

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 – FOR LONG-TERM SUCCESS

SOLUTION – ORIENTED ACTION RESEARCH

enLINK-ing FOR A BETTER WORLD



CAPACITY BUILDING



enLINK-ing FOR A BETTER WORLD



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PRESIDENT'S MESSAGE

Recent reports from international organizations show that the number of malnourished people in the world has increased to include a billion individuals suffering from undernutrition. This unfortunate evolution has occurred in spite of the decision 9 years ago of many heads of state to set "the Millennium Development Goals". The first of these goals is "to eradicate extreme poverty and hunger", an objective which has not been reached. The reason for this failure is not a lack of food production in the world, but is likely the result of political and socio-economic issues, lack of priorities, poverty and insufficient education at all levels of society.

The mandate of the Nestlé Foundation is "to study problems of nutrition in the world". This is a very current challenge and the task seems enormous. To

be efficient, our Foundation has set priorities by focusing its activities in two main fields. Our goals are:

1. To improve the effectiveness of local nutritional interventions by providing scientific evidence on the specific needs of the target population;
2. To contribute to improve education and the transfer of knowledge to people who are involved in these programs, such as physicians, nutritionists, nurses and healthcare workers.

In the past, the Nestlé Foundation supported large research projects carried out by European or U.S. universities in developing countries. These projects had significant scientific impact with publications in the best scientific journals, but they had little sustainable effects on the development of local universities or

on the nutrition status of the population. Today, we encourage scientists from developing countries to identify the problems of nutrition that they plan to study and to design a research protocol to improve the situation. When these scientists submit their research concept and intervention plans, they gain a greater motivation to carry out their own investigations than if they were only collecting data in projects led by foreign universities. A key contribution of our Foundation is capacity building of local institutions in terms of personnel and equipment. This policy has resulted in creating sustainable links between the Foundation and departments of human nutrition in several developing countries.

Why is it so important to prevent undernutrition? Food insecurity in young infants and children leads to two dramatic consequences: sustained alterations in their psychomotor development and the occurrence of an immuno-deficiency syndrome which favors the development of preventable diseases. A monotonous plant-based diet leads to deficiencies in micronutrients such as iron, vitamin A, iodine and zinc. Recent studies, supported in part by the Nestlé Foundation, show that most "classical vitamin deficiency diseases" do not result from a single micronutrient deficiency. For instance, in countries where vitamin A availability is limited, interventions providing both iron and vitamin A to prevent iron deficiency anemia are more efficient than those providing iron alone. This is due to the fact that vitamin A stimulates erythropoiesis and decreases the prevalence of infections, two mechanisms that contribute to the prevention of anemia. Another micronutrient interaction is between iron and iodine: anemic children suffering from goiter showed a weaker response to iodine supplementation than non-anemic goitrous children, because iron deficiency impairs thyroid metabolism. In order to improve thyroid function and to reduce the incidence of goiter, both iodine and iron are needed. These examples emphasize the need to study problems of nutrition locally in order to identify the best prevention strategies.

Our interest does not limit itself to micronutrient malnutrition because food insecurity and poverty often lead to insufficient energy and protein intakes. Micronutrient supplementation or food fortification with micronutrients can prevent deficiency diseases only when energy and protein requirements are met. This important concept is often disregarded when implementing large nutrition interventions focused on micronutrient supplementation or food fortification.


This message is my last one since I left the presidency of the Foundation at the end of 2009. I take this opportunity to welcome Professor Susanne Suter, the new President of the Nestlé Foundation. Dr. S. Suter was chief of the Department of Pediatrics, University of Geneva. She worked as an advisor for the Nestlé Foundation a few years ago and her

advice has been greatly appreciated. She is President of the Swiss Council for Science and Technology, an important institution dealing with the promotion of higher education and research in Switzerland. Her vast knowledge in the field of child health and child development will be a great asset for the future activities of the Foundation.

I am very grateful to the Council members and advisors of the Foundation for their invaluable contributions to our activities. I thank them for the excellent support that they have provided to the Director and to me for many years. My particular gratitude goes to Professor Paolo Suter, the Director of the Foundation, who has been very successful in promoting new activities such as the enLINK digital library, the enLINK library trunks, and new developments in e-learning strategies. It has been a great pleasure to work with such a dynamic and enthusiastic colleague. I also thank Mrs. Catherine Lieb, the assistant to the Director, for her excellent work in the everyday tasks. Finally, I want to express my gratitude to Mr. Peter Brabeck, Chairman of the Board of the founding company and to Professor Werner Bauer, Director, for their support and interest in our activities.



