inadequate analysis of nutritional problems, lack of integration of nutrition interventions into overall district development plans, failure to prioritize interventions, lack of effective guidelines in planning and inadequacy of staff skills necessary for participation of the local actors in planning. A study was carried out between 1996 and 2000 to examine the factors that influence decentralized planning and, based on the findings, suggest activities for improving planning at the district and sub-county level. The research involved the adaptation of common planning tools/approaches to the decentralized context at district and sub-county level. The study made three important contributions to decentralized planning: (a) identification and documentation of the main practices in decentralized planning; (b) development of a conceptual framework for decentralized planning; (c) development of a method for planning at the district and sub-district level. This paper presents an overview of the research and the subsequent application of the research results under practical field conditions.

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### **3. Evaluation rapide des troubles dus à la carence en iode: Le projet ThyroMobil dans six pays d'Afrique de l'Ouest**

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Il y a une décennie, la carence en iode affectait de manière particulière toute l'Afrique. Depuis 1994, la plupart des pays africains ont mis en œuvre la stratégie d'iodation universelle du sel pour prévenir les graves manifestations de cette carence nutritionnelle. Au seuil de l'an 2000, peu de données fiables étaient disponibles sur l'évolution de cette lutte en Afrique de l'Ouest.

Doté d'un camion équipé notamment d'un échographe, le projet ThyroMobil a permis d'évaluer l'efficacité de la lutte contre la carence en iode dans six pays d'Afrique de l'Ouest, à savoir, le Bénin, le Burkina Faso, le Ghana, le Mali, le Niger et le Togo. Les principaux indicateurs de l'évaluation ont été : la disponibilité du sel iodé dans les ménages, la teneur en iode du sel, la concentration de l'iode urinaire et la prévalence du goitre. Dans chaque pays, l'enquête a été menée en moyenne dans six sites différents. Par site la population d'étude était constituée d'environ cent enfants d'âge scolaire (6-12 ans) des deux sexes. Au total, dans les six pays, l'évaluation a porté sur 6 111 enfants pour le dépistage du goitre par échographie thyroïdienne, et sur 2 322 enfants pour le dosage de l'iode urinaire. La disponibilité du sel iodé au niveau des ménages a été établie sur le terrain à l'aide des kits de test rapide détectant l'iode dans le sel sur 3 202 échantillons de sel rapportés par les enfants, et la teneur du sel en iode a également été déterminée en laboratoire par titrimétrie sur 614 d'entre eux.

Cette évaluation a montré une bonne consommation d'un sel suffisamment iodé et une médiane d'iode urinaire au-dessus de 100 µg/l indiquant l'absence de déficience iodée dans tous les pays enquêtés, sauf au Niger. Le dépistage par échographie a permis d'établir une prévalence du goitre en dessous de 6 % au Bénin, au Ghana et au Togo, mais une prévalence au-dessus de 10 % dans les autres pays.

De manière générale, ces résultats établissent une nette réduction des troubles dus à la carence en iode au regard de la situation épidémiologique qui prévalait avant l'introduction du sel iodé. Toutefois, il est nécessaire de renforcer le contrôle de qualité du sel iodé et le suivi du statut iodé de la population dans chaque pays.

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#### **4. Tracking the nutritional transition in Bolivia. A descriptive study**

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The objective of the present study is to identify some of the characteristics of the nutritional transition in Bolivia. Using data from the Development and Health Surveys (DHS), the changes in the nutritional status of Bolivian women in childbearing age could be determined. While undernutrition almost disappeared in this group, an important increase of 10 % in the prevalence of overweight was observed in the period between 1994 and 1998. A gap of information on the nutritional status of other population groups was also identified. Therefore, a survey was carried out in a sample of 525 adolescents attending public and private schools of La Paz, the main Bolivian city. The findings suggest that overweight is highly prevalent in this age group (22 %). The results also suggest that female adolescents are more likely to cluster stunting and overweight.

The present study also shows the trends in food availability at household level that were obtained from the data provided by the Household Surveys of 1999, 2000, 2001 and 2002. The methodology proposed by the European Data Food Networking Initiative (DAFNE) was applied.

Disparities in food availability within the country could be observed. Rural households have systematically fewer amounts of food available than urban households do. The wealthier the households are, the higher the availability of most food groups, except for potatoes and cereals. These findings suggest that Bolivian poorer households will prefer the more energy-dense and cheaper food sources.

