

REPORT 2010

Nestlé Foundation

for the study of problems of nutrition in the world



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The direction in which education starts a man will determine his future life.

Plato



REFERENCES AND CREDITS:

PAGE 2: Spirulina algae: Prof. Dr. H.R. Preisig, Botanical Garden & Institute of Systematic Botany, University Zürich, Switzerland.
PAGE 10: UN-Millennium Development Goals <http://www.un.org/millenniumgoals>; Waage J et al. The Millennium Development Goals: a cross-sectorial analysis and principles of goal setting after 2015. Lancet 2010;376:991-1023. **PAGE 13:** "Books Published" (Map 343) and "Books Borrowed" (Map 344), reproduced with permission from Worldmapper (<http://www.worldmapper.org/>) © Copyright 2009 SASI Group (University of Sheffield). **PAGE 18:** Evans MDR et al. Familial Scholarly culture and educational success: Books and schooling in 27 nations. Research in Social Stratification and Mobility 2010;28:171-197; "Asmara Public Library Introduces 17,000 New Books" accessed (October 5th 2010 at <http://allafrica.com/stories/201009271125.html>). **PAGE 38:** 1. USAID, Global Food Insecurity and Price Update # 3, May 2008. 2. FAO, 2002; World agriculture: Towards 2015/2030. Summary report. Rome: FAO. 3. FAO, 2003; Global and regional food consumption patterns and trends. In Diet, nutrition and the prevention of chronic disease. Rome: Nutrition and Consumer Protection Division, FAO. 4. FAO, 2010; The state of food insecurity in the world 2010: Addressing food insecurity in protracted crises. Rome: FAO. 5. SCN, 2010; Sixth Report on the World Nutrition Situation: Progress in Nutrition. Geneva: UN/SCN. 6. UNICEF/MI, 2004; Vitamin and mineral deficiencies: A global progress report. Ottawa: Micronutrient Initiative (MI). 7. SCN, 2004; Fifth report on world nutrition survey – nutrition for improved development outcomes. Geneva: UN/SCN. 8. UNICEF, 2004. The state of the world's children. NY: UNICEF. 9. WHO, 2007; WHO global InfoBase. Online. Available: http://www.who.int/ncd_surveillance/infobase. 10. Drewnowski A. & Popkin B. M. Nutrition Reviews, 1997; 55: 31-43. 11. Popkin B. M. Malaysian Journal of Nutrition 2002; 8(1): 109-124. 12. Wahlquist M. Diversification in indigenous and ethnic food culture. In Diet Diversification and Health Promotion Forum Nutrition Basel, Karger, 2005; 57: 52-61. 13. Tontisirin K & Bhattacharjee L. Nutrition Research 2001; 21 (1-2): 425-433. 14. Tontisirin K & Kosulvat V, 1998; Food based dietary guidelines in Asian countries. In P. Shetty & C Gopalan (Eds), Diet, nutrition and chronic disease: An Asian perspective. London: Smith-Gordon. 15. Tontisirin K & Bhattacharjee L, 2007; Food based dietary guidelines from around the world: An overview. In E. Kennedy & R. Deckelbaum (Eds), Nation's nutrition. Washington, DC: ILSI. **PAGE 42:** 1. Ramakrishnan U. Am J Clin Nutr 2004;79:17-21. 2. Ebbs JH et al Can Med Assoc J 1944;50:208-13. 3. Burke BS. Am J Public Health Nations Health 1945;35:334-9. 4. Susser M & Stein Z. Nutr Rev 1994;52:84-94. 5. Higgins AC. J Canadian Dietetic Association 1976;37:17-35. 6. Fisher M & Biggs R. British Medical Journal 1955;1:385-386. 7. Stoltzfus RJ & Dreyfuss ML. Guidelines for the use of iron supplements to prevent and treat iron deficiency anemia. Geneva: WHO, 1998. 8. Pena-Rosas JP & V

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PHOTO:

Cover: The endless fight against sand by the "Green Wall": Barchan-Dune in the region of Bikeqi in Inner Mongolia - photograph by Georg Gerster (Switzerland)

Spirulina algae (**PAGE 2** middle): Prof. Dr. HR Preisig, Botanical Garden & Institute of Systematic Botany, University of Zurich, Switzerland; **PAGE 13** Reproduced with permission from Worldmapper (<http://www.worldmapper.org>) © Copyright 2006 SASI Group (University of Sheffield) & Mark Newman (University of Michigan); **PAGE 6, 8, 9, 15, 53, 66, 73** Eric Jéquier; **PAGE 54 & 55:** Henri Dirren, **PAGE 68** Jehan-François Desjeux.

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FOCUSED AND GLOBAL – THE FOUNDATION FOR THE STUDY OF THE PROBLEMS OF NUTRITION IN THE WORLD

HIGH-IMPACT – RESEARCH PROJECTS TO REDUCE MALNUTRITION

INNOVATIVE – FOR SUCCESS

CAPACITY BUILDING – AS A BASIS FOR IMPROVEMENT

SUSTAINABILITY – A KEY MISSION

ENDURABLE NUTRITION – THE PRESCRIPTION FOR SUCCESS

PUBLIC HEALTH – ORIENTATED

EVIDENCE-BASED – PROACTIVITY

THE FOUNDATION AT A GLANCE

PARTNERSHIP – INCLUSIVENESS FOR LONG-TERM SUCCESS

SOLUTION – ORIENTED ACTION RESEARCH

enLINK-ing FOR A BETTER WORLD



CAPACITY BUILDING



enLINK-ing FOR A BETTER WORLD



PUBLIC HEALTH ORIENTATED

enLINK

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PRESIDENT'S MESSAGE

The Nestlé Foundation for the study of problems of nutrition in the world was founded 44 years ago. Its activity is concentrated on support for research in nutrition in low-income countries, and in order to meet most appropriately the needs of these countries, its policy has continually been adapted to changing circumstances.

In his review of 26 years of presidency, Eric Jequier described and explained some of these policy changes in the last annual report. While in earlier years support went to large research projects carried out by American or European scientists, it was later felt that the support should be allocated to scientists from low-income countries. In addition, much more emphasis was given to local capacity building. Since its beginning, the Foundation has contributed to the

training of over 130 masters of science or PhD's in the field of nutrition, strengthening thereby the local potential for research. It will certainly continue to do so. But capacity building is and has to be understood as going beyond the training of scientists. Each research project involving human beings must intend to have some long-lasting impact for the study population, be it through the continuous supply of a study drug or by other means. This can also be achieved by the transfer of knowledge: about growing plants which most appropriately cover the needs of the population, about the preservation of nutritional value by appropriate cooking, or about knowledge of the special nutritional needs of pregnant women, infants and children. Since 2010 the Foundation has supported a large, prospective research project about the special needs of women of childbearing age and

their children in rural Vietnam, which fulfils all these requirements in a most comprehensive way (see page 30 & 42).

But there is more to be mentioned about the policy of the Foundation. The funding choices made in recent years among submitted projects show that the Foundation joins the effort of the United Nations to achieve several of the millennium goals, which all 192 UN member states and more than 23 international organisations have agreed to achieve by 2015. Eradicate extreme poverty and hunger, achieve universal primary education, empower women, reduce the child mortality rate, and improve maternal health are all goals to which most supported projects contribute. In forthcoming years we will continue to favour high-quality research projects contributing to one or several of these goals. Having spent 40 years of my professional life in academic paediatrics, in research, teaching and caring for children, in a wealthy country such as Switzerland, I am very happy to have the privilege to contribute to this worldwide effort as the president of the Foundation since 2010.

Finally, I would like to mention one more millennium goal: develop a global partnership for development. A global partnership for research and education in nutrition has been extensively developed by the Foundation's Council. One of our members who left the Foundation in 2010 has made an especially large contribution to this goal: Jo Hautvast was a pioneer and main actor who established contacts throughout the world during the 30 years he spent as a member of the Council and I would like to thank him very warmly for his commitment.

Susanne Suter

Susanne Suter





One of the Foundation's main aims is the transfer of scientific and technological knowledge to low-income countries. The Foundation advances nutritional science both by supporting nutrition research projects in established institutes and universities and by giving focused support to existing nutrition schools and educational programs. To further fulfil the mandate of the Council and also encourage sustainable improvement in nutrition, a proactive strategic area of activities was introduced in 2003: The enLINK Initiative.

This year a French version of the small mobile enLINK nutrition library trunk has been added. In addition several e-books have been added to the digital library. Promising e-learning strategies for long term implementation have been developed and are currently being tested.

PROJECTS INITIATED BY THE FOUNDATION

THE enLINK INITIATIVE

- Study of the Vitamin A value of spirulina carotenoids in humans
- The enLINK digital library
- The enLINK hard-copy service
- Mobile enLINK library in English and French
- The large & small enLINK library trunk



THE enLINK INITIATIVE

Sustainability and public-health relevance are key issues for all activities of the Foundation. Research projects need to result in a short- and long-term public-health implementation. Knowledge and know-how have to be sustainable at all levels of the population.

The vast experience of the Foundation's Council members as well as the Foundation's past activities led to the creation of the **enLINK Initiative**, a project which illustrates the proactivity of the Foundation regarding its core issues.

This initiative focuses on information transfer in the area of nutrition and malnutrition as well as on the resolution of specific research questions and their implementation at the public-health level.

The name enLINK comes from the old English verb "**to enlink**", meaning "**to chain together**" or "**to connect, as by links**". The analysis of the semantic relations of "enlink" reveals related words which illustrate our central concepts and aims: to connect, to join, to associate, to unite, to tie, to conjoin.

Our mission is to link and join cultures, to associate and conjoin institutions and people locally, to study and diminish the problems of malnutrition globally.

Malnutrition can only be solved by "enlinking" – connecting – different strategies and approaches. Malnutrition has to be addressed universally by joint strategies which address many levels, looking at the level of medical issues (such as infection) and hygiene (such as water quality), proposing changes at the level of agriculture as well as in the society at large, and, last but not least, working to improve the level of education and information.

The **enLINK** Initiative has four main levels:

1. **e**xploration in **n**utrition, which represents the research level
2. **e**ducation in **n**utrition, targeting populations such as researchers, medical doctors, or health care workers, or the general population or specific population groups such as women
3. **e**lectronic **n**utrition
4. **e**ndurable **n**utrition

The elucidation of the high bioavailability of provitamin A from spirulina algae has been studied in a metabolic ward study. Based on these results an intervention study has been initiated in China and results can be expected shortly.

The **enLINK** library – the electronic nutrition library – represents the core component of the educational level of the initiative. The library will be updated and adapted to specific needs. Despite all the advances in information transfer by the newest information technology, books and printed materials will remain indispensable. The small and large orange **enLINK** library trunks have been shipped to more than 51 institutions in 26 different low-income countries. In addition, since fall 2009 the small trunk has been available in French. Preliminary tests of the **enLINK** e-learning and communication platform have been successful.

Life can never give security, it can only promise opportunity.
Chinese Proverb





THE enLINK CIRCLE: From Security to Opportunity

In a globalized world we need food security, health security, agricultural security, public health security, and socioeconomic security, to mention only a few. Basically we need security regarding all five key components of the enLINK circle (Figure 1). Without any doubt these are important and noble aims, which should be pursued equally for all people in all geographical areas in the world. Nevertheless, in view of the still existing disparities and widening gaps between North and South these “security-based” aims are difficult to achieve. The Millennium Development Goals (MDG) focus basically on the “security” of the eight formulated goals. Despite many achievements the overall progress towards the attainment of the MDG is unfortunately delayed due to different reasons, such as the global economic downturn or climate changes, but often also due to forgotten and missed opportunities.

“Life can never give security, it can only promise opportunity”. This Chinese saying precisely reflects one guiding principle of the activities of the Foundation: looking for and researching opportunities which will lead to a sustainable improvement in nutrition, health and finally also the socioeconomic situation. Without the right opportunity, which includes the right choices, there will be no improvement, especially no equal improvement. Improvement can only be achieved by building local opportunities which imply local capacity, i.e. local ownership, local know-how, local application of know-how and last but not least also the generation of new capacity locally. One of the Foundation’s basic principles is the creation of local capacity by supporting local research in nutrition and targeted knowledge transfer. All research projects are locally owned and the responsibility for the study

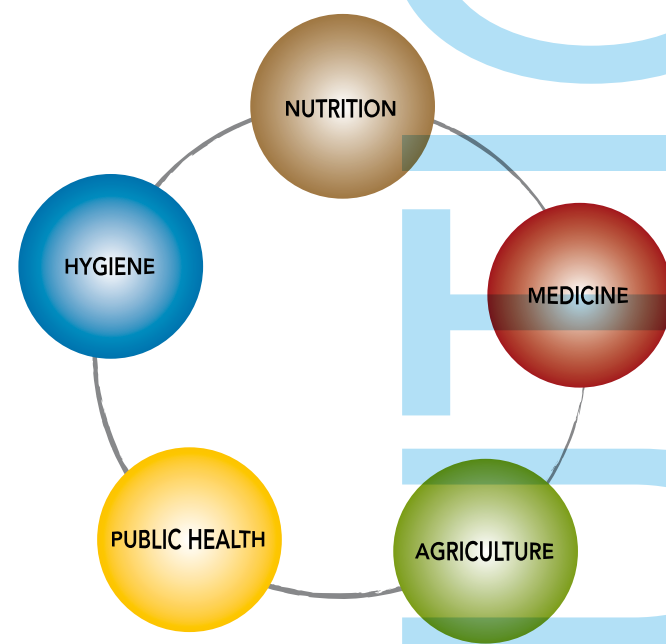


Figure 1: The enLINK circle: The five central fields of intervention for the control of malnutrition, hunger and poverty

and especially also the sustainable further distribution of the knowledge lies in the hands of the local applicants. This approach assures in the long term the creation of local opportunities for improvement in all fields of life.

Many of the problems for malnutrition and other issues addressed in the MDG have a strong scientific base regarding aetiology and also regarding the solutions. According to a recent report of a Lancet Commission, one major reason for the delay in the achievement of the MDG is the apparently insufficient capacity to transfer and implement the solutions. This drawback – despite the availability of knowledge –

obviously has many different causes, which cannot be discussed here. The authors of this report mention also that there are “considerable gaps between goals that undermine their capacity to achieve some interaction and synergy in development”. Solutions should reflect opportunities. Solutions can only lead to success if there are local opportunities for sustainable implementation. “Missed opportunities” are often isolated, not enlinked opportunities. Ideal solutions in the field of malnutrition or also poverty reduction – to mention just a few – are usually “enLINKed” opportunities, i.e. opportunities addressing most if not all of the key components of the enLINK circle. There are many opportunities but there is only one enLINKed opportunity – this is usually the successful opportunity. enLINKing is a key characteristic of the activities of the Nestlé Foundation.

The Nobel laureate Amartya Sen wrote that “starvation is the characteristic of some people not having enough food to eat. It is not the characteristic of there being not enough to eat”. This statement underlines the issue of disparity of opportunities. During more than 40 years of research support the Foundation has looked for opportunities addressing the whole pathophysiological and causal “supply chain” at the population level, asking, for example, if the cause of malnutrition is the lack of food or (what is most often the case) due to the persistence of major diseases such as malaria, hookworm infestation or diarrhoeal diseases and poor hygiene. In these settings the opportunities lie often not in “food aid” but in the control and, whenever possible, elimination of the underlying diseases. Obviously the distribution of supplements is an easier opportunity which will, however, in the long run not lead to a sustainable solution.

Obviously there are many opportunities but only a few will lead to a real change, i.e. improvement in health and economic capacities. One of the long-term goals for a healthy and happy life is the freedom to choose between different opportunities, and this can only be achieved in the setting of a holistic security. Any opportunity has to be tested for its suitability and advantage. The economist is well aware of the issue of “opportunity cost”, a concept which stresses besides others also the interrelationship between “scarcity” and “choices”. There are many opportunities but only a few suitable choices which will lead to a sustainable improvement. A prerequisite not only for favourable opportunity costs but also success lies most often in local capacity, i.e. suitable local opportunities.

In the modern world there are many opportunities; one may even think that there are too many opportunities. Accordingly, opportunities have to be well chosen and opportunities have to be linked together to achieve synergistic effects. During the last decade the developmental origins of disease gained more and more acceptance and, to quote Amartya Sen again, “poor prenatal experience shows the seeds of ailments that afflict adults”. These well-known research findings pinpoint one central opportunity: women and their children. The latter has been one key area of research and capacity building of the Foundation for more than 40 years.