Eric Jéquier



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 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
- e-Learning



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. exploration in nutrition, which represents the research level
2. education in nutrition, targeting populations such as researchers, medical doctors, or health care workers, or the general population or specific population groups such as women
3. electronic nutrition
4. enduring nutrition

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 advances in the information transfer by newest information technology, books and printed materials will remain indispensable. The small and large orange **enLINK** library trunks are shipped to more than 32 institutions in 17 different low income countries. In addition since fall 2009 the small trunk is available in French. Preliminary test of the **enLINK** e-learning platform has been successful.



«If you think education is expensive, try disease.»



THE enLINK CIRCLE: enLINKing actions and solutions

Global Public Goods for health: the role of education

Five years ago the Foundation called into life the enLINK initiative, which tries to address causal factors for the improvement of malnutrition and hunger. Nutrition is a central player for health and well-being. In a globalised world everything gets more complex and interdependent, and it is evident that nutrition cannot be regarded in isolation but has to be one main pillar among other issues: nutrition goes hand in hand with medicine, hygiene, public health, agriculture and education. The increasing global interdependence has positive and negative aspects, leading, for example, to increasing inequalities in many aspects of life, including the five “key players” in the enLINK circle (Figure 1). The economic turbulences of 2009 led to an exponential increase in global hunger and food insecurity but also to accelerated inequalities, putting millions of people – most of them in low-income countries – on a downward spiral in all aspects of life, including nutrition, health and basic issues of life such as education. According to the recent FAO statistics more than 1 billion people are undernourished globally, most of them living in low-income countries.

Lack of food and nutriture is only one of many inequalities. Other major inequalities concern basic health care, economic opportunities, and last but not least education and capacity building. These inequalities correspond, along with others, to the global public goods in health. Multiple evidence suggests that these global basic health goods have

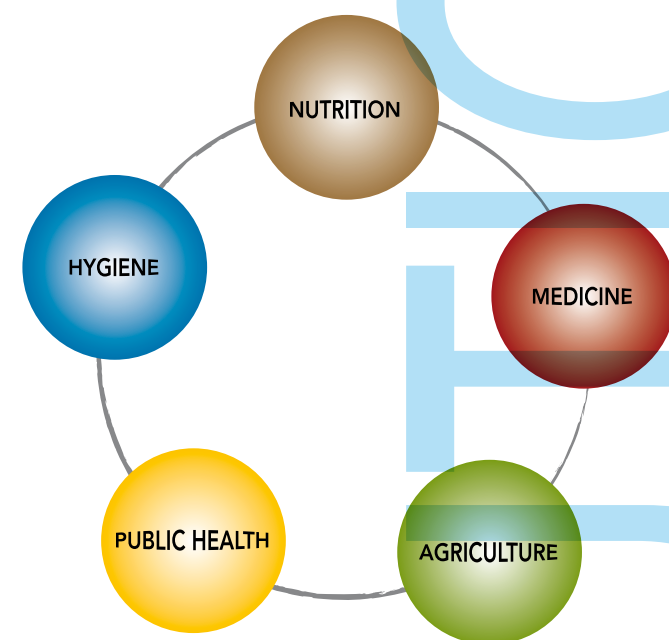


Figure 1: The enLINK circle: The five central fields of intervention for the control of malnutrition, hunger and poverty

been neglected during the last few years in many areas of the world. The consequences of the lack of basic, population-wide health services are well known and are reflected not only in the hunger and health but also the economic statistics of many low-income countries.

Some solutions to the major problems of public health seem to be too simple to make sense in a technology-driven world. Simple solutions are neglected in the age of genomics. Promoting the construction of latrines or basic hygiene is obviously not academic enough, but would lead to a real change at low-cost in most aspects of life, including nutriture. However, the implementation of these strategies is obviously more difficult than the study of the short-term effect of supplements on the nutritional status.

Obviously there is no advancement and no implementation without knowledge and know-how. The sources of knowledge and capacity are multiple – including local teachers, health care workers, nurses, midwives, doctors as well as researchers. Unfortunately all of them are threatened by “brain drain” and unidirectional “brain circulation”. To make health and nutrition knowledge trickle down to those who need it, strong local institutions with a strong knowledge of the local situation are needed. One of the main aims of the activities of the Foundation is capacity building in the field of nutrition and nutrition research by promoting locally relevant nutrition research and thus building individual and institutional capacity. Capacity building corresponds to skill and competence building, or, more generally, education. There is no education without the possibility of access to information. The digital enLINK library and the enLINK book trunks try to fill the gap and offer an opportunity for continuing education of colleagues in Africa and other areas of the world. Support of specific research projects translates theoretical knowledge into practical knowledge and action on the ground.