In conclusion, overweight and stunting coexist in the same population; however, obesity is still very low. The most alarming finding is the steadily increase in energy-dense sources of food, accompanied by a decrease mainly in food of plant origin. All together, the observed changes in availability of the main food groups suggest that the nutritional transition is incipient in Bolivia. Therefore, interventions are urgent in order to prevent undesirable nutrition-related health outcomes such as obesity and other chronic diseases.

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**5. Influence of a complementary food on the growth and iron & zinc nutritional status of children 6 months – 1 year old in Kilosa district, Tanzania**

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A study, set up as a double-blind randomized, placebo controlled trial, was conducted from March 2001 to March 2002 involving 309 infants who received either a processed Complementary Food (CF) or a placebo from six to twelve months of age. Both groups were comparable in baseline characteristics. The study took place in Kilosa district, Tanzania. The processed CF contained germinated, autoclaved and dried finger millet (65.2 %), kidney beans (19.1 %), roasted peanuts (8%) and mango puree (7.7 %). The same blend, but not processed, served as placebo. Processing increased energy density for the same viscosity and solubility of iron and zinc. Mean length for age, weight for age, haemoglobin, zinc protoporphyrin and hair zinc concentration at six and twelve months were not different between the two groups. The results show that the processed food was not superior with regard to improving growth or iron and zinc nutritional status of infants when given under the study conditions. The control group consumed equal amounts of macronutrients, and the higher energy density, in this study, did not seem to have any benefits. In our study there was a very intensive follow-up with at every encounter an intensive motivation of mothers to give the required amounts and add extra lipids. In those conditions well-balanced complementary food with additional lipids can cover the energy needs of young children. The observed reduction in phytates by 34 % and improved solubility of iron and zinc due to processing, might not have been enough to compensate for the rather low iron and zinc content of the complementary food.

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**6. Le projet MISAME. Prévention du retard de croissance intra-utérine dans le district de Houndé, Burkina Faso**

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Intrauterine Growth Retardation (IUGR) is the most important determinant of mortality and morbidity in the neonatal period. It is also a very important factor in predicting nutritional status, health and development in childhood. It even influences health in adult life, contributing to the vicious cycle of disease and poverty. The high rate of IUGR in developing countries represents therefore a major public health problem. Maternal malnutrition and malaria during pregnancy are usually assumed to be major determinants of the problem. In Houndé district, 17 % of hospital deliveries are low birth weight (LBW). Anaemia during pregnancy is highly prevalent, general diet is of

poor quality and malaria transmission is perennial. Therefore, it is expected that covering needs of pregnant women by a multivitamin-mineral supplement and providing effective malaria prevention will have an effect of public health importance on children's health.

The overall objective is to study ways to improve children's health by preventing IUGR through the provision of an improved package of prenatal care in Houndé medical district, Burkina Faso. The package includes multivitamin-mineral supplements and intermittent preventive treatment by sulfadoxine-pyrimethamine.

This research includes two constituents:

- An exploratory phase during which socio-anthropological, nutritional and epidemiological aspects of IUGR are assessed through qualitative and epidemiological methods.
- A double-blind randomized controlled trial (RCT) including 1,200 women. This is a 2x2 factorial trial where each pregnant woman is allocated to receive:
  - ✓ Iron (60 mg) and folic acid (400 mcg) versus UNMMAPP (a mix of 15 micronutrients recommended by UNICEF);
  - ✓ Weekly chloroquine (300 mg) versus sulfadoxine-pyrimethamine (500 mg x 3, once in trimester 2&3).

Efforts are made to detect pregnancy as early as possible through a network of home visitors (monthly visits of 3,000 women 15-45 years). The UNMMAPP tablets are taken daily under direct supervision of home visitors. Newborns are followed up until their first birthday. Main outcomes are: newborn and infant anthropometry and morbidity/mortality; IGF-I and haemoglobin at birth, age 6 and 12 months; maternal anthropometry; haemoglobin and serum Transferrin receptors (sTfR) at 20 and 32 weeks of pregnancy.

The main findings of the exploratory phase are presented in the text. The RCT is on the trail. The randomization process began in March 2004. So far, 417 pregnant women have been included. Nearly 25 % of pregnancies are detected during the first trimester. 90 % of tablets are effectively taken. Results on pregnancy outcomes are expected by end 2006.

In conclusion, the MISAME project will yield important information on how to alleviate the IUGR burden in developing countries. It is also a strategy to reinforce research capacities in Burkina Faso.

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## **7. Challenges and expectations in the Third World applied nutrition research: The Kenyan experience**

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