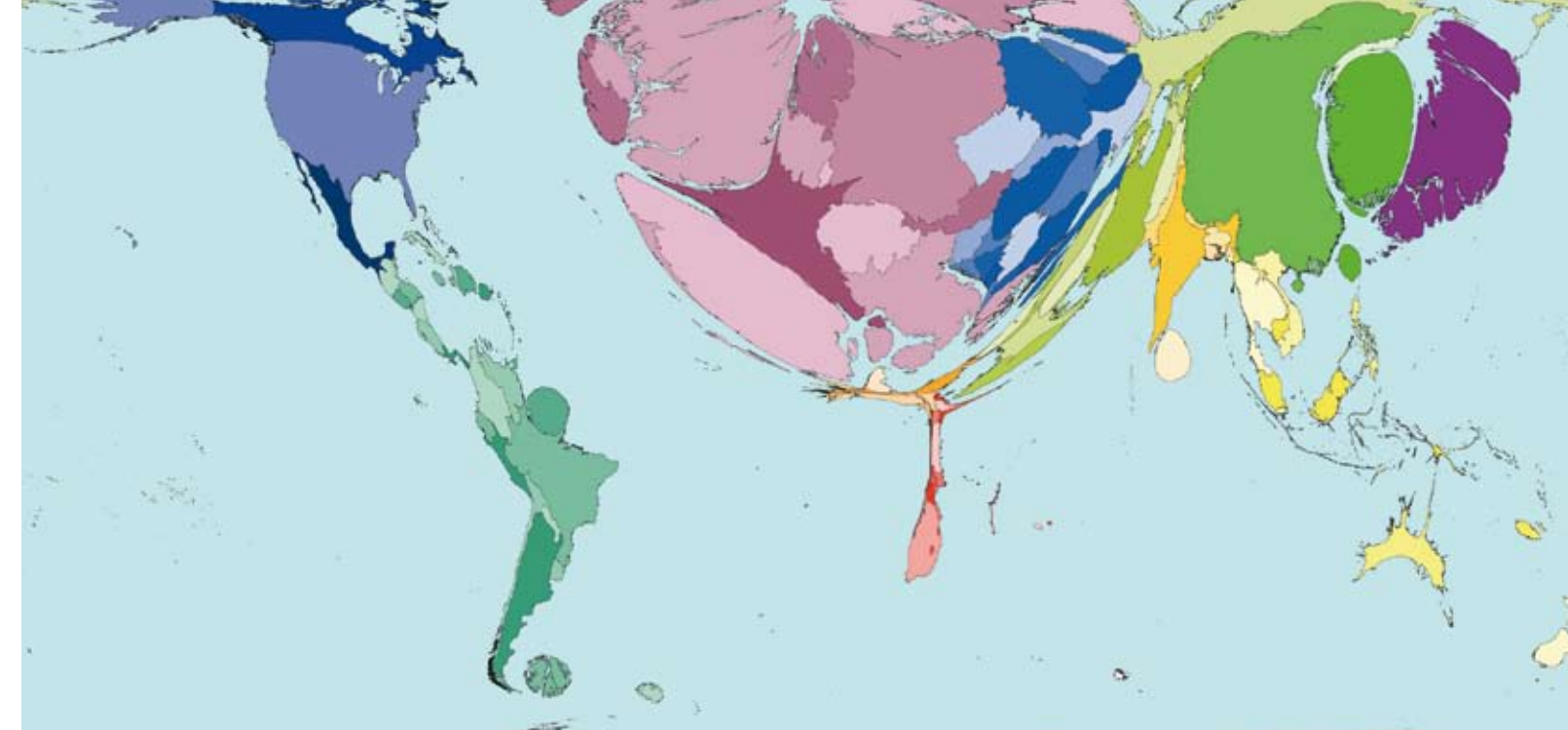
The Latin word “opportunitas” means “suitability”, “convenience”, “fitness”, and last but not least, “advantage”. These meanings are actually needed in a modern world full of “opportunities”. In any case there are only a few local opportunities which will be suitable and which will lead to a real sustainable and population-wide equal advantage for all. These are usually “synergistic opportunities” – as reflected in the enLINK circle; however, according to the





geographic area certain key players in the enLINK circle might be more important than others. Opportunity includes obviously also “capacity” and “capabilities” – without capacity and capabilities there is no possibility to take advantage of an opportunity and vice versa. Therefore, as also proposed in the Lancet report, opportunities and capabilities should be equal for all.

The Nestlé Foundation for the study of problems of nutrition in the world has, during the more than 40 years of its existence, grasped many opportunities for research and capacity building. One characteristic which is the guiding principle of all activities of the Foundation is that the research activities should lead to the creation of locally owned, action-oriented opportunities for an improvement of nutriture and life. Together, let's catch the already existing opportunities.



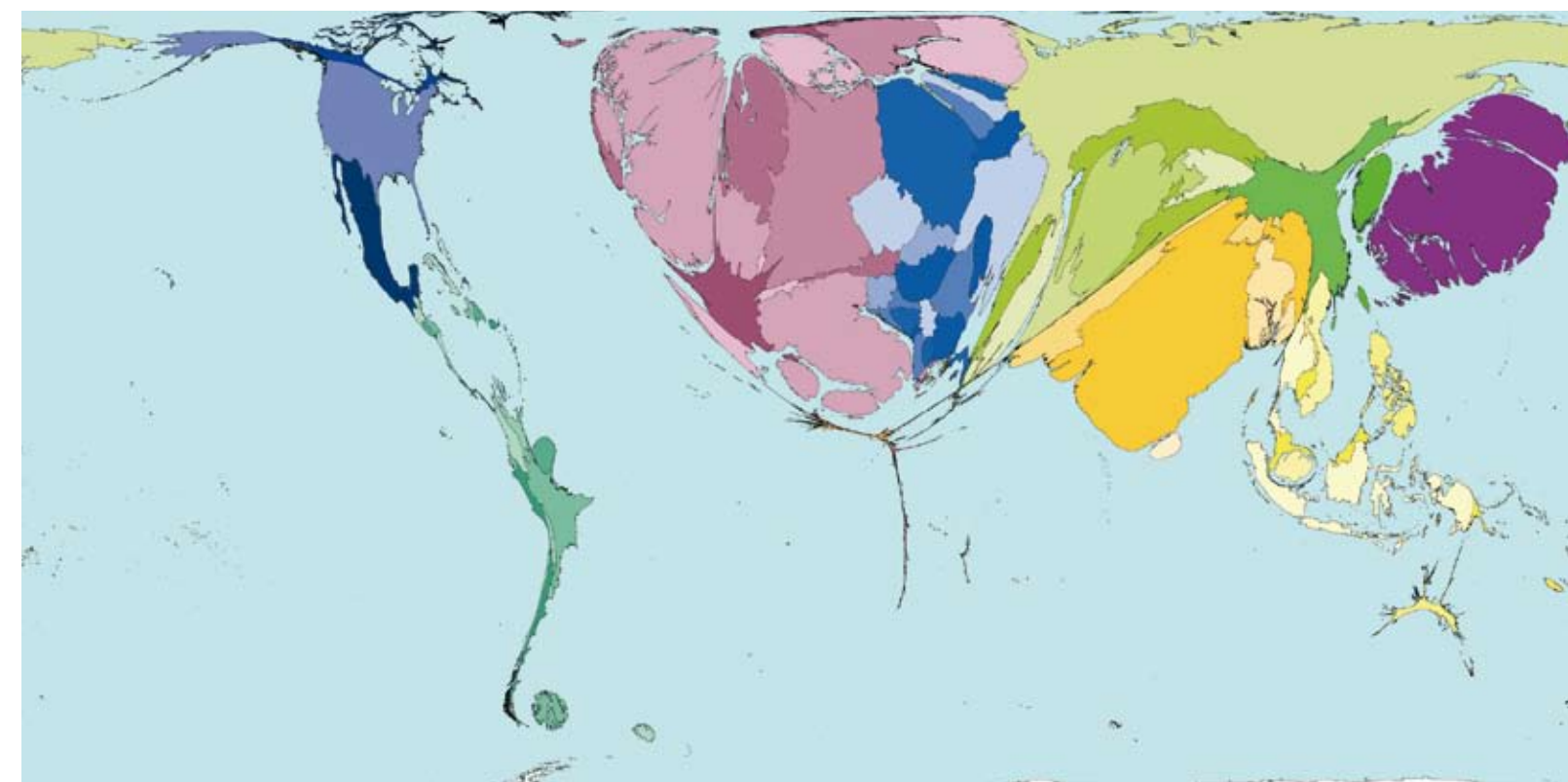
Map Legend:

Books Published (above)

This map shows the distribution of book and pamphlet titles published (not the number of copies sold!). A book is defined as having at least 50 pages; a pamphlet has 5 to 49 pages. In 1999 there were one million new book titles worldwide. The most new titles were produced in the United Kingdom, China and Germany. The world rate of new titles is 167 being published per million people per year.

Books Borrowed (below)

The map shows books borrowed from public libraries - which lend books to members for free or for a nominal charge. Libraries share books, making it unnecessary for us to buy books that we will read only once or twice. The most books borrowed were in the Russian Federation. There were high rates of borrowing in Western Europe, Japan and Eastern Europe. In other regions reported book borrowing was lower, and many territories reported very little or no borrowing at all.





THE enLINK LIBRARY



e-journals in nutrition
e-books
Global Health Database

Without access to information there is no education. Six years ago, the Foundation put together the enLINK digital library of nutrition research, which is now appreciated by users in over 30 low-income countries. This library is a concerted action between OVID Technologies, certain publishers and the Foundation.

For nutrition information the enLINK library is already an established and appreciated source of information. The enLINK library targets individual users and so far over 80 registered users from 33 different countries have access to this unique library.

Besides full-text access to key nutrition journals, a large e-book section is fully operational, as well as the Global Health Database.

If you are from a low-income country and if you are working in your country of origin, apply at www.enlink.org to become a registered user. (Please read the instructions carefully and follow the guidelines. Registration and use of the enLINK library are both free of charge.)

enLINK statistics as of December 31, 2010:

- Over 80 users from 33 countries
- More than 20,000 page views per month
- More than 200 views per day



The orange library

**THE enLINK LIBRARY TRUNKS –
THE ULTIMATE LIBRARY FOR
NUTRITION**

These are some of the characteristics of the mobile enLINK nutrition library for institutions in low-income countries. According to medical criteria, the enLINK trunk is definitively too heavy for its height – but as a rare exception these dimensions are welcomed since it represents a condensation of nutrition knowledge in a mobile trunk library.

There is no education without access to information. In today's world, information access is equated with access to the internet and other electronic media. Yet despite all the developments in information technology and computer science, this statement is in part a misconception. It is well known that a combined, integrated access to hybrid collections of printed and electronic resources is at present the most powerful tool for education.



The large trunk
ENGLISH

Colour: orange
Height: 1.0 m
Weight: 80 kg
Number of books: 35
Number of brochures, booklets, etc: 120
Total number of pages: 30,000

The small trunk
ENGLISH
FRENCH

Colour: orange
Height: 33 cm
Weight: 30 kg
Number of books: 10
Number of brochures, booklets, etc: 40
Total number of pages: 10,000

In addition to the digital enLINK library (see <http://www.enlink.org>), the Foundation created a small, traditional, "paper-based" mobile enLINK library. The mobile enLINK library consists of an orange metal trunk containing more than 120 books, brochures and guidelines from the field of nutrition and health. Nutrition cannot be viewed separately from other disciplines, especially medicine, agriculture or public health. Accordingly, the enLINK trunk also contains books such as the Harrison's textbook of medicine and a textbook of tropical medicine. One can find "down to earth", ready-to-use guidelines for the treatment of severe malnutrition or the construction of a home garden.

The enLINK trunk has the same size and layout as the Blue Trunk Library from the World Health Organization (WHO). The enLINK trunk has been created as an addition to the WHO Blue Trunk Library and covers the major issues around the theory and practice of nutrition. The combined use of both trunks will without a doubt have a booster effect on the capacity of many institutions in low-income countries.

Without a doubt it can be said that the trunk library in combination with the enLINK digital library is the ultimate nutrition library, representing the basis for new capacity building for students in the field of nutrition, but also as a booster and knowledge source for experts in the field.

The enLINK nutrition library trunk will initially only be offered as a present to selected nutrition institutes in low-income countries.

So far trunks have been mailed to over 80 nutrition institutes in 26 countries, mainly in Africa and Asia.

French version of the small enLINK trunk

Although English is considered to be the global language dominating most issues of communication and education it is often forgotten that many individuals do not have the opportunity to acquire English language skills. In fact, there are 31 francophone African countries where more than 100,000 million people live. According to the saying "Knowledge gained through the mother tongue is best" the Foundation created a French version of the enLINK trunk.

Order forms for the enLINK trunk are available on the Foundation's website.
Remember that the trunk is free of charge (including free shipment) for institutions in low-income countries.

>30,000 pages of nutrition knowledge!



Order forms for the enLINK trunk are available on the Foundation's website.
www.nestlefoundation.org

Remember that the trunk is free of charge (including free shipment) for institutions in low-income countries.

NEW IN FRENCH



22,000 BOOKS FOR THE ASMARA PUBLIC LIBRARY

Reading is the universal means to access knowledge. The geographical areas (see also maps on page 13) where hardly any books are printed are identical to those areas where books cannot be borrowed, either. A deadly combination for any development to the better. This gap has to be filled, since literacy and basic education go hand in hand with better health and nutrition as well as economic development.

In a concerted action between the Foundation and Books For Africa (an organization which collects and distributes books for educational purposes in Africa, www.booksforafrica.org) a 40-foot sea container, holding approximately 22,000 primary and secondary books, was sent to fill the bookshelves of Asmara Public Library, the largest public library in the small country of Eritrea. Despite difficult transport conditions within Eritrea, the container arrived in Asmara in May 2010. After clearance the books will be distributed in part to other local libraries in Massawa, Keren or Madefera.

Capacity building and capacity development in nutrition and nutrition research has been one of the main pillars of the activities of the Foundation during more than four decades. Ideally, capacity building should take place along the whole life cycle, starting as early as possible. In many areas of the world basic schooling and education are not developed fully, thus leaving more opportunities for non-institutional capacity building. "Brain power", i.e. young educated and brilliant students, need to be created as early in life as possible. Needless to say, public libraries do play a key role in this crucial developmental process.

Insufficient reading skills are a risk factor and handicap for long-term good health, good nutrition and also the economic development of an individual but also a whole population. A recent study by Evans et al. (2010) reported that children from 27 different countries growing up in families with a home library get on average 3 years more schooling than children from "bookless homes". These school achievements are independent from their parents' education, occupation and also socioeconomic situation – they depend only on the availability of books at home. The positive effects remain strong even after controlling for the classical sources of educational success, i.e. parents' education, or the class of the family. Each additional book in a household led to a further improvement of educational success and it is good to remember that the effects are strongest in children from lower socioeconomic strata. If there are no books at home, one has to ensure that they are available in public libraries. Unfortunately this is often not the case (see maps). The consequences are known, but generally forgotten.

Offering over 20,000 books to the Asmara Public Library will have an "unimaginable effect on the development of our country", as Mr. Ephrem Matewos, the director of the library, said. The Foundation is evaluating ways to further develop these aspects of basic capacity-building groundwork.

One key official from the Eritrean Government sent us an encouraging email that was short but says it all: "I am dead certain of one thing and that is: we do need books!" Unfortunately, this is also valid for many other countries.



A day of reading is a day of gain,
A day without reading is ten days of loss.

Chinese proverb



OTHER ACTIVITIES

NEW RESEARCH PROJECTS

INSTITUTIONAL SUPPORT

OTHER CAPACITY-BUILDING ACTIVITIES

In 2010 the Council decided to fund
11 research projects.

SCHOOL FEEDING

MICRONUTRIENTS & INFLAMMATION

NUTRITION EDUCATION

IODINE

MICRONUTRIENT STATUS

NEW RESEARCH PROJECTS

BREASTFEEDING & CHILDHOOD OBESITY

PEARL MILLET

NUTRITION & PREGNANCY OUTCOMES

PROMOTION OF BREASTFEEDING

INFANT FEEDING PRACTICES

SCHOOL FEEDING

Improving nutritional status of schoolchildren through consumption of cowpea – A food sovereignty perspective

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USD 88,522

Over the years, interventions have been put in place to contribute to solving hunger and anaemia especially among school-age children. One such intervention has been the school feeding programme (SFP). SFPs are common in both developing and industrialized countries with the common objectives of providing meals or snacks to reduce short-term hunger in the classroom so that pupils can concentrate and learn better, and to attract children to school and have them attend regularly. There is evidence from a number of countries that suggest that SFPs have fulfilled some or all of these objectives but little has been demonstrated of their contribution to reducing micronutrient malnutrition.

The interest of the present research project is in the potential contribution of cowpea, as used in a SFP, to contribute to improving iron status of beneficiary school children. The general objective of this study is to assess the efficacy of iron-fortified cowpea-based diet to improve diet quality and (micro-)nutritional status of school children (classes 1-3) as well as its contribution to food sovereignty in the Tolon/ Kumbungu district.

The proposed research is part of an interdisciplinary cross-country research project of the Wageningen University, the Netherlands, entitled "Tailoring Food Sciences to Endogenous Patterns of Local Food Supply for Future Nutrition" (TELFUN). Breeding, Food Science/Technology and Social Science are the three other key disciplines which are involved in this project.

Effect of fish meal and vitamin C on the iron status of Ghanaian children consuming cowpea-based food

Godfred Egbi

Noguchi Memorial Institute for Medical Research
College of Health Sciences
University of Ghana
Legon, Ghana
USD 17,941

Iron deficiency and anaemia are a public-health concern among Ghanaian children. Ghana Health Services in 2003 indicated that 76% of children under five years of age had various degrees of anaemia. In the same year, 73% of children between 2-10 years assessed for micronutrient deficiencies and prevalence of parasitic infections had anaemia. The causes of iron deficiency and anaemia among Ghanaian children are multifarious. It is often due to intake of poorly bioavailable non-heme iron from plant-based diets. These diets have appreciable amounts of non-heme iron but also contain anti-nutritional factors (phytates and polyphenols) which inhibit non-heme iron absorption. Information gaps exist on the efficacy of plant-based diets to improve the iron status of individuals and populations.