Correctly targeted and focused provision of information leads to measurable changes in behaviour such as hygiene, agricultural practices, food habits, child

feeding practices and basic medical care. The transfer of knowledge is actually a rather straightforward issue but definitely more time-consuming than the distribution of nutrient supplements. Yet in the long run a sustainable improvement can only take place when knowledge is transferred. “If you think education and prevention is expensive, try disease” – a well-known saying illustrates the central role of education and know-how transfer. There is no prevention without education and know-how. As Lao-tse said “Learning is like rowing upstream. If one stops, one drifts back.” Implementing the different components of the enLINK circle in a sustainable manner is the basis of preventive health care and health-promotion activities and has been implemented by the Foundation for more than four decades.

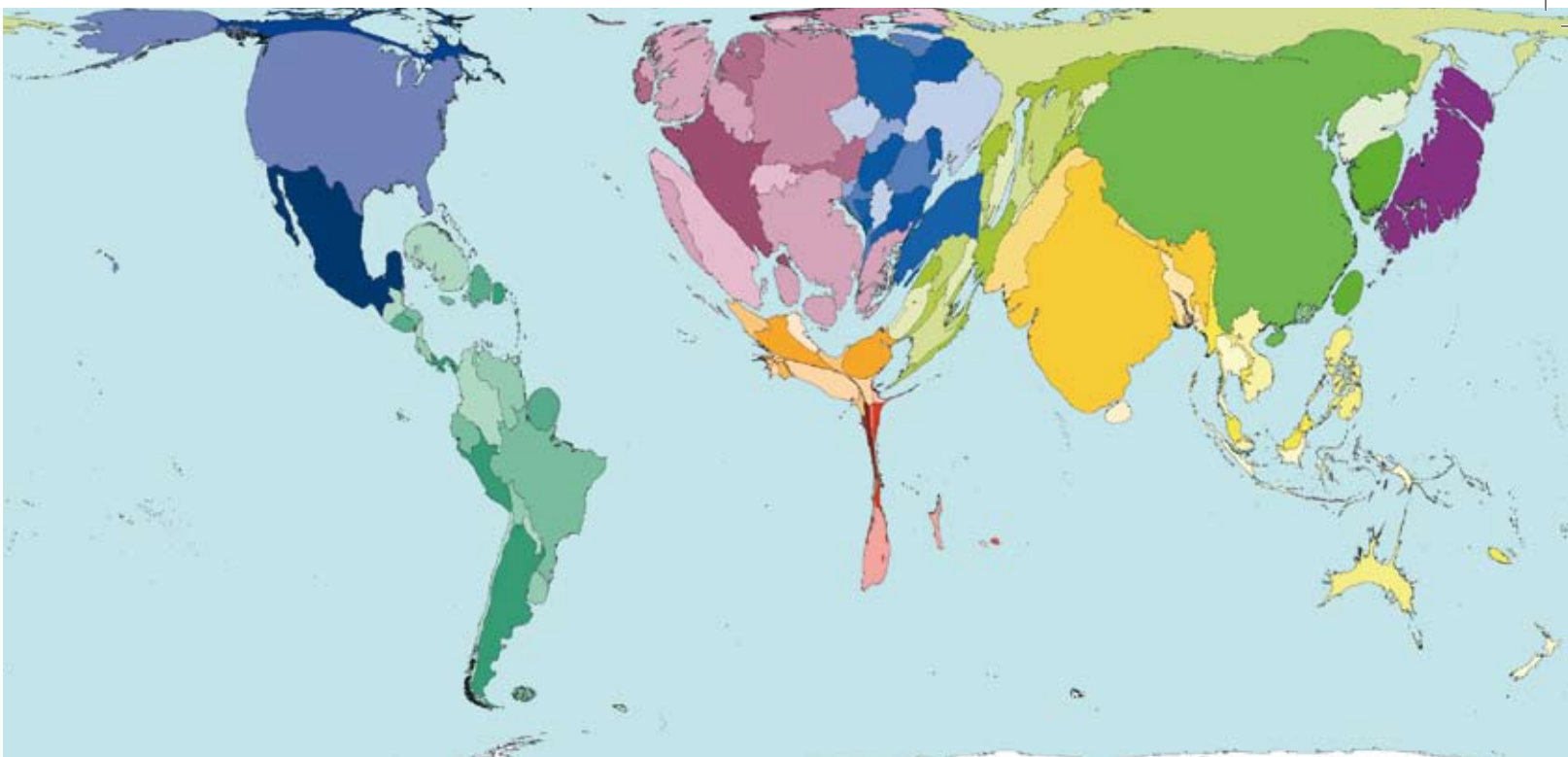
Education represents a continuum starting early in life and is a never-ending endeavour. Different studies showed that by offering sustainable access to information and possibilities for implementing continuing education, brain drain of, for instance, medical doctors can be reduced. As illustrated in the Worldmapper map “Physicians Working” (map top page 13) there are comparatively few physicians on the African continent: the territory size shows the proportion of all physicians working in the corresponding geographical area. 50% of physicians live and work in territories with less than a fifth of the world population. The comparatively few physicians and other health personnel still working in Africa need optimal access to basic health information and continuing education. It is well known that even a small increase in access to information would result in a disproportional improvement of health within a short time frame.





Already the transfer of only a little knowledge and know-how in the global public goods of health would have a larger impact than many if not most technology-driven approaches. The Foundation is active in the promotion of research capacity in the field of nutrition. The territory size in the Worldmapper map “Public Health Spending” (map bottom of page 13) shows the proportion of spending (measured in purchasing power parity) on public health services in the corresponding geographic region. Not surprisingly, low-income countries in Africa are hardly visible.

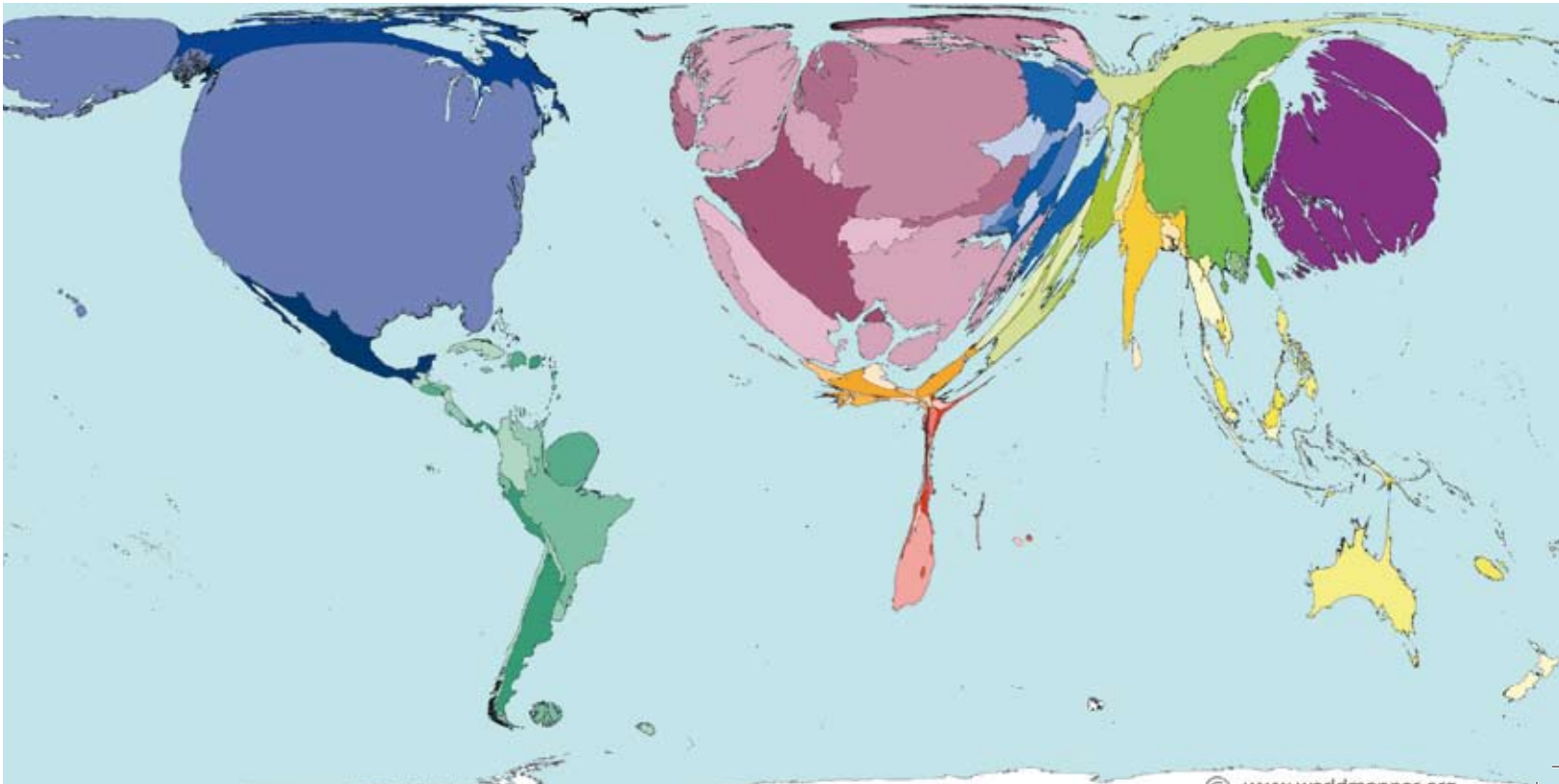
The locational bias as shown on the two maps reflects not only inequalities in the allocation and distribution of governmental and non-governmental resources and money but especially also of knowledge and know-how. The primary aim of the activities of the Foundation is a transfer of knowledge which can be applied in a sustainable manner, even in the face of limited resources. Much research is problem-oriented instead of solution- and action-oriented. “Action research”, i.e. learning by focusing on local problems and solutions, is of key importance for the Foundation.