This proposed study seeks to investigate the effect of fish meal and vitamin-C-rich juice on the iron status of Ghanaian children consuming cowpea-based food. The study sample will comprise school children 6-12 years of age. The study has two components: a baseline phase and a nutrition intervention phase. For the baseline, selected children will be assessed for their iron status (ferritin and transferrin receptor levels) and hemoglobin concentrations. Dietary iron intake will be assessed using the 24-hour-recall method. The iron content of cowpea-based foods will be determined. The iron bioavailability of the diets will be estimated with bioavailability algorithm. During the intervention phase, there will be two groups: an intervention group and a control group. The intervention group will be assigned to a 15% fish-meal-fortified cowpea-based food and served 300 ml of vitamin-C-rich juice (34 mg/100 ml). The control group will be given cowpea-based food and served 300 ml of Fanta lemon drink. The iron status of the two groups will be determined and the results compared for any differences. Finally the results of the study should lead to implementation in daily life.

MICRONUTRIENTS & INFLAMMATION

The role of sub-clinical inflammation on micronutrient status of Myanmar adolescent girls during micronutrient supplementation

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and

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USD 50,707

Anaemia is a major nutritional problem in Myanmar. It results from the interaction of several causal factors, and a better understanding of the etiology to interpret the prevalence and to formulate appropriate measures is necessary. Anaemia is mostly caused by iron deficiency, but infection/inflammation and other micronutrients such as vitamin-A deficiency are also important determinants. Both deficiencies are influenced by inflammation but there is often a lack of information on the prevalence of inflammation during nutritional studies.

Anaemia prevalence during pregnancy is high and responsible for poor pregnancy outcomes in developing countries. The adolescent period is a window of opportunity to improve nutritional status before pregnancy, and new ways of effective intervention are needed. The purpose of this study is to investigate the role of sub-clinical inflammation on anaemia, iron and vitamin-A status during micronutrient supplementation. The findings will show the extent to which micronutrient supplementation has been hampered by inflammation and to formulate the necessary measures to overcome the interference.

A block randomized, double-blinded, placebo-controlled experimental study will be conducted to ensure the equal distribution of inflammation status among groups. Subjects will be assigned to one of the four groups: placebo, Fe, Vitamin A and Fe + Vitamin A. They will receive weekly supplementation of 60 mg elemental iron and/or 20,000 IU vitamin A for 12 weeks.

In a province where anaemia prevalence is high, apparently healthy, post-menarcheal, anaemic school girls (Hb<120 g/L) will be recruited from high schools. To assess anaemia, iron, vitamin A, and inflammation status, three blood collections will be performed: one week after deworming, at the middle and at the end of the supplementation.

NUTRITION EDUCATION

Intensive nutrition and hygiene education for improving nutrient intake of children aged 6-11 months

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USD 40,547

The first year of life is a critical period for human growth and development. Young children are at risk of inadequate nutrient intake, which may be caused by a lack of access to a sufficient amount and variety of foods. Often times, caregivers cannot make use of the available resources due to lack of knowledge, inappropriate beliefs and practices and incorrect advice. Educational interventions have shown to be effective in changing feeding practices, increasing dietary intake, and improving child growth. The importance of hygiene practices is as great as nutrition practices for ensuring optimum growth and development of children. Within growth monitoring and promotion activities, cadres who run the Integrated Health Post (posyandu) are supposed to provide nutrition education and advice for mothers, but this function is the most neglected.

This study will assess the effect of intensive nutrition and hygiene education provided by cadres towards the nutrient intake of infants 6-11 months old. The main outcome variables are the intake of energy, protein, iron and zinc and score of food safety practices. The study will be in Bekasi municipality, a peri-urban city where child undernutrition (21.5%) and diarrhea (16.7%) is prevalent. Posyandu will be the cluster of the study with a total sample of 224 infants. Randomization into intervention and control groups will be done at the posyandu level. The WHO/UNICEF complementary feeding guideline and the result of a previous HACCP study on complementary food will be used as the basis for the development of modules. Training materials will be provided in the form of a flip chart (for cadres), fliers (for mothers) and posters (for posyandu). The intervention group will receive nine counseling sessions delivered by trained cadres within a three-month period. The control group will receive existing services as part of the growth monitoring program provided by local cadres.

IODINE

Urinary iodine concentration of pregnant women in Zambia as an indicator of their iodine nutrition status

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USD 31,680

Iodine deficiency disorder (IDD) is the world's most significant cause of preventable brain damage and mental retardation in human populations. Women suffer from IDD more frequently than men of the same age. Maternal IDD in early pregnancy can result in irreversible cretinism as well as miscarriages, stillbirths, and low-birth-weight babies.

In Zambia, a national baseline study was done in 1993 using goitre prevalence rate and median urinary iodine concentration as indicators of IDD. The study included one school from each of the nine provinces. Results showed a significant IDD problem in schoolchildren between 7-12 years old, suggesting IDD problems in the country. After the baseline survey, many activities in IDD control were put in place, including the revision of the salt legislation and implementation of universal salt iodation. In 2002 the same clusters of schools were used, this time for a sentinel surveillance study. Two additional schools in the Kasempa and Kaputa districts were included because these are the areas with the highest production of local salt in Zambia. The median urine iodine excretion concentration of 245 µg/l from these sentinel sites indicated that overall iodine intake in the Zambian (children) population was sufficient. However, a mild IDD was found at one site in Katete, Eastern Province.

In all previous studies of IDD in Zambia, there were no reports of studies targeting pregnant women. Therefore, this proposal aims at a pre-study of the iodine nutrition status of pregnant women. A sample of pregnant young women in their first semester will be used. The urinary iodine concentration will be measured in a casual urine sample of each subject. The iodate content of salt samples from households of the participants will also be measured. The pilot study will include pregnant women from Kitwe, Kasempa, Mpika and Kaputa.

MICRONUTRIENT STATUS

Efficacy of combined selenium and iron supplementation on micronutrient status of school children

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USD 49,000

Vitamin A deficiency, iron deficiency anaemia, and selenium deficiency are public-health problems worldwide. These deficiencies often coexist in children in developing countries. Single micronutrients fortified with iron have successfully been studied in Vietnam. Preliminary evidence suggests that selenium might modulate iron status and metabolism. The potentially favourable effect of a combined iron-selenium supplementation on the control of anaemia among schoolchildren will be evaluated in this study.

To test the effects of iron fortification combined with selenium on controlling anaemia among schoolchildren, different intervention groups will be studied. In the iron group, children will daily receive 10 mg of iron; in the selenium group, children will daily receive 40 µg selenium; in the iron-selenium group, children will receive a daily dose of 10 mg iron and 40 µg selenium; and there will be a placebo group. The children will receive a dose of supplements five days per week for six months. Subjects of the study are schoolchildren 6-11 years old in poor areas of North Vietnam. Nutritional collaborators will administer the supplements to the children. Before the initiation of the study, all subjects in all groups will be de-wormed by a single dose of Albendazole 400 mg. Variables such as weight and height, and biochemical indicators such as serum selenium, serum retinol, hemoglobin concentration, serum ferritin, transferrin receptor, C-reactive protein (CRP) and Alpha-1 glycoprotein (AGP) will be collected at baseline and after six months of intervention.

BREASTFEEDING & CHILDHOOD OBESITY

SMS and web-based support for appropriate infant feeding to prevent childhood obesity in urban China

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USD 50,500

Following rapid economic development in the last two decades, China is going through a nutrition transition. As a consequence, the prevalence of adult and childhood obesity is on the rise. The obesity rate for children under 7 years of age has almost tripled in the past 20 years. Meanwhile, a decline of the breastfeeding rate (exclusive or predominant) has been documented. Data from the fourth National Health Services Survey (2008) indicated that the exclusive breastfeeding rate in urban areas was only 15.8% for infants under 6 months. Furthermore, inappropriate feeding practices and lack of 'feeding interaction' skills between caregivers and infants is very common in China. The low level of breastfeeding is likely contributing to the emerging childhood obesity epidemic in China. There has been, however, little intervention research aimed at improving infant feeding in China. There is an urgent need, therefore, to initiate research to explore effective ways of promoting breastfeeding and feeding behaviours during infancy in China.

As part of the rapid economic and social development in China mobile phones and the Internet are widely used and have become an important platform for communication and information exchange. Short message services (SMS) and web-based interventions have shown to be effective and beneficial in promoting healthy behaviour changes. The feasibility and acceptance of health promotion for breastfeeding and appropriate infant feeding using SMS and web-based intervention, however, need to be tested in China.

This project is designed to develop and implement a community-based health promotion project in Shanghai, China. The study will provide personalized advice and support for breastfeeding and infant feeding, through SMS and the Internet, to expecting and new mothers. This proposed small research grant will provide the basis for a larger intervention project to fully evaluate this innovative intervention in the near future.

PEARL MILLET

Pilot study to assess the acceptability of pearl millet grain at macro and micro levels in rural Eastern Kenya

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and

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USD 19,927

This pilot study is a demonstration project to assess the acceptability of switching from maize to pearl millet in two rural villages in Mbooni West currently subsisting on maize. The hypothesis to be tested is that with appropriate training, mothers will incorporate pearl millet into the daily diets of the children, and households and villages will accept this change.

With the endorsement of the Kenyan government (National Council for Science and Technology) and with the local district office and elders of two villages in the Ukambani region of Kenya, approximately 40 households will be recruited, each with weaned children under 5 years. Mothers will be taught the additional nutritional value of pearl millet and given hands-on training on its preparation and storage. Menus incorporating pearl millet will be provided. Grain will be given to each household for a 3-month period and mothers will be encouraged to replace maize with pearl millet, especially for children. Random 24-hour diet recalls will be conducted with mothers for their children during the study. Surveys will be conducted in the household and at community focus groups to assess the level of acceptance of pearl millet into the daily diet.

The aim is that at the end of the training program, 70% of mothers will readily gain the skills to prepare and incorporate pearl millet into the daily diet of children. Overall, 65% of the meals given to children in the 40 households will incorporate pearl millet and 40% of the meals for adults. The study will show whether the reintroduction of pearl millet will be accepted and whether the reintroduction might represent a good means to improve the nutritional status of the population, especially the children.



NUTRITION & PREGNANCY OUTCOMES

Pre-conceptional vs gestational food supplements and pregnancy outcomes in rural Vietnam

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and

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Davis, California, USA

and

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USD 299,346

Poorly nourished women tend to have poor pregnancy outcomes. Consequently, women world-wide are advised to take micronutrient supplements during pregnancy. The impact of this advice has been disappointing. Possibly, this is because programs initiated during pregnancy are too late to affect maternal nutrition and fetal growth. In rural Vietnam, the incidence of low birth weight and preterm births is high. Also, the women rarely eat micronutrient-rich animal source foods (ASF), and their intakes of iron, zinc, vitamins A and B12 are low, which is associated with a high prevalence of anaemia and infection. The effect of a small (<150 kcal), micronutrient-rich, ASF supplement given from pre-conception to term has never been compared with an ASF supplement given from mid-gestation to term or with routine prenatal care. The goal is to evaluate the effects of an ASF supplement given pre-conception to term (PC-T, group 1) with ASF supplementation from mid-gestation to term (MG-T, group 2) and with routine education only (group 3) on birth weight, prematurity, maternal nutritional status, and maternal infections in rural Vietnamese women randomized to one of the three intervention groups. This is the first study to assess the interaction among maternal nutrition, infection and pregnancy outcomes. It also is the first head-to-head comparison of pre-conceptional versus gestational supplementation. Further, if an ASF supplement given prior to pregnancy improves outcomes more than a gestational intervention, current world-wide prenatal recommendations will undergo a major paradigm shift.

PROMOTION OF BREASTFEEDING

Testing the efficacy of an audio program and discussion guide in promoting exclusive breastfeeding in Cameroon, Africa

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and

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USD 106,146

In the Northwest Region of Cameroon, Africa, approximately 90% of women initiate breastfeeding; however, a significant number of these women do not continue exclusive breastfeeding for the recommended six months. In Africa, radio is the most commonly utilized form of mass media. Research shows that messages broadcast via radio have the potential to influence behavior change in listeners and to facilitate discussion among community members and listeners. By using a randomized experimental intervention, this project will test the hypothesis that an audio drama and discussion guide can increase the duration of exclusive breastfeeding among women in the Northwest Region of Cameroon. This will be tested by designing an audio drama and discussion guide and evaluating differences in exclusive breastfeeding knowledge, attitudes, and practices between participants who receive standard care (group 1), standard care plus listening to an audio program (group 2), and standard care plus listening to an audio program and participating in a post-listening discussion (group 3). This project will be developed in coordination with local health workers trained in using qualitative research methodologies to design audio programs for future radio broadcasting. Upon completion of the project, the audio program and discussion guide will be made available to health clinics and non-governmental and international development organizations in the region for health education. Prior to distribution of the program and discussion guide, health workers will be trained in using the audio program, leading post-listening discussion groups and counseling pregnant women to exclusively breastfeed.

INFANT FEEDING PRACTICES

Feeding practices in Guatemalan infants – Adherence to the WHO recommendations and barriers to their implementation

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Guatemala

USD 20,000

Guatemala’s high prevalence of childhood chronic malnutrition may be related to suboptimal early infant feeding practices. Between 2000 and 2007 only 51% of Guatemalan infants were exclusively breastfed for 6 months and only 67% of infants 6-9 months were partially breastfed. In low-income peri-urban Guatemala, where 42% of the children under 3 years of age are chronically malnourished, most mothers (79%) did not initiate breastfeeding in the first hour and only 14-23% of infants were exclusively breastfed for the first 6 months of life. Additionally, by 2 months of age, 39% were exposed to bottle feeding, which may lead to microbial contamination. The proposed study aims to monitor the adherence to the WHO recommendations in infants until 6 months in the urban areas of Quetzaltenango. Half the population is of Mayan origin and the other half is Ladina, and both groups are undergoing rapid urban and economic development. The aim of the study is to determine if mothers are adhering to the WHO early feeding practices, and examine the barriers to this recommended behaviour. Length of exclusive breastfeeding, predominant breastfeeding and any breastfeeding and the determinants for the changes in intensity will be examined. Quantitative methods will be used to identify the feeding practices most related to poor child health outcomes, whereas qualitative methods will be used to explore reasons for these behaviours. Lessons from successful mothers will be derived to improve adherence to the WHO early feeding recommendations according to the Positive Deviance approach.

One of the major aims of the Nestlé Foundation is the transfer of sustainable capacity-building knowledge to low-income countries. During 2010 several different capacity-building activities were supported.



INSTITUTIONAL SUPPORT AND OTHER CAPACITY-BUILDING ACTIVITIES

AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT

Local dissemination of nutrition knowledge is of great importance. There are only a few nutrition journals on the African continent, one of them being the African Journal of Food, Agriculture, Nutrition and Development (AJFAND) (see also <http://www.ajfand.net>). The AJFAND is meant to create awareness of the multiplicity of challenges facing Africa that lead to abject poverty and destitution. The Foundation is supporting this important effort with a contribution for each issue. The journal is only available as a web-based publication. The submission of original articles and other contributions can only be encouraged.

AFRICAN NUTRITION LEADERSHIP PROGRAM (ANLP)

The African Nutrition Leadership Program (ANLP) is a leadership development and networking seminar in the field of human nutrition in Africa. The ANLP concept is based on activities initiated by the Food & Nutrition Program of the United Nations University (UNU-FNP) and the International Union of Nutrition Sciences (IUNS). Every year a one-week leadership program is held at the University of Potchefstroom (South Africa). The Foundation supports this program and yearly event with an annual contribution.

THE ORANGE enLINK TRUNK LIBRARY: ENGLISH AND FRENCH VERSIONS

In 2010 the orange enLINK trunk has been provided to 20 different nutrition institutions in more than 10 different countries in Asia and Africa (see page 17). Since the enLINK trunk contains only new books and publications, it represents a key addition to the existing libraries in different nutrition institutes. In certain institutions the enLINK trunk represents actually the foundation on which a nutrition library will be built. At present the small and the large orange enLINK trunk are offered free of charge. The small trunk is also available in French.

AFRICA

FORMATION INTERNATIONALE EN NUTRITION ET SCIENCES ALIMENTAIRES (FINSA)

In 2010 the FINSA course took place for the 19th time at the Department of Nutrition and Agricultural Sciences of the University of Abomey-Calavi (Benin). For many years the Foundation has supported this course in French to promote capacity building in French-speaking Africa. Besides support for the infrastructure of the course the Foundation covered the travel cost as well as participation fee for 7 participants from Niger (1), Ivory Coast (3), Cameroon (1), and Burkina Faso (2). It is crucial that nutrition courses continue to be held in French to promote research capacity in the many French-speaking countries of Africa.

BOOKS FOR AFRICAN LIBRARIES

In a concerted action between the Foundation and Books For Africa (BFA) a 40-foot sea container, holding approximately 22,000 primary and secondary books, was sent to fill the bookshelves of the Asmara Public Library. Despite difficult transport conditions within Eritrea, the 40-foot container arrived in Asmara in May 2010. After clearance at the Asmara Public Library the books will be distributed in part to other local libraries in the capital, but also other cities such as Massawa, Keren or Medefera. Thousands of readers of all age groups will have hundreds of new books and plenty of information (see also page 18).