Map Legend:

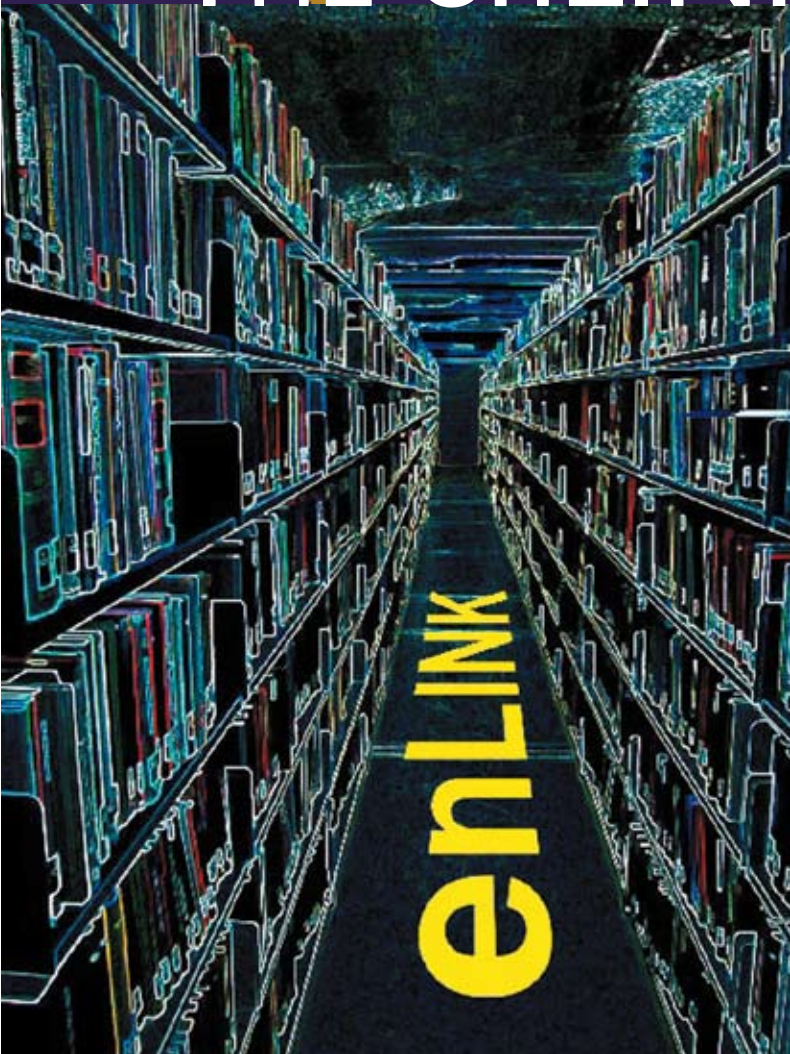
Physicians Working (above): Cuba has the most physicians per person. The fewest physicians per person are in Malawi. In 2004 there were 7.7 million physicians working around the world. 50% of physicians work in territories with less than a fifth of the world population. The worst-off fifth are served by only 2% of the world’s physicians. Territory size shows the proportion of all physicians who work in the corresponding territory.

Public Health Spending (below): Public health spending is all government spending on health care, plus money from grants, social insurance and non-governmental organisations. The highest public health care spending per person is in the regions of Western Europe, North America and Japan. The territory size represents the proportion of worldwide spending (measured in purchasing power parity) on public health services that is spent in the corresponding territory.





THE enLINK LIBRARY



e-journals in nutrition
e-books
Global Health Database

Without access to information there is no education. Five 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.