UNIVERSITY OF MALAWI

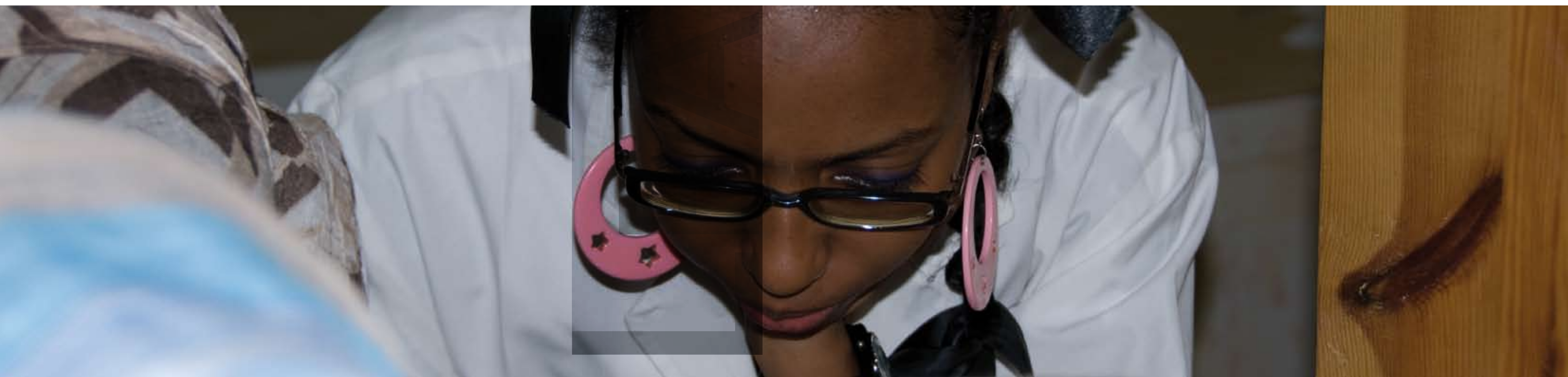
Based on a research application to test the efficiency of a fortified peanut-based spread in children for different malnutrition in the Mangochi Child Nutrition Intervention Study, a fellowship was given to two students from the Division of Community Health of the College of Medicine at the University of Malawi to complete their nutrition education at the Department of International Health at the University of Tampere Medical School in Tampere (Finland). Upon completion of their studies in Finland the two students will return to Malawi and strengthen the theoretical and practical capacity in the field of nutrition research at the College of Medicine in Mangochi (Malawi).

ANLP GRANT PROPOSAL WRITING WORKSHOP

The start for a research career is a good and feasible research idea which needs to be put down on paper in form of a grant application. There is no modern research without funding. "Want research money, write a grant" is an oft-mentioned straightforward recommendation, yet we all know that grant writing is a science in itself. Accordingly the ANLP (African Nutrition Leadership Program) directorship decided to organize a 4-day grant writing workshop in Windhoek (Namibia) early in December 2010. Twenty-two participants from the over 200 ANLP alumni from more than 10 different African countries were invited to participate in this workshop. Almost all of the participants already have their PhD degree and they brought along a nearly final draft of a grant proposal. The aim of the workshop was to become a master in grant and proposal writing. Theory and practice was communicated during four intense working days. After the four days all participants advanced well in the art of «grantsmanship» and were able to understand the principles of success and failure and all made a step in the right direction. Nevertheless, they also all became aware that the science of grant writing is nearly as difficult as rocket science ... it is a matter of training. It is hoped that some of the participants will be successful grant writers in 2011. The Foundation supported this workshop as one of the main sponsors.

SENEGAL

The MS program in the Nutrition Unit (Equipe de Nutrition, Faculté des Sciences et Techniques) at the University Cheikh Anta Diop (UCAD) in Dakar (Senegal) received a grant to improve the IT infrastructure for the students and the research team. The Nutrition Unit at UCAD was created 20 years ago and has offered an MS/PhD course since 2004.





VISION 2010

Maternal nutrition is of critical importance for fetal growth and development. As we all know, maternal nutrition can be improved by different strategies. However, as Prof. Janet King underlines, the food-based approach seems to be not only the most promising but also the most meaningful. In view of the present trends a paradigm shift back to food-based approaches is needed. The research agenda has to be adapted accordingly.

In the same sense, the article by Dr. Lalita Bhattacharjee and Council Member Prof. Kraisid Tontisirin underlines the importance to go “back to the roots” of nutrition and health knowledge. To improve health and nutrition, no highly sophisticated strategies are needed but instead just basic key actions based on a comprehensive multilayer approach – from agriculture to nutrition and health education.

The same would also apply to the solution for overweight and obesity. Dr. Tang, a Nestlé Foundation

grant recipient, offers solutions to the obesity problems based on her PhD studies in Vietnam. Once more, enLINKing strategies and going “back to the roots” seem to be crucial.

In view of the climate change, changing global eating patterns and the food price surge, the invited contribution from Prof. Bernhard Lehman on agro-economics is more than timely and might show us new roads to pursue in research and policy as well as the development of sustainable solutions for malnutrition and disparity.

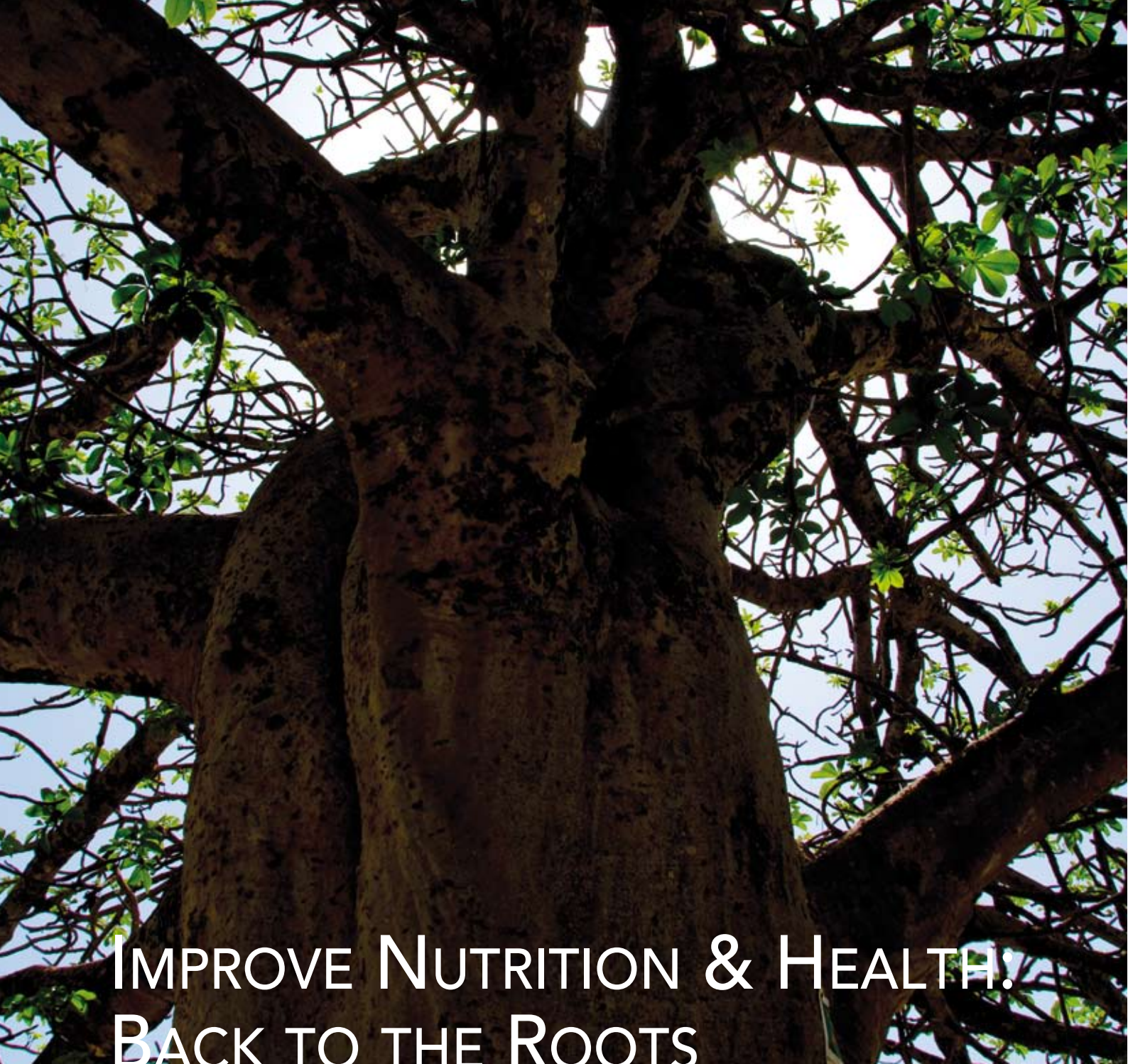
These four contributions illustrate major areas of activities of the Nestlé Foundation. It is obvious that we have to go back to basic issues and enLINK the solutions to malnutrition by disentangling the basic causal roots. “Back to the roots” means also applying sustainable and implementable solutions, a strategy which the Foundation has pursued for more than four decades and which has been intensified by the enLINK initiative.

IMPROVE NUTRITION & HEALTH:
BACK TO THE ROOTS

MATERNAL NUTRITION & HEALTH

NUTRITION TRANSITION

AGROECONOMICS



IMPROVE NUTRITION & HEALTH: BACK TO THE ROOTS

Causal strategies to improve nutrition and health: back to the roots

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Introduction

Nearly one-sixth of the world's population suffers from hunger, which has far-reaching effects. Each year, over 3.5 million children die from undernutrition (1). More than a third of the world's population suffers from micronutrient malnutrition, which exists as a form of hidden hunger, the effects of which are often overlooked. Micronutrient deficiencies arise largely due to a habitually low dietary consumption of micronutrients in relation to requirements. This situation is often seen in food-insecure households in much of the developing world. The underlying cause of this inadequate consumption is what needs to be appropriately addressed. Diets in developing countries generally lack many nutrients, including

energy (inadequate amounts of food), so that strategies need to also emphasize an increase in total food intake, in addition to a greater variety. Increasing dietary diversification is the most important factor in providing a wide range of nutrients/micronutrients, and to achieve this in a development context requires an adequate supply, access and consumption of a variety of foods. Agriculture can play a major role in combating the challenges of hunger and malnutrition. Linking community development policies to national programmes for improving nutrition and health, with an emphasis on increasing the variety of foods consumed, is probably the best strategy on a sustainable basis.

Food consumption and nutrition situation

The analysis of dietary energy supplies (DES) (2) data shows that the dietary energy availability has increased globally from the mid-1960s to the late 1990s by approximately 450kcal/capita/day and by 600 kcal/capita/day in developing countries, but the change has not been equal across regions. The world has made significant progress in raising food consumption per person. Current energy intakes range from 2681 kcal/capita/day in developing countries to 2906 kcal/capita/day in transition countries and 3380 kcal/capita/day in industrialized countries. The growth in food consumption has been accompanied by significant change and shift in diets away from staples, such as roots and tubers, towards more meat products and vegetable oils. Per capita energy supply from both animal and vegetable sources has declined in the transition countries, but has increased in developing and industrialized countries (3).

Worldwide, an estimated 925 million people were undernourished in 2005-2007 with most (835.2 million) living in developing countries. A majority (578 million) of the undernourished is concentrated in the Asia Pacific region. The absolute number of undernourished people has changed little over the last decade. However while China had major reductions in its cases of protein energy malnutrition during this period, this was balanced by a corresponding increase in the rest of the developing world (4). The incidence of undernourishment has declined from 20% two decades ago to 16% at present. The proportion of undernourished children under five years has been lowered from 33% in 1990 to 26% in 2006 (5). Worldwide, however, the number of undernourished people remains unacceptably high with population growth and recent economic hardships threatening further improvements.

Micronutrient deficiencies, especially deficiencies in iron, iodine and vitamin A, are more widespread worldwide than protein deficiencies (6). An estimated 163 million children are vitamin-A deficient, 700 million people are affected by goiter and 500 million or more women are anaemic. Malaria also has a substantial

effect where endemic and anaemia is one of the reasons for malarial control. Besides being important causes of disability in themselves, micronutrient deficiencies often underlie other types of morbidity. Using underweight as a marker of malnutrition, almost 150 million children were reportedly undernourished at the turn of the century, most of whom reside in Asia (7). The lack of progress in the reduction of intra-uterine growth retardation (IUGR), an important determinant of subsequent growth and development, is of particular concern in South Asia, where one out of three children are born with low birth weight (less than 2.5 kg). This contrasts with prevalence rates of less than 10% in industrialized countries or even in other developing countries, such as Mexico and China (8). Along with the burden of undernutrition among children and chronic energy deficiency (CED) in adults in many parts of Asia, the burden of overweight and obesity is becoming increasingly widespread (9). In some countries, this situation exists amidst continued food shortages and nutrient inadequacies.

Linkages between agriculture and nutrition

Agriculture underpins both household incomes and community wealth. Recent advancements in our understanding of the nutritional needs of populations suggest that the integration of agriculture and human nutrition should be positively exploited for improvement in nutrition, health and human capital. Unfortunately, the thrust of food production strategies to date has been mainly on cereals and other starchy staples which provide energy, with much less emphasis on fruits and vegetables or small livestock, which are rich sources of micronutrients. There is also lack of integration at the farm level between plant and animal production. This is particularly true for small livestock and fish that are particularly important in improving the micronutrient value and protein content of diets of rural communities in developing countries. Opportunities for promoting non-intensive small livestock production, such as raising chickens and ducks, can also fulfil critical niches in the agro-ecosystems of developing countries.

However, the world is facing erosion of genetic diversity in food crops, resulting in loss in food production diversity. Many of the traditional cultivars have been replaced by a relatively small number of high yielding pest- and drought-resistant varieties. Cultivation of such crops has tended to benefit large-scale farmers who have access to water management and other facilities. Monoculture practices for a few staple crops, notably rice, wheat and maize, have led to a decline in the consumption of more diverse grains. The resulting distortion in the pattern of food grain production has in turn been reflected in the relative market price of these food grains and this trend has coincided with a net decline in the diet's

fiber content. Asian diets that are traditionally cereal-based are seen to be undergoing changes in structure and patterns. Diets are becoming distinctly higher in fat and protein content. More specifically, the changes have included shifts towards higher energy density diets, characterized by increased consumption of fat and added sugars, saturated fat intake and reduced intakes of complex carbohydrates, dietary fiber, and fruit and vegetables (10). Altogether, these shifts have contributed to a rise in overweight and obesity throughout the developing world (11). Given that globally indigenous people use diverse ways to procure food which includes hunting, gathering, fishing, and herding but also subsistence farming and trading, there is a need to strengthen the diversity in the food supply to enhance nutrition while protecting environmental integrity (12).

Policy Interventions

As part of a comprehensive approach to interventions, all aspects of production, access and utilization issues of food should be incorporated in the national food and agriculture policies with nutritional outcomes among their goals. While the overarching goal of the policies should be to sustainably reduce poverty and malnutrition by tackling the root causes, implementation strategies should work towards achieving large-scale and sustainable impact. Developing policy which is strongly supportive of community-based programme implementation can and should greatly strengthen and improve existing situations. Commencing with the food supply chain, possible solutions should begin with providing a nutrition orientation in agriculture and food supply in addition to adequate and safe food supply and improved services. Production and consumption diversification with a focus on horticulture crops, small livestock and fisheries and better crop diversity and biodiversity should be a key approach. Intercropping and intensive and integrated home gardens and community and school-based nutrition education and community-based food processing and marketing should be emphasized to improve food and nutrition security. Targeting vulnerable groups, notably women and young children, providing massive training and capacity building and implementing nutrition promotion actions should be strengthened, with an emphasis on improving adolescent and maternal diet and infant and young child feeding. The interface between agriculture and health sectors should be bridged so as to combat nutrition problems within an integrated context. Interventions need to be monitored and evaluated in relation to processes and outcomes.

Community-based programs that have been sustainable in addressing undernutrition can be expanded to include nutrition and health-literacy programs that address problems of obesity and non-

communicable diseases. Nutrition labeling will need to be mandatory and national education strategies would need to explicitly cover nutrition promotion and advocacy at various levels (13). Detailed knowledge about patterns of food and nutrient intake is needed to compare existing nutrient intakes and give meaningful advice about appropriate food choices (14). Reducing the supply of fatty, sugary, or salty foods and replacing them with fruits and vegetables and modified/appropriate cooking methods, along with increased physical activities, should be promoted.

Major efforts need to be made through convergent efforts of the agriculture and health sectors to improve national diets through a demand-led food policy whereby nutrition education policies (influenced by food-based dietary guidelines) stimulate consumer demand for healthier food choices (15).

Conclusion

Mainstreaming nutritional considerations in food and agriculture and strengthening linkages with the health sector provides opportunities for increasing food and nutritional security on a sustainable basis. The guiding principles to consider would be: strategic improvement of nutrition outcomes and protection of human capital; positively exploiting the potential of national policies to change food and nutrition behavior; a comprehensive strategy that effectively uses available resources; and finally, accountability at all levels.





MATERNAL NUTRITION & HEALTH

Maternal nutrition and health: a review of intervention strategies

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Introduction

Poor maternal nutrition causes low birth weight (LBW), neonatal morbidity and mortality. Indicators of maternal nutrition both before and during pregnancy

account for over 50% of the LBW cases in developing countries (1). The key question underlying maternal nutrition policies and programs is when and how to improve maternal nutrition. This review looks back at nutritional programs used since the early 1950's, the impact of those programs on pregnancy outcomes, and, based on those data, suggests a future direction.

Maternal nutrition and neonatal health

The association between maternal nutrition and neonatal health was first observed over 80 years ago in experimental animal studies. Lord John Boyd Orr, winner of the 1949 Nobel Peace Prize for establishing

programs to reduce hunger, showed in the early 1930's that pregnant rats fed the diet of the Scottish working class supplemented with milk and green vegetables had bigger offspring more resistant to infection. Nearly a decade passed before studies of diet quality and pregnancy outcome were done in humans. The two leaders were J. Harry Ebbs at the University of Toronto and Hospital for Sick Children and Bertha Burke from the Department of Maternal and Child Health at the Harvard School of Public Health (2, 3). Both observed that supplying poor women with a few simple foods (milk, cheese, oranges, wheat germ) strikingly improved infant mortality and morbidity. Results of the Dutch famine in the winter of 1944-45 augmented the work of Ebbs and Burke by clearly demonstrating that maternal subsistence on a poor diet in the third trimester drastically reduced fetal growth and vitality (4).

A dynamic woman, Agnes Higgins was the first, however, to launch a battle against low birth weight by improving maternal nutrition. She developed a systematic approach to defining the nutritional needs, problems, and risk factors for individual pregnant women and then launched a clinical program of motivational counseling and food supplements to improve maternal nutrition. This program, called the "Higgins Method", was impressive. Ms Higgins demonstrated that her program improved the average birth weight of intervention infants 107g compared to their non-intervention siblings (5). The Canadian and USA WIC (Women, Infants, and Children) food assistance programs, still in existence today, were modeled on the "Higgins Method".

The supplementation era

While studies of diet quality were taking place in the Western Hemisphere in the 1940's and 50's, British scientists began investigating the "physiological anemia of pregnancy" (6). Administering iron orally or intramuscularly showed that the anemia of pregnancy could be prevented. Consequently, therapeutic doses of oral iron supplements became a routine prenatal practice. Due to concern about insufficient folic acid intakes and an increased risk for neural tube defects, the World Health Organization recommends a combined iron-folic acid supplement throughout pregnancy and the first 3 months postpartum (7).

Although supplemental iron and folate reduces maternal anemia and neural tube defects, its affect on fetal growth and survival is weak. A 2009 Cochrane meta-analysis of 49 trials involving 23,200 women failed to find a significant effect of supplemental iron or iron and folate on birth weight, pre-term birth, or low birth weight prevalence (8). A comprehensive review of micronutrients, birth weight, and survival (9) only found two trials, both among iron-sufficient women in the USA, reporting significantly increased birth weights in iron-supplemented versus non-supplemented women. Another trial in China reported



that supplemental iron reduced neonatal mortality, but had no effect on birth weight (10).

It soon became apparent that, when iron was limited, other micronutrients were also likely to be limited in the diets of pregnant women and in 1999 the WHO and UNICEF recommended that pregnant women receive multiple micronutrient (MMN) supplements (11). Since there was considerable evidence that MMN deficiencies were common in developing countries (12), it was assumed that MMN supplements would improve fetal growth and reduce LBW. However, recent studies of multiple micronutrient supplementation (MMS) have also failed to have a significant effect on birth size (9). A systematic review of 12 MMS studies conducted primarily in SE Asia, Africa, and Latin America showed that they only increased birth weight by 22.4 g, reduced LBW by 11%, and Small for Gestational Age (SGA) births by 10%.

What works? Efficacy, effectiveness, and the tendency toward short-term, one-size-fits-all interventions

Given the disappointing impact of single or multiple micronutrients on birth weight and neonatal health, it seems prudent to return our attention to improving diet quality. The Pune Maternal Nutrition Study in India recently demonstrated the strong impact of a few simple quality foods on pregnancy outcome in poor women. Like Ebbs and Burke showed previously, adding green leafy vegetables and milk several times a week improved birth weight by 100 to 200 g after controlling for pre-pregnancy weight, weight gain, physical activity, and socioeconomic status (13). Caan and co-workers evaluated the effect of WIC participation between pregnancies on the outcome of the subsequent pregnancy (14). Receiving WIC supplements for 5 to 7 months between pregnancies increased the birth weight in the second pregnancy by 131 g and reduced the risk of LBW significantly. These data show that a few, simple, quality foods benefit pregnancy outcomes even in women who are not severely malnourished.

The development of single or multiple micronutrient interventions stemmed from a top-down approach that begins with a needs-assessment identifying nutrition-related health problems and isolating causative underlying nutrient deficiencies. This is followed by developing intervention strategies that are tested first for efficacy, i.e., if they produce a measurable biological impact in carefully designed randomized trials, before evaluating effectiveness in large-scale programmatic trials (15). If successful in altering outcomes on both a small scale and when scaled up to the programmatic level, these strategies are promoted, along with data supporting their cost and potential benefit, to non-government and government organizations responsible for implementing national intervention

strategies toward nutritional improvement.

The efficacy/effectiveness model has several pitfalls. First, it favors strategies that are likely to affect dramatic changes in outcome measures over a short period of time in a small sample, and thus promotes relatively quick ways to reduce malnutrition without treating the underlying causes. This model has therefore promoted a focus on therapeutic doses of micronutrients and on health outcomes easily coupled with observable intermediate changes in micronutrient status, despite growing evidence that these intermediate changes may not be relevant to health outcomes (16).

Due to its top-down nature, the current model also fails to address existing health, economic, or agricultural infrastructures or local solutions for the problem, or the need for developing a technically proficient research community at the local level. Despite continued improvement in agricultural production throughout the world, the focus on solutions from the top, coupled with challenges fitting to a model of efficacy and effectiveness, have made food-based approaches much less likely to be considered.

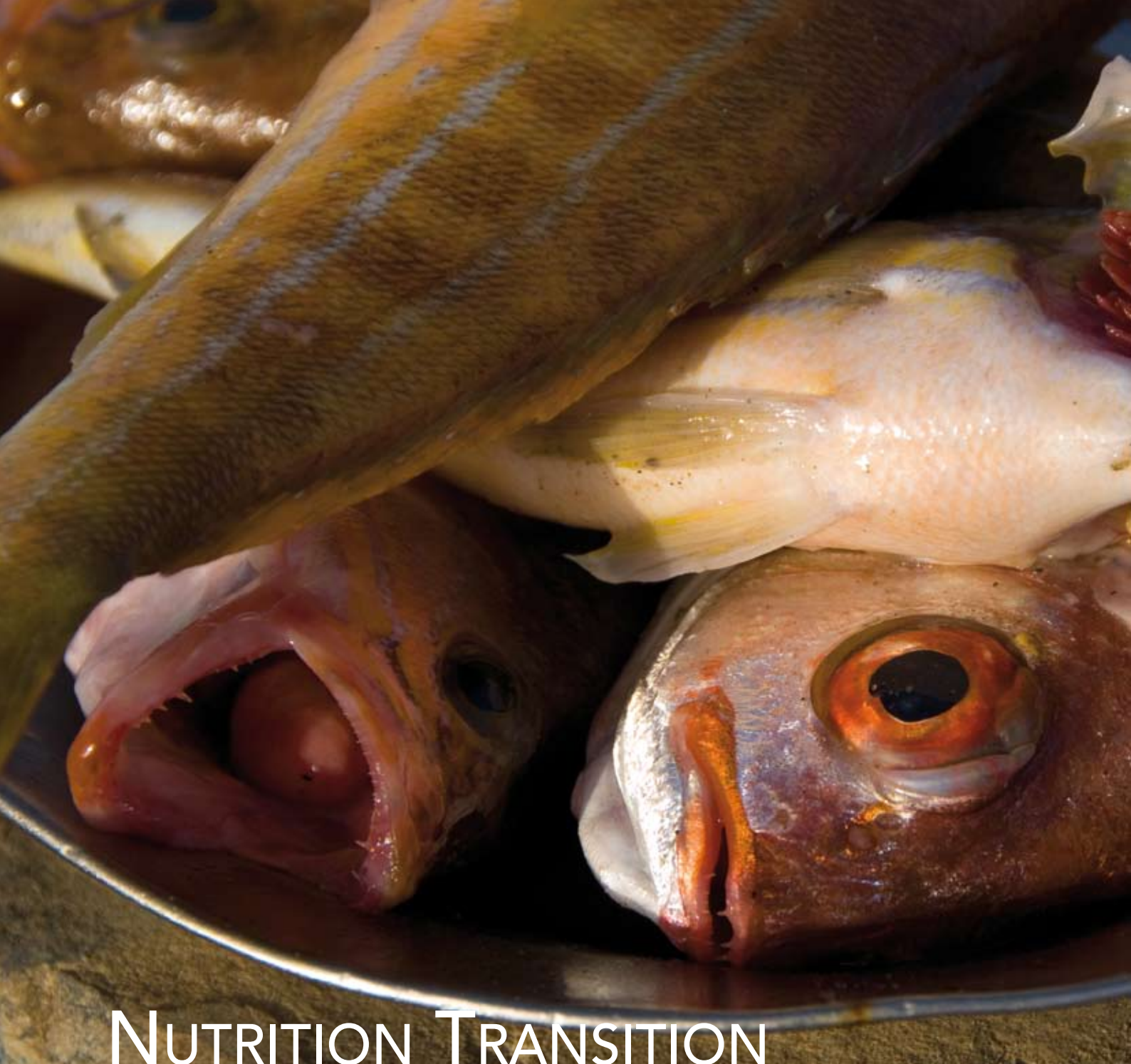
Paradigm shift

In support of a trend back to food-based approaches to combating malnutrition, rather than continue fitting potential nutrition intervention strategies to a Procrustean bed of efficacy and effectiveness criteria, we propose the following changes in paradigm:

1. Conduct a comprehensive needs assessment alongside local stakeholders. Perform a rigorous evaluation of nutritional needs and comprehensive review of previous studies and interventions, develop a multidisciplinary understanding of underlying causes and potential interactions, and identify local resources and infrastructure (such as agriculture and health care) that could be applied toward solutions.
2. Weigh the potential for sustainability alongside that for nutrition and health benefits. Depending on local needs, some approaches with better long-term potential may outweigh those most easily tested.
3. Stress methodological rigor at all stages. Determine appropriate outcomes and the best available methodology for their measurement, and then design supporting research studies. Identify technical limitations and pitfalls at all stages, and develop strategies to overcome them. Be creative; one size does not fit all.

With this paradigm shift, we are confident that developing countries can build comprehensive agricultural and health care infrastructures that will support sustainable improvements in the food supply and a healthier population.





NUTRITION TRANSITION

Vietnamese adolescents: transition from undernutrition to overnutrition

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Ho Chi Minh City is the largest city in Vietnam and a leading centre of financial services, industry, trade, science and technology. Over the last two decades the city has experienced rapid social, economic and demographic changes, which has led to important environmental changes that are influencing many health behaviors of children and adults.

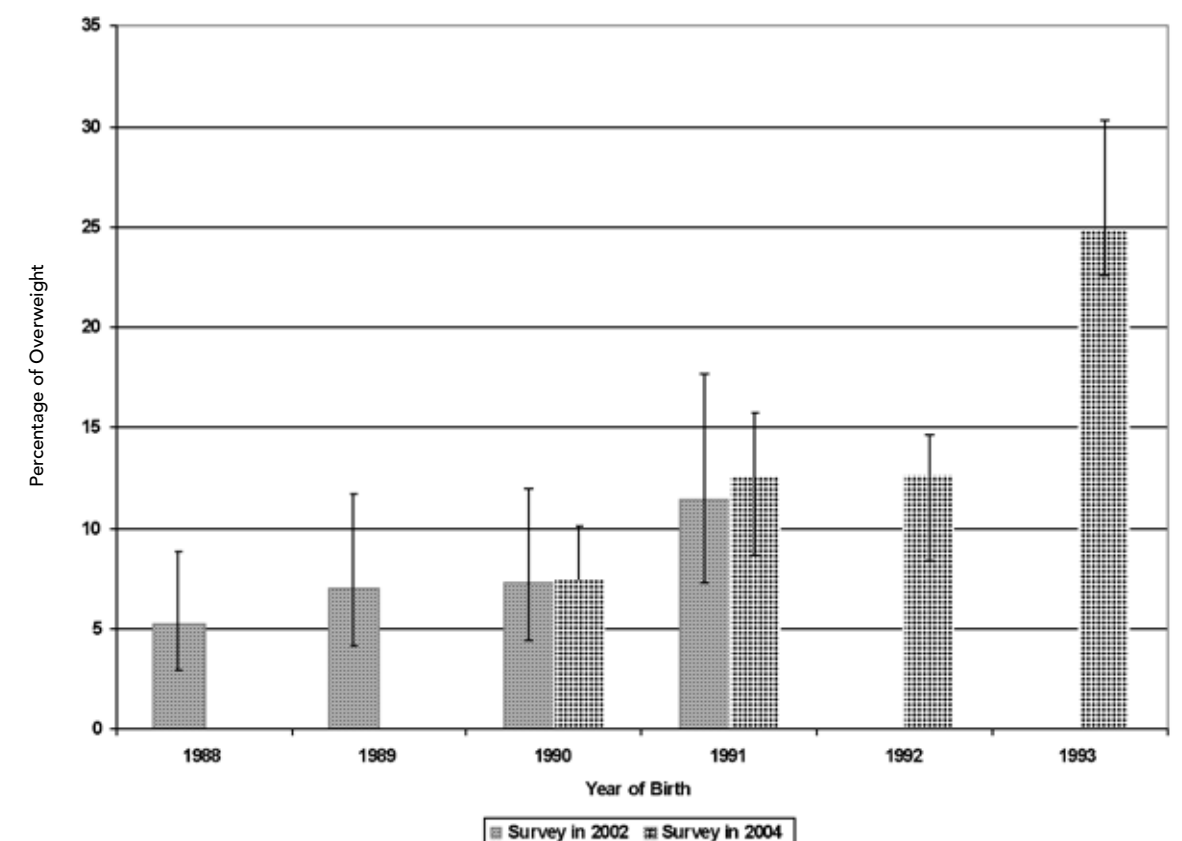
The city has expanded rapidly from five million in 1999 to more than seven million by 2009. Roads in Ho Chi Minh City which were once crowded with bicycles are now over-crowded with motorcycles and cars that are bumper-to-bumper in rush hours. Children no longer walk or ride a bicycle to school but now are usually taken on motor bikes or in cars. Pressure on adolescents to perform academically at school has increased, leaving them with heavy after-school study burdens. Diets have also changed with the introduction of many high-energy processed foods and Western fast foods. Family incomes have steadily increased, reflecting the high GDP of the city, which has averaged 40% over the last decade. As a result of these changes, dietary and physical activity, including sedentary habits, have all changed simultaneously.

Parallel to these changes, overweight and obesity have emerged as a very significant health issue. Ho Chi Minh City is in an early 'nutrition transition' where both undernutrition and an emerging problem of overnutrition can be found in both child and adult populations.

An analysis of trends in underweight and overweight among urban junior high school students in Ho Chi Minh City between 2002 and 2004 revealed a shift away from undernutrition and toward overnutrition in urban areas. After a short period of only two years, the prevalence of overweight and obesity among adolescents increased substantially, from 5.0% and 0.8% in 2002, to 11.7% and 2.0% in 2004, respectively, especially for boys and for children from wealthier households, whilst the prevalence of underweight decreased rapidly (Hong, Dibley et al. 2007). The prevalence of underweight over the two-year period fell across all age groups, suggesting an improvement in the availability of food over the time period consistent with the rapid economic development of Ho Chi Minh City. However, during this period the problems of under-nutrition and overweight continued to co-exist.

As seen in the figure below, the prevalence of overweight increases as the year of birth decreases. Children who were born in the 1987 to 1990 cohorts are more likely to have experienced undernutrition as preschool-aged children. Furthermore, as these children grew up they would have had less exposure to high-energy foods, more activity and less sedentary behaviors, such as TV viewing, than the children born into later cohorts. The pace of economic development in Ho Chi Minh City increased greatly in the 1990s and children born in the later birth cohorts would have experienced many micro-environmental changes that would be likely to promote energy imbalance and overweight and obesity.

Figure 1:
Prevalence (in %) of overweight and obesity in Vietnam



In 2004, a cohort study was commenced to follow up a sub-sample of the children from the cross-sectional survey who resided in districts of Ho Chi Minh City where obesity was most prevalent. The cohort study assessed the magnitude and change of adolescent overweight and obesity over a five-year period (from 2004 to 2009) and also identified risk factors that favor energy imbalance leading to overweight and obesity, including 'obesogenic' elements in neighborhood and school environments, family social environment, diet, physical activity and sedentary behaviors. The results show that daily time spent in moderate to vigorous physical activity declined while time spent in sedentary activities increased significantly from 120 minutes/day to 210 minutes/day. Students' BMI increased significantly, from 18.6 kg/m² on average to 20.6 kg/m². Longitudinal regression analyses showed a negative association between time spent in physical activity and BMI after adjustment for parental education level, family wealth index, parental BMI status, child's pubertal status, gender and age. The results also showed that playing games, viewing TV and studying after class were positively associated with BMI. Obviously, decreases in physical activity and increases in sedentary activity were significantly associated with increases in BMI, suggesting that interventions to increase physical activity in Vietnamese children could contribute to prevention of overweight/obesity.