The economic turbulences in 2009 also affected the digital **enLINK** library so that access to certain journals was no longer guaranteed. Thankfully, the high standards of access are already being re-established, due in part to the use of the newest technologies provided by OVID Technologies. Limitations and problems in accessing the journals in full-text mode are also due to the ongoing discussions and controversies around free full-text access to scientific journals. 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. (The registration as well as the usage of the **enLINK** library is free of charge.)

enLINK statistics as of December 31, 2009:

- 80 users from 33 countries
- More than 20,100 page views per month
- More than 400 page views per day



The orange library
THE enLINK LIBRARY TRUNKS –
THE ULTIMATE LIBRARY FOR
NUTRITION EDUCATION

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 represents 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 32 nutrition institutes in 17 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



PRESENT KNOWLEDGE IN NUTRITION

Time is knowledge. Despite the increase in the availability of information in modern societies, in many parts of the world access to information is limited and still a time-consuming task.

“Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information on it.” This saying from Samuel Johnson illustrates nicely the capacity-building activities of the Foundation. Present knowledge in nutrition can either be found in the **enLINK** digital library or in one of the leading textbooks about human nutrition, the Present Knowledge in Nutrition (PKN).

Soon a new edition of PKN will be published and accordingly the enLINK PKN mailings will be stopped. Since the start of the initiative approximately 6,000 books have been sent to institutions and individuals in nearly 40 countries. This enLINK initiative is a concerted action of the Foundation and the International Life Science Institute (ILSI) in Washington, D.C. (USA).

Thanks to the PKN mailing, library collections were completed, and also individual students in institutions from North Korea to Zambia could enjoy studying the science of nutrition with their own textbook.



Knowledge is like a garden: If it is not cultivated, it cannot be harvested.
Guinean Proverb



NEW RESEARCH PROJECTS

INSTITUTIONAL SUPPORT

OTHER CAPACITY-BUILDING ACTIVITIES

In 2009 the Council decided to fund
8 research projects.

OBESITY

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

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The George Institute for International Health
University of Sydney, Australia

and

The George Institute
Beijing, China
USD 20,020

With economic development over the last decade, China is undergoing a rapid nutrition transition from under- to over-nutrition, especially in urban areas. The China National Nutrition Surveys indicate that the prevalence of obesity of children and adolescents aged 7-17 years in urban areas has increased by 42%, from 3.1% in 1992 to 4.4% in 2002, according to Chinese screening criteria. The situation is even worse in Beijing. The latest data in 2004 indicate that prevalence of obesity in adolescents aged 13-15 in urban Beijing has reached 11% according to Chinese screening criteria. As the prevalence of adolescent overweight and obesity continues to rise, the need for feasible and effective prevention is becoming increasingly urgent.

The best available evidence indicates a lack of established and effective preventive interventions for adolescent obesity around the world. It is well recognized that peers are an important influence on health-related behaviour and a key source of information for young people. Promotion of healthy eating and physical activity by peers is more likely to be accepted than promotion by authority figures such as parents and teachers. Recent studies have shown peer education programs can significantly improve a range of health behaviours, including increasing fruit intake and reducing the risk of eating disorders in primary school students as well as improving clinical and quality-of-life indicators in adolescents with asthma. However, little is known about whether this premise holds for educating junior high school students about obesity-related behaviours like dietary and physical activity. This one-year pilot study aims to evaluate, based on theory and prior research, the feasibility of innovative peer-led interventions in students in grade 7 in two intervention and two control junior high schools in urban Beijing, and provide a scientific basis for the development of formal intervention studies in the future.

CHILD GROWTH AND DEVELOPMENT

Gestational nutrition, pregnancy outcome and infant growth – a life-cycle approach in a set of Eritrean communities

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USD 50,000

The rationale for the present investigation is to acquire systematic data on selected measures of maternal and newborn nutritional status at the community level in a manner that has seemingly not yet been carried out. The investigation will utilize simplified cross-sectional, prospective data under field conditions in urban Eritrea. It is assumed that such data will retain a significant and meaningful proportion of the information that otherwise would require cumbersome, time-consuming and highly costly longitudinal prospective field studies. The study will adopt a life-cycle approach to programming in which the average age at onset of menarche in the community, and the physical and nutritional attributes of the young, nulliparous, non-pregnant, menstruating girl-mother will provide the background scene for the period prior to pregnancy. The mother's anthropometry at the onset of pregnancy will give insight into the nutritional endowment with which the mother embarks on pregnancy. Her total and retained pregnancy weight gain will give information about gestational nutrition. The birth weight and gestational age of the infant will be systematically and carefully documented. The information obtained would be used to depict the character of the birth weight distribution and to estimate the proportion of newborns with low birth weight, i.e. less than 2.5 kg. The data will allow designation of birth weights in relation to length of gestation. This will be followed by a consecutive series of monthly cross-sectional interviews regarding breastfeeding, introduction of supplements, and onset of infections or other illnesses. A set of anthropometric measurements will be taken on each child on a cross-sectional basis. The information obtained will be used to depict the pattern of growth during critical stages of development in early infancy and childhood at the same time as the occurrence of area-specific onset of factors that influence growth will be elucidated. Extensive nutritional and health data are being presented by the developing nations in response to their commitment to the UN Millennium Declaration. The present study aims to focus on quality aspects of nutritional growth data under field conditions.