Detailed analysis of a cross-sectional assessment within this cohort study conducted in 2007 on a representative sample of 693 high school students also indicated that overall 4.6% of the adolescents and 11.8% of the overweight/obese adolescents had metabolic syndrome. After adjusting for other study factors, the odds of metabolic syndrome among youth in the lowest physical activity group (<29 minutes of physical activity/day) were six times higher than those in the highest physical activity group (>85 minutes/day). Metabolic syndrome was also positively associated with socioeconomic status. It seems that in Vietnam, children in the wealthiest families are least likely to be active because their parents usually provide them with a "modern" life, including up-to-date recreational facilities such as televisions, computers, and other technical household devices and helpers that reduce the level of activity needed for daily household chores. Besides, wealthier families are more likely to be able to purchase ample food, including energy-dense foods and drinks (Nguyen, Tang et al. 2010).

In conclusion, urban areas in Vietnam currently confront a nutrition transition with the double burden of underweight and overweight in adolescents. The problem of overweight and obesity was more prevalent in males than in females, in younger age groups, in wealthy urban districts and in children from high-economic-status families. Appropriate public

health policies are needed to deal with both problems and long-term follow up of these subjects should be undertaken to have a better understanding of the factors associated with obesity and the potential for prevention for overweight and obesity in this population of adolescents.

Acknowledgement

Data collection for the 2004 survey was conducted with the funds from the Nutrition Centre, Ho Chi Minh City Health Department and a grant from the Nestlé Foundation. The cohort study was funded by the Nestlé Foundation.





AGROECONOMICS

Malnutrition, food security, and agriculture in the 21st century

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In the period since 1960 the number of people living on our planet has doubled. The increase resulting from longer life expectancy and powerful population dynamics – particularly in developing countries – far outweighs the decrease resulting

from having fewer children per family in industrial countries and in China. This development will probably continue well into the 2050s, when the global population is expected to stabilize at around 9.2 billion. The world's total population – in the space of just one century – will have tripled.

The demand for food is increasing at a disproportionately faster rate than the increase in global population. With rising affluence consumer requirements are changing. As income rises, more calories are consumed – and this increasingly in the form of animal protein. With one acre (100 m²) of land we can produce 60 kg of cereals, which provide 200,000 kcal for human nutrition. When this energy is used for animal nutrition (pigs, poultry) we obtain three to five times fewer kcal – 50,000 kcal in average –

in meat. This is especially the case for livestock whose fodder consists of crop-based concentrates. As a result, demand for cereals, maize, and soya increases disproportionately when meat demand increases. These crops are produced on land that could be used instead to produce human nutrition directly.

Nowadays agricultural production uses 33 percent of the Earth's land surface. The other two-thirds comprise jungle, forest, deserts, wetlands, and areas of human settlement. Of the 5 billion hectares of agricultural land, two-thirds are permanent grassland and one-third is cropland. These resources are finite. The area of cropland has been expanded in recent years to the detriment of jungle and virgin forest, with adverse effects on the quality of the environment. This is a major onslaught on our natural environment, whose resources are being overused. The increasing demand challenges our ability to provide enough food in a sustainable way.

Thanks to the "green revolution" and partly also to a high level of subvention, food production has so far managed to keep pace with an increasing demand of a growing population. Whereas the number of kilocalories available per capita per day in the industrial countries is well over 3000, the average in Sub-Saharan Africa, for example, is just under 2000. The percentage of undernourished people varies globally. Whereas over the last five years in South and Central America or in Asia around 10-15 percent of the population was on average undernourished, it was 30 percent in Sub-Saharan Africa. In order to meet food requirements in 2050, the FAO (Food and Agriculture Organization) predicts that global production has to rise by between 70 and 100 percent.

Despite a strong growth in global population, the number of undernourished people dropped slightly at the end of the 20th century. The UN's "Millennium Development Goals" aim to halve the proportion of people living in extreme poverty and suffering from hunger by 2015. Unfortunately, although the number of people living in poverty and suffering from hunger dropped from 900 million in the 1970s to about 800 million by the mid-1990s, we have not been able to sustain this success. The number of undernourished people increased anew, from 850 million in 2005 to over one billion in 2009. This number was reduced again by 10 percent as tension on the food markets subsequently eased, but this was only up until 2010. With the market deteriorating at the end of 2010 and a Food Price Index reminiscent of mid-2008, we are faced with two worrying scenarios: first, tensions on the food markets could become a chronic malaise; and second, as the UN's Millennium Development Goal to halve poverty and hunger by 2015 slips beyond our reach, food security is being seriously jeopardized.

Food security is based on four pillars: food availability,

food access, food use, and system stability. Food security can be assessed at an individual level (per person or household), at a country level, or even at the global level. In this context, food distribution is of central importance. There might be enough food available globally; locally however, access to food is not ascertained everywhere. Even though the actual supply is physically adequate, economic factors reduce the access to food. We see here only too clearly how closely poverty and malnutrition are interconnected. Food use may also be subject to certain limiting factors, for example, where people do not feed themselves properly – out of thrift, or ignorance, or even distorted eating habits, a phenomenon increasingly affecting industrial and post-industrial societies.

Interdisciplinary agricultural and economic research has identified numerous fields which can contribute to ensuring better food security and reducing the impact of limiting factors.

Improvement of food availability and sustainability:

- Cultivation of crops with higher yields and lower susceptibility to pests, parasites, fungal disease, unfavorable temperatures, drought, and waterlogging. It is about exploiting the potential of plants more effectively by avoiding "pre-harvest losses".
- Breeding of farm animals capable of using feedstuff that is not a direct substitute for human nutrition.
- Support in providing training and further education for farmers in developing countries with a view in particular to exploiting the potential of available resources at once more efficiently and more ecologically. This includes the proper use of suitable products, their storage and conservation, and the avoidance of "post-harvest losses".
- Better integration at the institutional level of the value-adding process involved in the food supply such as corruption, market power, and information asymmetry.

Improvement of food access:

- Reducing the volatility of food prices. Policy research has the potential to suggest the optimal allocation of public spending in order to assure food security, especially food access, while achieving environmental objectives in an efficient and effective way. The food access issue is a challenge which cannot be fully solved by market mechanisms.
- Better understanding of the effect of price development and price volatility of food on the demand and the eating habits, especially of socially disadvantaged population strata in rural and urban areas.
- Understanding the influence of women-led home garden production on the stability of food provision and diet-related health status of peri-urban and rural households.

Improvement of food use:

- Analyzing the link between qualitative and quantitative food availability and economic incentives on the one hand and the eating habits in industrial and developing countries on the other.
- Reducing the amount of food lost or wasted by understanding the mechanisms and challenges within the food supply chain. Depending on the product, up to 40 percent of the output is lost along the chain, from harvest, storage, and processing to trade and consumption. In developing countries, for the most part the losses are in the first stages, while in industrial countries the losses are bigger in the last stages of the chain. Research on supply chains helps to reduce environmental deterioration and improves food security.
- Describing the decision-making processes faced by small farm households in developing countries, as defined by the area of conflict between consuming and trading the food produced on the farm. The degree of market integration of such farm households in light of the volatility of food prices is a particular challenge with direct implications on the nutritional status of the households.

Improvement of system stability:

- The dimensions of stability of food security are complex and diverse. A pivotal condition for stability is an enhanced collaboration between natural and social sciences. The objective must be to increase the overall sustainability of the food system, including elements such as the use of natural resources, food production, food consumption and eating habits, as well as to improve institutional and political framework conditions.





PROFILE OF A NUTRITION INSTITUTE



PROFILE OF A NUTRITION INSTITUTE

THE NATIONAL INSTITUTE OF NUTRITION (VIETNAM)

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The National Institute of Nutrition (NIN) under the Ministry of Health was founded in 1980 by the Government of Vietnam. The NIN is the national leading institution responsible for research, training and implementation activities in the field of nutrition, food sciences and clinical nutrition for the whole country of Vietnam, including:

1. Research on nutritional requirements and the dietary intake of Vietnamese people appropriate to human physiological status and socio-economic conditions of the country in each period
2. Food and nutrition surveillance, nutritional epidemiology studies and studies of other nutrition-related health problems
3. Research on nutritive values and health aspects of Vietnamese foods
4. Research on food hygiene and food safety
5. Research on and development of approaches and solutions to improve nutritional status, food hygiene and food safety
6. Development of food-based dietary guidelines for Vietnamese people
7. Coordination of the nutrition network for the whole country and implementation of different nutrition action programs
8. Development of nutrition policies

The NIN has a scientific and research staff of more than 80 people, of whom five are associate professors, mainly from medicine and from other disciplines. The NIN also has undergraduate and graduate technicians and a support staff of about 90. The NIN is now composed of six departments (School and Occupational Nutrition; Community Nutrition; Nutrition Surveillance and Policy; Clinical Nutrition and Dietary Therapy; Micronutrient Research and Application; Food Sciences and Food Hygiene and Safety) and five centers (Food and Nutrition Training Center; Nutrition Information Center, Education and Communication Center; Food and Nutrition Center; Applied Nutrition Center; and Nutrition Counseling Center) and the Logistics Department.

MAJOR ACHIEVEMENTS:

The NIN has implemented:

- Assessment of nutritional status and dietary intake of Vietnamese people in different ecological regions
- Epidemiological research on major nutritional deficiencies and disorders
- Establishment of the Dietary Allowances and Food-Based Dietary Guidelines for Vietnamese people
- Development and updating of food analysis data, and establishment of the Vietnamese Nutritive Composition Table
- Investigation of food safety and food hygiene control, development of the Standard Laboratory of Food Safety and Food Hygiene, and contributions in the development of food regulations
- Research on nutrition issues in transition period

VIETNAM

AREA

Total	331,051 km2
Agriculture lands	251,273 km2

POPULATION

Total:	87,096,000 (2008)
Urban population:	29.6%
Under age 15:	25%
Median age	27.4

POPULATION GROWTH RATE

Total:	1.2%
Rural areas:	0.4%
Urban areas:	3.4%
Fertility rate:	2.03 children born/woman

GNP (per capita): \$392.19

LIFE EXPECTANCY AT BIRTH

Total:	71.94 years
Male:	69.48 years
Female:	74.69 years

UNDERNOURISHED PEOPLE

Women with low BMI (<18.5):	10% (2005)
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MORTALITY RATES

Birth attended by skilled health personnel:	88% (2006)
Neonatal Mortality Rate:	12/1000 (2004)
Infant Mortality Rate (under 1):	12/1000 (2008)
Under-five Mortality Rate:	14/1000 (2008)
Maternal Mortality Ratio:	150/100,000 live birth (2005)

UNDERWEIGHT

Low birth weight:	7% (2006)
Children under 5 moderately or severely underweight:	18.9%
Children under 5 severely underweight:	2.2%

INFANT AND YOUNG CHILD FEEDING

Exclusive breastfeeding rate (0-5 months):	17%
Timely complementary feeding rate (6-9 months)	70%
Children who are still breastfeeding (20-23 months)	23%

KEY NUTRITIONAL ANTHROPOMETRY

Stunting in children under 5:	31.9% (2009)
Prevalence of wasting (moderate and severe):	6.9% (2009)

MICRONUTRIENT DEFICIENCIES

Percentage of households consuming adequately iodized salt:	93%
Prevalence of sub-clinical vitamin A deficiency in preschool children:	34%
Prevalence of vitamin A supplementation in children:	98%

OTHER PARAMETERS

Total adult literacy rate:	94% (2009)
Primary school net enrolment/attendance	89.5% (2009)
% of population using improved drinking water sources, 2008, rural:	92%
% of population using improved drinking water sources, 2008, urban:	98%
% of population using improved sanitation facilities, 2008, total:	33%
% of population using improved sanitation facilities, 2008, urban:	34%
% of population using improved sanitation facilities, 2008, rural:	31%

- PhD training in community nutrition and collaboration with Hanoi Medical College in the program Master of Science in community nutrition
- Development of nutrition policy through the implementation of the National Nutrition Strategy (NNS), and the coordination of the Protein Energy Malnutrition Program (PEM) and micronutrient deficiencies control programs (Vitamin A and iron deficiency)
- Implementation of nutrition education and nutrition surveillance activities

The founding of the NIN marked an important milestone for the nutrition sector in Vietnam. Since the beginning, NIN has implemented many research programs. The research findings have been applied in the implementation of national nutrition strategies, child malnutrition control programs and other intervention programs. The nutrition interventions have contributed to the eradication of xerophthalmia due to Vitamin A deficiency in children, and the reduction of child malnutrition from 51.5% (1985) to 18.9% (2009). WHO and UNICEF have determined Vietnam to be the only country in the region that reaches the goal of child malnutrition reduction as established within the Millennium Development Goals (by 2% a year).

At this critical point, NIN is the focal institution to develop the National Nutrition Strategy (NNS) for the new period of 2011-2020 after the success of the former NNS 2001-2010. This upcoming NNS has to address existing and emerging nutrition problems of the country, with the stated goal being: "By the year 2020, the diet of Vietnamese people will be improved in terms of quantity, balanced in terms of quality, hygienic and safe; child malnutrition will be further reduced, especially stunting, thus improving the physical status and stature of Vietnamese people; and obesity/overweight will be managed, contributing to the control of nutrition-related chronic diseases".

With all the contributions since its foundation, NIN has just been awarded the Labor Hero by the Government of Vietnam and its four directors have also been awarded Labor Medals on the occasion of NIN's 30th anniversary in November 2010.

INSTITUTIONAL COLLABORATION:

The NIN has set up cooperative relationships with such international agencies as UNICEF, WHO, FAO, the government of the Netherlands, ADB, WB, and ILSI as well as many non-governmental organizations and other research institutions and universities including WU (Netherlands), INMU (Thailand), the University of Japan, the University of the Philippines Los Baños, IRD, and GRET (France).

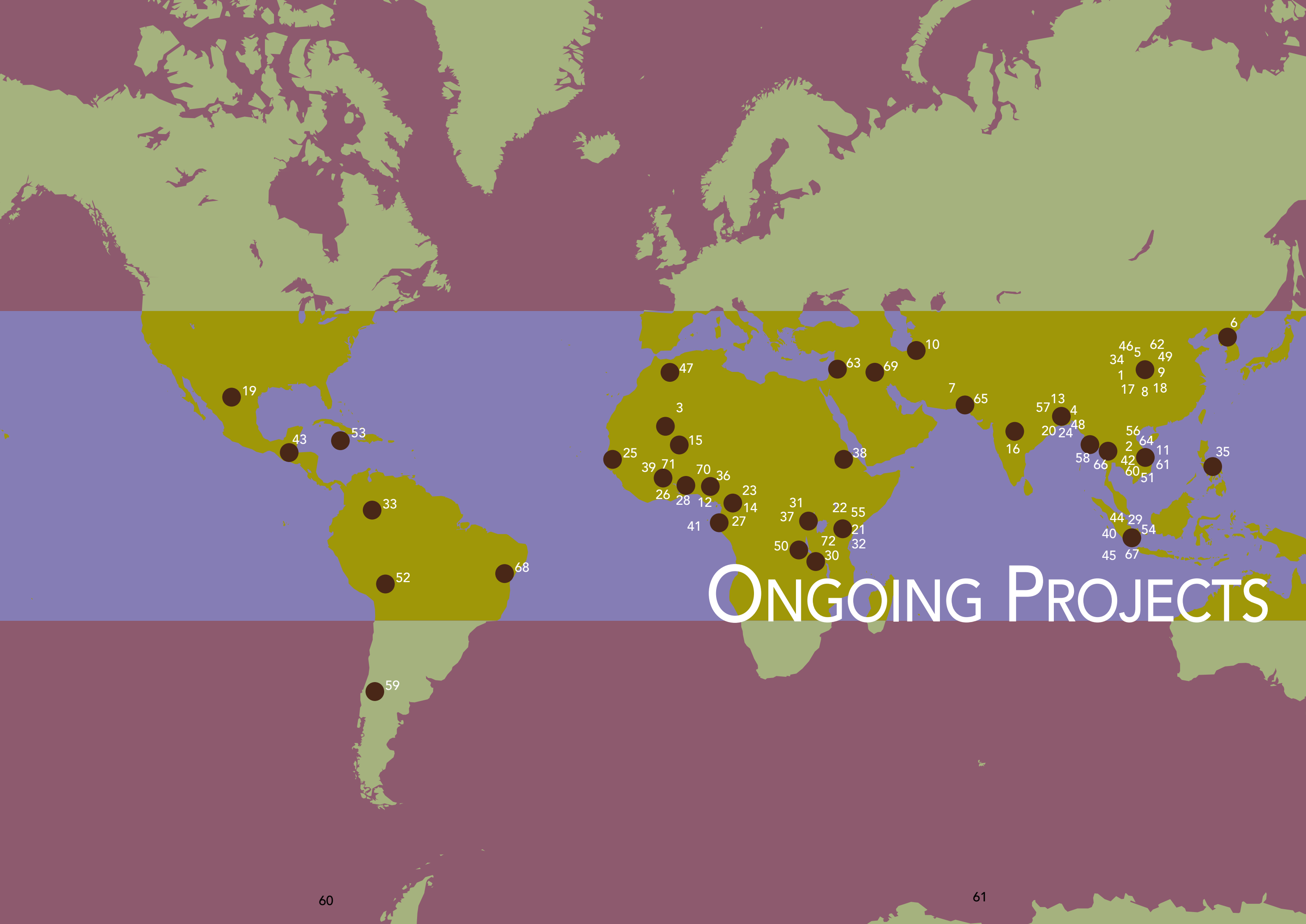
The National Institute of Nutrition has been appointed as the WHO national participating Institution for Food Contamination Monitoring (1995), and as the SEAMEO-TROPED Collaborative Center in Community Nutrition (1994).