OBESITY

CHILD GROWTH AND DEVELOPMENT

FOOD SECURITY

NEW RESEARCH PROJECTS

ZINC

VITAMIN A

VITAMIN B12

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

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University of Indonesia
Jakarta, Indonesia
USD 64,121

WHO has recently urged all developing countries to develop programmes to improve complementary-feeding (CF) practices because of their importance for the optimal growth, development and health of infants and young children. While supplementation programmes and/or highly-fortified “super-foods” have limited success in improving CF-practices in disadvantaged environments, population-specific food-based dietary guidelines (FBDG), based on locally available foods and requiring minimal changes to the local food pattern, will enhance the chances of programme success and sustainability.

An earlier study was able to identify the need and potential and finally develop FBDG for CF infants at 6-8 months and 9-11 months, using a combined linear-and-goal programming approach (LP approach). This research grant application is therefore being made to support the next phase of the planned study, to assess the efficacy of FBDG for improving CF/dietary practices and growth in children under 24 months (window of opportunity). As growth and development are inter-related, home-based stimulation will be included in this trial to see the effect on child development. While studies have shown that stimulation at early age benefits children through their late adolescence, evidence from Indonesia is lacking. This study therefore aims to see the effect on growth and development of a community trial using food-based dietary guidelines and stimulation. It is expected that findings from this study will provide scientific evidence as the basis for program formulation.

Community-based nutrition intervention to improve the nutrient-density of meals for young children (6-24 months)

Margaret K Kabahenda

Department of Food Science and Technology
Makerere University
Kampala, Uganda
USD 5,000

A 9-session nutrition education intervention will be implemented to improve infant and young child-feeding practices of rural primary caregivers (mothers) of children 6-24 months. Each session has a didactic component and a practical session designed to help participants gain skills to select, prepare, and serve age-appropriate and nutritionally adequate meals and snacks to their young children. The didactic sessions address health benefits and ways to increase the variety of foods selected within and across food groups, while practical sessions provide skills to incorporate a variety of foods into the traditional dishes as a way to improve micronutrient and energy density. Emphasis is placed on improving consumption of underutilized nutrient-dense foods such as low-cost animal-source proteins, leafy-green vegetables, and orange-fleshed fruits and vegetables.

The intervention curriculum has already been developed and piloted and results from a case-control intervention trial conducted in western Uganda show that the intervention can improve caregivers’ child-feeding behaviours and consequently improve children’s growth and nutritional status. This study seeks to: 1) determine the efficacy of using this intervention to change child-feeding behaviours of groups of caregivers from different food-cropping regions; and 2) determine whether the intervention can be effectively implemented by local people through existing women’s groups.

One sub-county will be selected to represent the banana region and another sub-county from the non-banana-growing region. A total of nearly 200 households are targeted for the study. To improve recruitment and retention of participants, local leaders will be enlisted to serve as community liaisons and incentives will be provided to participants. Facilitators will be trained and monitored and sessions audio-recorded to assess fidelity of implementation. Caregivers’ feeding practices and children’s growth patterns will be monitored to assess the effectiveness of the intervention. It is expected that the results will lead to a long-term sustainable implementation of the chosen approach.

ZINC

Effect of maternal zinc supplementation during pregnancy and lactation on infants’ immunity

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USD 20,000

Maternal zinc status may influence infant immunity. Animal studies have shown that moderate gestational zinc deficiency results in reduced thymus size in the offspring, leading to cellular immune defects and lower antigen-specific, antibody-mediated responses. Interleukin-7 (IL-7) is essential for thymocyte development. Reduction in thymus size is associated with reduced expression of IL-7. The most widely used indicator for measuring zinc status is serum zinc concentration, which, however, is homeostatically regulated. Recent reports show that the expression of the zinc transporter ZnT1 (exports zinc from cytoplasm) in leukocytes may be an indicator of zinc status. The hypotheses to be tested are: a) zinc supplementation will lead to larger thymus size, increased IL-7 levels, and stronger adaptive immunity (vaccine specific) in children born to zinc-supplemented mothers; b) zinc supplementation will increase ZnT1 expression in maternal leukocytes. This pilot study will be nested in a large ongoing study where investigators are working to strengthen maternal, neonatal, and child health services by providing ante-natal care and promoting exclusive breast-feeding. This study will enrol 40 pregnancy-confirmed subjects, and randomly assign them to receive either zinc or placebo. At enrolment, a blood sample will be obtained to measure baseline plasma zinc and leukocyte ZnT1 expression. Subjects will receive a daily dose of 30 mg of zinc or placebo throughout pregnancy and 6 months postpartum. A second blood sample will be obtained at the end of the 3rd trimester to evaluate the impact of zinc supplementation. At birth, anthropometric data of newborns will be obtained. As part of a government-endorsed programme, infants will be given a hepatitis B vaccine at 6, 10, and 14 weeks. Thymus size of the infant will be measured 3 times (at 4, 16, and 24 weeks) by ultrasonography. One blood sample will be obtained from infants at 16 weeks to measure hepatitis B vaccine-specific response. The data may provide more insight into a new promising tool for assessing zinc status.