In the past few years, NIN has received three grants from the Nestle Foundation to conduct three nutrition studies:

- The Impact of Vegetable Gardening, Fishpond and Animal Husbandry on Household Food Security and Child Nutritional Status in Some Communes in Midland Vietnam
- Efficacy of Vitamin-A-Fortified Cooking Oil on Nutritional Status and Infection Incidents of Vietnamese Children 3-5 Years Old
- Pre-conceptional vs Gestational Food Supplements and Pregnancy Outcomes in Rural Vietnam

The studies' findings have contributed to nutrition sciences in Vietnam, providing good recommendations for intervention programs and thus improving the nutritional status of vulnerable Vietnamese populations.





ONGOING PROJECTS



TITLE

PRINCIPAL INVESTIGATOR

- 1 2001 / Effect of vitamin A and B2 supplementation added to iron on anaemia of pregnant women in China
Aiguo Ma
Qingdao University Medical College, Institute of Human Nutrition, Qingdao, China
- 2 2002 / Effects of an additional meal fortified with multiple micronutrients on the nutritional and micronutritional status of Vietnamese children
Nguyen Quang Dung
National Institute of Nutrition, Basic Nutrition Department, Hanoi, Vietnam
- 3 2003 / Evaluation of valid biomarkers to distinguish between iron deficiency anaemia and anaemia of inflammation in areas of high rates of parasite infestation and nutritional deficiencies
Mohamed Ag Ayoya
Cornell University, Division of Nutritional Sciences, Ithaca, New York, USA
- 4 2003 / Usefulness of ferrous fumarate and ferric pyrophosphate as food fortificants for infants and young children in developing countries
Shafiqul Sarker
ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
- 5 2003 / Zinc homeostasis in and zinc requirements of young Chinese children
Xiaoyang Sheng
Shanghai Jiao Tong University, Department of Child and Adolescence Healthcare, Shanghai, China
- 6 2004 / Effect of iron fortification of nursery complementary food on iron status of infants
Kim Su Huan
Institute of Child Nutrition, Pyongyang, Korea Democratic Republic
- 7 2004 / Investigation of blood, hair lead and manganese levels in children with different degrees of iron deficiency in Karachi
Mohammad Ataur Rahman
University of Karachi, Centre for Molecular Medicine & Drug Research, Karachi, Pakistan
- 8 2004 / Vitamin A value of spirulina carotenoids in humans
Guangwen Tang
Tufts University, Human Nutrition Research Center on Aging, Boston, Massachusetts, USA
- 9 2004 / Study on the causes of anaemia in elderly women in China
Jian Zhang
National Institute of Nutrition and Food Safety, Department of Elderly Nutrition, Beijing, China
- 10 2005 / Environmental supplementation of iodine by iodination of irrigation water in the Ferghana Valley
Maksuda Abidjanova
Association of Endocrinologists, Kokand City, Uzbekistan

- 11 2005 / Stability and efficacy of vitamin-A-fortified cooking oil on nutritional status of Vietnamese children aged 36-60 months
Cao Thi Thu Huong
National Institute of Nutrition, Department of Micronutrient Research & Application, Hanoi, Vietnam
- 12 2006 / Vitamin-A status of households according to the seasonal availability of vitamin A and beta-carotene rich foods
Romain A.M. Dossa
University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
- 13 2006 / Effect of psychosocial stimulation on development of iron-deficient anaemic infants: a randomized controlled trial
Jena D. Hamadani
ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
- 14 2006 / Assessment of iron status of children in rural communities in Abia State, Nigeria
Ignatius Onimawo
Ambrose Alli University, Biochemistry Department, Ekpoma, Nigeria
- 15 2006 / Efficacy of multiple micronutrients supplementation on anaemia in 6-23-month-old rural Burkinabe children
Hermann Ouedraogo
Inst. de Recherche en Sciences de la Santé, Ouagadougou, Burkina-Faso
- 16 2007 / Iodine supplementation in mild-to-moderately iodine-deficient pregnant women: Effects on pregnancy outcome and infant development
Sumitra Muthayya
St John's National Academy of Health Sciences, Institute of Population Health & Clinical Research, Bangalore, India
- 17 2008 / Improving micronutrient status of Chinese children using dietary spirulina
Shi-an Yin
National Institute of Nutrition & Food Safety, Beijing, China
- 18 2008 / Effects of vitamin A supplementation during lactation on infants' antibody response to hepatitis B vaccine in China
Zhxiu Wang
Nanjing Medical University, School of Public Health, Nanjing, China
- 19 2008 / Impact of vitamin A and zinc supplementation on pathogen-specific diarrheal disease in Mexican children
Kurt Long
University of Queensland, Division of International & Indigenous Health, Brisbane, Australia



TITLE

PRINCIPAL INVESTIGATOR



TITLE

PRINCIPAL INVESTIGATOR

- 20 2009/Effect of maternal zinc supplementation during pregnancy and lactation on infants' immunity
Mohammad Bakhtiar Hossain
ICDDR, B, Clinical Research Division, Mohakhali-Dhaka, Bangladesh
- 21 2009 / Efficacy of orange-fleshed sweet potato in enhancing breast milk retinol and Vitamin A status in pregnant Kenyan women (Resubmission)
Hugo Melgar-Quinonez
Ohio State University, Department of Human Nutrition, Columbus, Ohio, USA
- 22 2003/Evaluation of two counseling strategies to improve exclusive breastfeeding rates among HIV-negative mothers in Kibera slum of Nairobi, Kenya: a randomized clinical trial
Sophie Ochola
Kenyatta University, Department of Nutrition, Nairobi, Kenya
- 23 2008 / Information and education to support and promote exclusive breastfeeding
Ada C Uwaegbute
Michael Okpara University of Agriculture, Umuahia, Nigeria

REHABILITATION FROM MALNUTRITION

INFANT AND CHILD NUTRITION

- 24 2001 / Oral rehydration solution containing amylase resistant starch in severely malnourished children with watery diarrhea due to Vibrio cholerae
Nur Haque Alam
ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
- 25 2004/Rehabilitation of severely malnourished children in Senegal (West Africa): Use of a local solid food equivalent to WHO F100 with high energetic value. Part II
Salimata Wade
Université Cheikh Anta Diop (UCAD), Equipe de Nutrition, Dept de Biologie Animale, Dakar, Senegal
- 26 2003 / Comparison of the efficacy and acceptability of three types of micronutrient supplements added to complementary foods for infants in Ghana
Anna Larrey
University of Ghana, Department of Nutrition and Food Science, Legon, Ghana
- 27 2005 / Food-based approach for the control of stunting among preschool children
Chineze Agbon
University of Agriculture, Department of Home Science & Management, Abeokuta, Nigeria
- 28 2006 / STEP I: Complementary feeding-based approach to alleviate linear growth retardation and nutrient deficiencies in infants aged 6 to 12 months in the south of Benin
Romain A.M. Dossa
University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
- 29 2006 / Promoting breastfeeding: A formative study among women and their husbands with infants aged 0-6 months in urban households
Judhiastuty Februhartanty
University of Indonesia, SEAMEO-TROPED RCCN, Jakarta, Indonesia
- 30 2007 / Mangochi Child Nutrition Intervention Study
Kenneth Maleta
University of Malawi College of Medicine, Division of Community Health, Mangochi, Malawi



TITLE

PRINCIPAL INVESTIGATOR



TITLE

PRINCIPAL INVESTIGATOR

- | | | |
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| 31 | 2007 / Potential of amaranth grain seeds to improve the nutrition and health status of schoolchildren | John Muyonga
Makerere University, Department of Food Science and Technology, Kampala, Uganda |
| 32 | 2007 / Improving nutritional status of children aged 6-18 months in semi-arid area in Kenya: The potential of amaranth seed flour | Alice Mboganie Mwangi
University of Nairobi, Applied Nutrition Programme, Uthiru-Nairobi, Kenya |
| 33 | 2008 / Nutrition, anaemia, growth and oxygen weaning in low-birth-weight oxygen-dependent infants in a Kangaroo Clinic | Nathalie Charpak
Fundacion Canguro, Bogota, Colombia |
| 34 | 2008 / Assessment and promotion of adolescents' dietary calcium intake in China | Youfa Wang
Johns Hopkins School of Public Health, Department of International Health, Baltimore, Maryland, USA |
| 35 | 2008 / The effect of a 10-month school-based provision of high-calcium milk and weight-bearing exercise program on the bone mineral status of 7- to 9-year old prepubertal girls | Pura Rayco-Solon
Nutrition Center of the Philippines, Manila, Philippines |
| 36 | 2009 / Food based approach to alleviate linear growth retardation and nutrient deficiencies in young children aged 6 to 11 months | Romain A.M. Dossa
University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin |
| 37 | 2009 / Community-based nutrition intervention to improve the nutrient-density of meals for young children (6-24 months) | Margret K Kabahenda
Makerere University, Department of Food Science & Technology, Kampala, Uganda |
| 38 | 2009 / Gestational nutrition, pregnancy outcome and infant growth: A life-cycle approach in a set of Eritrean communities | Azieb Ogbaghebriel
College of Health Sciences, Asmara, Eritrea |
| 39 | 2010 / Effect of fish meal and Vitamin C on the iron status of Ghanaian children consuming cowpea-based food | Godfred Egbi
University of Ghana, Noguchi Memorial Institute for Medical Research, Legon, Ghana |
| 40 | 2010 / Intensive nutrition and hygiene education for improving nutrient intake of children aged 6-11 months | Dwi Nastiti Iswarawanti
SEAMEO Tropmed Regional Center, Jakarta, Indonesia |

INFANT AND CHILD NUTRITION

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| 41 | 2010 / Testing the efficacy of an audio program and discussion guide in promoting exclusive breastfeeding in Cameroon, Africa | Susanne Montgomery
School of Public Health, Loma Linda University, Loma Linda, California, USA |
| 42 | 2010 / Efficacy of combined selenium and iron supplementation on micronutrient status of school children | Nguyen Van Nhlen
National Institute for Food Control, Hanoi, Vietnam |
| 43 | 2010 / Feeding practices in Guatemalan infants: Adherence to the WHO recommendations and barriers to their implementation | Noel Solomons
CESSIAM, Guatemala City, Guatemala |

MATERNAL NUTRITION

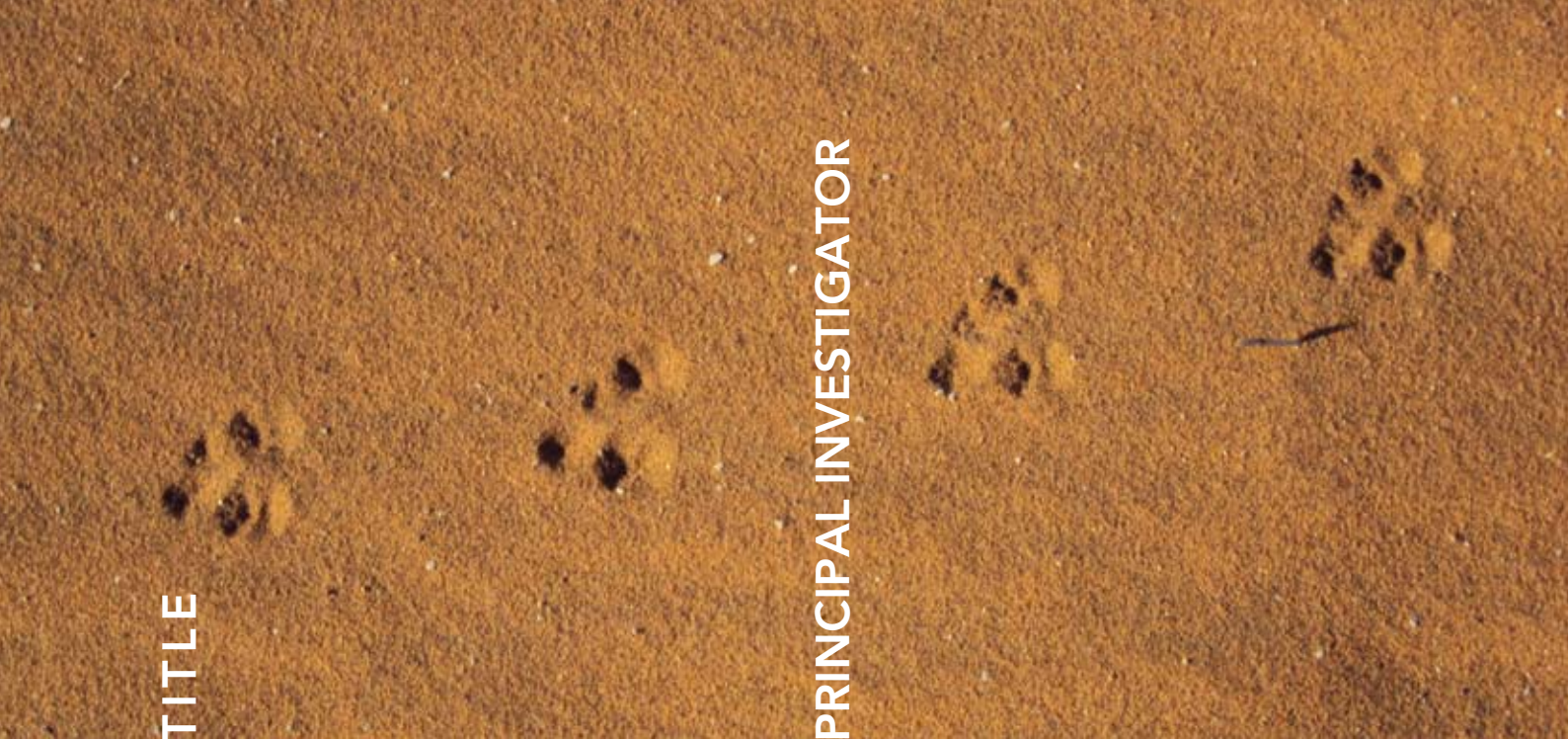
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|----|---|---|
| 44 | 2007 / Nutrition education to improve mother and cadre nutritional knowledge and children nutritional status in Indonesia | Ali Khomsan
Bogor Agricultural University, Department of Community Nutrition, Bogor, Indonesia |
| 45 | 2007 / Effect of tempe and vitamin-C-rich fruit supplementation during pregnancy on iron status and pregnancy outcomes | Maria Wijaya-Erhard
University of Indonesia, SEAMEO-TROPMED RCCN, Jakarta, Indonesia |
| 46 | 2008 / The development of new norms for indicators of iodine status during pregnancy and its impact on the prevalence of mental retardation in children | Chen Zupei
Tianjin Medical University, Institute of Endocrinology, Tianjin, China |
| 47 | 2009 / Impact of daily consumption of vitamin-A-fortified oil on breastmilk vitamin A concentration and vitamin A status of lactating Moroccan women | Najat Mokhtar
Ibn Tofail University, Nutrition Unit, Kenitra, Morocco |
| 48 | 2009 / Role of vitamin B12 supplementation during pregnancy and postpartum to alleviate nutritional anaemia in Bangladeshi women and their infants | Towfida Jahan Siddiqua
ICDDR, B, Nutritional Biochemistry Lab, Dhaka, Bangladesh |

INFANT AND CHILD NUTRITION



TITLE

PRINCIPAL INVESTIGATOR



MATERNAL NUTRITION

TITLE

PRINCIPAL INVESTIGATOR

- 49

2010 / SMS and web-based support for appropriate infant feeding to prevent childhood obesity in urban China

Hong Jiang
School of Public Health, Fudan University, Shanghai, China
- 50

2010 / Urinary iodine concentration of pregnant women in Zambia as an indicator of their iodine nutrition status

Cyprian Katongo
Copperbelt University, School of Mathematics and Natural Sciences, Kitwe, Zambia
- 51

2010 / Pre-conceptional vs gestational food supplements and pregnancy outcomes in rural Vietnam

Tu Ngu
National Institute of Nutrition, Department of Applied Nutrition & Nutritional Surveillance at the National Institute of Nutrition, Hanoi, Vietnam

CHILD BEHAVIOURAL DEVELOPMENT

- 52

2001 / Cognitive performance of iron deficient, non-anaemic Peruvian infants

Theodore Wachs
Purdue University, Department of Psychological Sciences, West Lafayette, Indiana, USA
- 53

2005 / Development of term low-birth-weight infants at 6 years, and the benefits of early stimulation

Susan Walker
University of the West Indies, Tropical Medicine Research Institute, Kingston, Jamaica
- 54

2009 / Food-based intervention and psychosocial stimulation to improve growth and development of <24mo Indonesian children

Umi Fahmida
University of Indonesia, SEAMEO-TROPED RCCN, Jakarta, Indonesia

IMMUNE DEFENSE AND INFECTION

- 55

2002 / Nutrition assessment of children orphaned from HIV/AIDS

Judith A Ernst
Indiana University, School of Health & Rehabilitation Sciences, Indianapolis, Indiana, USA
- 56

2002 / Examination of the relationships between low body mass index and micronutrient malnutrition and the risk of morbidity in adults aged 18 to 60 years in rural Vietnam

Tran Thanh Do
National Institute of Nutrition, Hanoi, Vietnam
- 57

2004 / Molecular and biochemical analysis of intestinal microflora in malnourished children with cholera treated with oral rehydration solution with and without amylase resistant starch

Motiur Rahman
ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
- 58

2010 / The role of sub-clinical inflammation on micronutrient status of Myanmar adolescent girls during micronutrient supplementation

Min Kyaw Htet
SEAMEO TROPED Network, Jakarta, Indonesia

EPIDEMIOLOGIC TRANSITION

- 59

2003 / Assessing physical activity of obese children by a clinical score

Claude Godard
INTA, Unidad de Endocrinologia Infantil, Santiago, Chile
- 60

2004 / Changing diets, levels of physical activity and environments and their relationship to the emergence of adolescent overweight and obesity in Ho Chi Minh City, Vietnam

Hong K Tang
Community Health Department, Training Centre for Health Care Professionals, Ho Chi Minh City, Vietnam
- 61

2007 / Diet, physical activity or environmental change: what are the key factors underlying the emerging child obesity epidemic in Ho Chi Minh City Vietnam

Hong K Tang
Community Health Department, Training Centre for Health Care Professionals, Ho Chi Minh City, Vietnam
- 62

2009 / A pilot study of school-based peer education and obesity-related behaviours in adolescents in Beijing, China

Zhaohui Cui
University of Sidney, The George Institute for International Health, Sidney, Australia



TITLE

PRINCIPAL INVESTIGATOR



BONE HEALTH

NUTRITION INTERVENTIONS

NUTRITION EDUCATION

TITLE

PRINCIPAL INVESTIGATOR

63	2003 / Heritability, nutrition and adolescent bone health	Ghada El-Hajj Fuleihan American University of Beirut, Calcium Metabolism & Osteoporosis Program, Beirut, Lebanon
64	2003 / School-based nutrition intervention pilot program	Dien N Le Institute of Nutrition, Ho Chi Minh City, Vietnam
65	2005 / A community-based randomized controlled trial of complementary feeding strategies in a squatter settlement of Karachi	Zulfiqar Ahmed Bhutta Aga Khan University Medical Center, Department of Paediatrics and Child Health, Karachi, Pakistan
66	2006 / Application of learning technologies to support community-based lay health care workers and build capacity in chronic disease prevention in Thailand	Rhona M. Hanning University of Waterloo, Department of Health Studies and Gerontology, Waterloo, Ontario, Canada
67	2008 / Care empowerment of mothers, cadres, and premarried women to improve children nutritional status (Resubmission)	Euis Sunarti Bogor Agricultural University, Department of Family and Consumer Science, Bogor, Indonesia

OTHER RESEARCH AREAS

68	2004 / Genetic diversity and selection of cassava (Manihot esculenta Crantz) with high beta-carotene content using molecular markers	Claudia Fortes Ferreira Embrapa Mandioca e Fruticultura, Cruz das Almas - BA, Brazil
69	2008 / Causes and control of food insecurity: A pilot model in the Northwest of Iran	Saeed Dastgiri Tabriz University of Medical Sciences, Faculty of Medicine, Tabriz, Iran
70	2008 / Contribution à l'amélioration de l'état nutritionnel et sanitaire des enfants de 06 a 59 mois dans la commune de bopa par des actions communautaires	Romain A.M. Dossa University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
71	2010 / Improving nutritional status of schoolchildren through consumption of cowpea: A food sovereignty perspective	Abdul-Razak Abizari School of Medicine and Health Sciences, Community Nutrition Department, Tamale, Ghana
72	2010 / Pilot study to assess the acceptability of pearl millet grain at macro- and micro-levels in rural Eastern Kenya	Mueni Hellen Ndiku University of Eastern Africa, Baraton (UEAB), School of Sciences & Technology & Department of Public Health, Eldoret, Kenya



TITLE

PRINCIPAL INVESTIGATOR

PUBLICATIONS

Arabi A, Mahfoud Z, Zahed L, El-Onsi L, El-Hajj Fuleihan G. Effect of age, gender and calciotropic hormones on the relationship between vitamin D receptor gene polymorphisms and bone mineral density. *Eur J Clin Nutr* 2010;64:383-391.

Ayoya MA, Spiekermann-Brouwer GM, Stoltzfus RJ, Nemeth E, Habicht JP, Ganz T, Rawat R, Traoré AK, Garza C. {alpha}1-Acid glycoprotein, hepcidin, C-reactive protein, and serum ferritin are correlated in anemic schoolchildren with *Schistosoma haematobium*. *Am J Clin Nutr* 2010;91:1784-90.

Khomsan A, Anwar F, Mudjajanto ES. Nutritional knowledge, attitude and practice of Posyandu participants. *Jurnal Gizi dan Pangan* 2009;4:34-42. (in Indonesian).

Ma G, Shouten EG, Sun YY, Yang F, Han XX, Zhang FZ, Jiang DC, Kok FJ. Supplementation of iron alone and combined with vitamins improves haematological status, erythrocyte membrane fluidity and oxidative stress in anaemic pregnant women. *Br J Nutr* 2010;104:1655-61.

Macharia-Mutie CW, Brouwer ID, Mwangi AM, Kok FJ. Complementary feeding practices and dietary intake among children 12-23 months in Mwingi district, Kenya. *Int J Food Safety, Nutrition and Public Health* 2010;3:45-56.

Nguyen Hoang TH, Tang HK, Dibley MJ. Waist circumference can be used to predict metabolic syndrome in adolescents of Ho Chi Minh City, Vietnam. *Obesity* 2010;18 (Suppl.2):S46 (812-P).

Ouédraogo HZ, Traoré T, Zèba A N, Dramaix-Wilmet M, Hennart P, Donnen P. Effect of an improved local ingredient-based complementary food fortified or not with iron and selected multiple micronutrients on haemoglobin concentration. *Public Health Nutr* 2010;13:1923-30.

Riyadi H, Sukandar D. Nutrients intake of children under five years old in Posyandu program. *Jurnal Gizi dan Pangan* 2009;4:43-53 (in Indonesian).

Sukandar D, Khomsan A, Anwar F, Riyadi H, Mudjajanto ES. Health and nutritional status of children under five years in Posyandu nutrition program. *Jurnal Gizi dan Pangan* 2010;5:171-6.

Tang HK, Nguyen Hoang TH, Dibley MJ. Family meals and overweight/obesity in adolescents of Ho Chi Minh City, Vietnam. *Obesity* 2010;18 (Suppl.2):S37 (625-P).

Tofail F. Prevalence of iron-deficiency anaemia among young children in rural Bangladesh. *Health and Science Bull* 2010;8:1-22.

Tofail F, Hamadani JD, Banu S, Mehrin F, Nahar N, Huda SN. Prevalence of iron-deficiency anaemia among young children of rural Bangladesh. Poster Presentation in 12th Annual Scientific Conference at ICDDR B, February 9-12, 2009, in Dhaka, Bangladesh, p151.

Walker SP, Chang SM, Younger N, Grantham-McGregor SM. The effect of psychosocial stimulation on cognition and behaviour at 6 years in a cohort of term, low-birthweight Jamaican children. *Dev Med Child Neurol* 2010;52:148-54.

Yu B, Wang J, Wang Z, Wang Y, Suter PM, Russell RM, Grusak MA, Yin SA, Tang G. High bioavailability of zeaxanthin from deuterium labeled spirulina in humans. *Abstract Experimental Biology, Anaheim*, 2010.

Zhou B, Yan L, Wang X, Schoenmakers I, Goldberg GR, Prentice A. Seasonal differences in mineral homeostasis and bone metabolism in response to oral phosphate loading in older northern Chinese adults. (In press 2010).

The publications are available free of charge upon request.





The Nestlé Foundation for the Study of Problems of Nutrition in the World was established in 1966 by a donation by the Nestlé Company on the occasion of its centenary. The Foundation is independent and self-constituting and is managed by a Council consisting of at least five internationally well-known scientists as Council Members. The Foundation is and has been financially and operationally independent of the Nestlé Company since its inception. The offices of the Nestlé Foundation are in Lausanne, Switzerland.

THE FOUNDATION

GUIDELINES FOR GRANT APPLICATIONS TO THE NESTLÉ FOUNDATION

PURPOSE

The Nestlé Foundation initiates and supports research in human nutrition with public-health relevance in low-income and lower-middle-income countries according to the World Bank classification (see <http://www.worldbank.org>). The results of the research projects should ideally provide a basis for implementation and action which will lead to sustainable effects in the studied populations as generally applicable to the population at large. They should also enable institution strengthening and capacity building in a sustainable manner in the

host country, and further cooperation and collaboration between institutions in developed and developing countries.

The Foundation expects research proposals to be primarily the initiative of local researchers from the developing countries. However, the Foundation will be inclined to consider favourably those applications made jointly by scientists from developed countries with those from developing countries provided it is clear that the initiative will result in capacity building and human-resource development in the latter and that the bulk of the budget is spent in the developing country.

CURRENT POLICY

Sustainable improvement in human nutrition is one of the major issues in the portfolio of the Foundation. During more than 40 years, basic and applied research in nutrition has been supported by the Foundation in over 50 developing countries. In view of the past activities of the Foundation as well as the world's situation at the turn of the millennium, it was recognized that the public-health relevance of the supported research as well as aspects of sustainability, capacity building and educational issues should have a higher priority. Thus, priority is given to projects which lead to sustainable developments with strong elements of capacity building, and the implementation of the results of a research project should be immediate and sustainable. Highly sophisticated nutrition research of mainly academic interest without public-health relevance has lower priority for support, as do solely laboratory-based studies or animal experimentation.

RESEARCH TOPICS

At present the Foundation's work is primarily concerned with human nutrition research issues dealing with:

- (1) maternal and child nutrition, including breastfeeding and complementary feeding,
- (2) macro- and micronutrient deficiencies and imbalances,
- (3) interactions between infection and nutrition, and
- (4) nutrition education and health promotion.

The precise priorities and goals of the Foundation are modified from time to time to meet emerging public-health and nutritional needs in the developing world.

Studies in other areas of human nutrition research might also be considered, as long as they are dealing with problems of malnutrition in eligible countries (see above). Other areas of research may possibly be considered for support if the applicant can offer specific and convincing evidence and justification for the choice of the research topic.

Funded projects are usually of one- to three-year duration. Projects with a high potential for effective and sustainable improvement of the nutritional status as well as a high capacity-building component will be funded preferentially. The budget of the projects must be appropriate and reasonable and has to be justified in detail.

One of the Foundation's main aims is the transfer of scientific and technological knowledge to target countries. In cases where Foundation-sponsored research projects are realized in collaboration with scientists at universities and research institutes in high-income countries, at least 75% of the budget has to be earmarked for use within the low-income country.

Research grant applications from high-income countries are only considered under rare and exceptional conditions.

The Foundation does not normally fund:

- (1) projects with low public-health relevance
- (2) projects with doubtful sustainability
- (3) projects lacking transfer of scientific, technical and educational knowledge, i.e. lacking a capacity-building component
- (4) large-budget projects, meaning projects that exceed USD 100,000 per year or USD 300,000 over the total duration of a 3-year project
- (5) nutrition surveys or surveillance studies
- (6) research on food policy, food production and food technology except when linked to an intervention with high potential for sustainable improvement of the nutritional status
- (7) in vitro and/or animal experiments.

Although obesity and related diseases are of emerging importance in several low-income countries, the Foundation does not generally support projects in this specific area unless the proposal demonstrates linkages with under-nutrition, and the protocol is innovative and exceptionally well justified.

ELIGIBLE INSTITUTIONS

Eligible institutions are departments or institutes from universities, hospitals, and other institutions of higher education in low- or lower-middle-income countries. Joint applications from more than one institution (especially South-South) are welcomed. Joint applications from more than one institution involving a North-South collaboration may also be considered. For project applications demonstrating North-South collaboration, it is important that the following criteria are fulfilled: (i) the Principal Investigator is from the South and the proposal has relevance to nutritional problems of the South; (ii) the majority of the budget is earmarked for the South; and (iii) demonstration upon completion of the project of institution- and capacity building in a sustainable manner in the South.

The capacity-building component represents a core issue for all applications to the Foundation. This means that every application needs to demonstrate a training and human-resource and capacity-building component for the developing world. Ideally graduate students or young investigators should play a key role and, where possible, be designated as the Principal Investigator (PI), i.e. be the primary grant applicant, or Co-PI. Established researchers can nevertheless apply but need to clearly indicate the capacity-building component and the designated beneficiaries. Established investigators alone are not usually eligible to apply for a grant, except when they address innovative and exceptionally well-justified research questions in developing countries. Such applications need to clearly state the capacity- and human-resource-building components in the host country as well as the long-term sustainability of research in the host institution. Applications from individuals who are non-affiliated researchers and not attached to research or academic institutions can be considered only in very special cases.



TYPES OF AWARDS

The Nestlé Foundation offers different award and grant categories, some of them using a modular approach; for example, the Pilot Grant Program represents the starting grant module for a later Full Grant Research application. The eligibility criteria as well as the research objectives and topics have to be fulfilled no matter what the award category (for further details see www.nestlefoundation.org):

A. Research Grants

Grant type	Description	Budget (in USD)
Training Grant (TG)	The Training Grant (TG) Program supports a small research project such as a MSc or PhD thesis project or another training endeavour.	up to 20,000 in total
Pilot Grant (PG)	The Pilot Grant (PG) Program of the Foundation provides support for pilot research that has a high potential to lead to a subsequent full research project grant. Usually the Foundation does not support nutritional survey research, but often to be able to identify areas of problems for potential intervention one has to collect baseline data. If a pilot study (pre-study or baseline study) will create the needed data for a larger research project, the PG program may assist this. The pilot study and PG usually represent the starting point for a later full research grant application (i.e., a SG or LG) to the Foundation.	up to 20,000 in total
Small Research Grant (SG)	The Small Research Grant (SG) provides support for a small research study. This may represent a continuation of a TG or a PG.	up to 50,000 in total
Large Research Grant (LG)	Full grant application of a complete research proposal according to the guidelines.	up to 100,000 per year to a maximum of 300,000 for 3 years
Re-Entry Grants	To encourage post-graduate students to return to their own countries and to aid them in establishing their careers, the Foundation will support a research programme for eligible candidates. The host institution will need to guarantee a post for the returnee and ensure career development within the host institution. Contribution of support to the eligible candidate from the host institution is essential, while support and collaboration from the overseas institution where the candidate trained is helpful.	up to 50,000 in total

B. Institutional Support

Institutional support involves the support of research or educational projects in specific institutions in low- or lower-middle-income countries which contribute to a focused development of capacity and know-how and human-resource development in the corresponding institution.

HOW TO APPLY

Interested scientists should first submit a letter of intent in which they describe very briefly the kind of project they would like to undertake, including an estimated budget. Instructions for the letter of intent are available on the Foundation website at www.nestlefoundation.org. For a submission of a letter of intent only the downloadable form on our website should be used. If the suggested project is compatible with the Foundation’s current funding policy, applicants will receive an invitation to submit a full grant proposal. The guidelines for the submission of a full grant proposal are also available on our website. Other formats will not be accepted, neither for the letter of intent nor for the full grant applications.

In the letter of intent and in the grant application, detailed, evidence-based information about the public-health relevance of the project as well as its immediate impact and sustainability have to be reported. This part of the application is as important as the scientific section of the application.

Research grant applications are evaluated twice a year by the Foundation’s Council, a group of independent international scientists. The funding of projects is primarily based on the scientific quality, public-health relevance in the short and long term, sustainability, capacity-building component and, last but not least, budget considerations.

Applications are accepted throughout the year, and the Foundation encourages applicants to submit their proposals early to allow sufficient time for internal as well as external reviews. All submissions should be made electronically by e-mail. Final deadlines for submission are January 10 and May 10 for the Spring and Fall Council Meetings, respectively.

For more information consult www.nestlefoundation.org



The Council of the Foundation consists of five Council Members and Advisors. All Council Members and Advisors are internationally well-known scientists with a specific expertise in different fields of nutrition. The Council is self-constituting and operates independently. The Foundation is directed jointly by the Director and the President of the Foundation.

COUNCIL MEMBERS

Susanne Suter, MD

President Nestlé Foundation

Professor Emeritus of Pediatrics, University of Geneva, Geneva, Switzerland

Jehan-François Desjeux, MD

Emeritus Professor at CNAM, Paris

Member, Académie Nationale de Médecine, France

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Professor Emeritus, Wageningen University, The Netherlands

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Professor Emeritus of Medicine and Nutrition

Former Director, Jean Mayer Human Nutrition Research Center on Aging, Tufts University, Boston, Massachusetts, USA

Prakash S. Shetty, MD, PhD

Professor of Public Health Nutrition, Institute of Nutrition, University of Southampton, Southampton, UK

Editor-in-Chief, *European Journal of Clinical Nutrition*

Former Professor of Human Nutrition, London School of Hygiene and Tropical Medicine, London

Former Chief, Nutrition Planning, Assessment & Evaluation, Food & Nutrition Division, FAO, Rome, Italy

Kraisid Tontisirin, MD, PhD

Professor, Mahidol University, Salaya Campus, Nakhon Pathom, Thailand

Former Director, Nutrition and Consumer Protection Division, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy

DIRECTOR

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Professor of Medicine, Clinic and Policlinic of Internal Medicine, University Hospital, Zurich, Switzerland

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Catherine Lieb

Assistant to the Director

AUDITOR

Ernst & Young AG, Bern, Switzerland