VITAMIN A

Efficacy of orange-fleshed sweet potato in enhancing breast milk retinol and vitamin A status in pregnant Kenyan women

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USD 88,937

Supplementation with vitamin A reduces all-cause maternal mortality. Vitamin A deficiency (VAD) contributes to anaemia in pregnancy, low birth weight and child mortality. Pregnant women have increased vitamin A needs. Prenatal supplementation can improve foetal vitamin A liver stores and increase breast milk retinol concentration. Genetic improvement of staple crops is a promising first-line intervention, because such crops are regularly consumed in large quantities throughout the year. Because orange-fleshed sweet potato (OFSP) is multiplied through vegetative propagation, farmers can grow improved varieties indefinitely with lower financial inputs. The aim of this study is to improve breast milk and serum retinol levels in pregnant Kenyan women by providing them with a meal supplemented with OFSP. Subjects will be recruited at antenatal clinics in the Kisii district of Nyanza province, a region characterized by high incidences of maternal and infant mortality. Pregnant women with gestational age >28 weeks will be randomly assigned to one of two groups: for twelve weeks, six days per week, the experimental group will receive a midday meal containing OFSP, kidney beans, cabbage, and fat; the control group will receive the same meal substituting the OFSP with a white sweet potato variety. At baseline, subjects will be dewormed and intermittent preventive treatment for malaria will be provided according to national guidelines. Anthropometry, and self-reported night blindness data will be collected at baseline and end of the study. Dietary intake and consumption of vitamin-A-rich foods will be determined using three 24-hour recalls at baseline and end of study. Concurrently, breast milk concentration of retinol, and serum concentrations of retinol, beta-carotene, ferritin, transferrin receptor, C-reactive protein and Plasmodium-falciparum-specific histidine-rich protein-2 will be assessed.

Impact of daily consumption of vitamin-A-fortified oil on breast milk vitamin A concentration and vitamin A status of lactating Moroccan women

Najat Mokhtar

University Ibn Tofail
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Kenitra, Morocco
USD 25,000

Breast milk is an excellent source of vitamin A for infants. However, the vitamin A content of breast milk from malnourished women may not be sufficient for infants to meet their physiologic needs. Supplementation of women with a high dose of vitamin A during the first 6 weeks post-partum is likely to increase maternal vitamin A stores but may have limited impact on breast milk vitamin A concentrations. In contrast, there is strong evidence from animal studies that small, daily doses of vitamin A are efficacious for maintaining adequate breast milk vitamin A concentrations throughout lactation. Food fortification is considered to be a long-term strategy for improving vitamin A intake and status in populations at risk of deficiency. In Morocco, vegetable oil has recently been fortified with vitamin A to increase the vitamin A content of the diet. Moroccan women from low-income communities also receive a single high-dose vitamin A supplement at 15 days post-partum. The purpose of this study is to evaluate the impact of daily consumption of vitamin-A-fortified oil on breast milk vitamin A and maternal vitamin A status during the first 6 months post-partum in lactating Moroccan women from low-income communities. It is a randomized, masked, placebo-controlled trial.



VITAMIN B12

Role of vitamin B12 supplementation during pregnancy and postpartum to alleviate nutritional anaemia in Bangladeshi women and their infants

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and

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USD 20,000

Nutritional anaemia is a major public health problem among children and women in developing countries. Despite an ongoing national program of supplementing pregnant women with iron-folate, prevalence of anaemia is 39% among pregnant women and 78% among infants in Bangladesh. Vitamin B12 deficiency is a more prevalent cause of megaloblastic anaemia than folate in many developing countries. Low dietary intake of animal products, a predominant source of vitamin B12, may cause anaemia. Besides maintaining normal erythropoiesis, B12 is essential for immune function. However, no studies have evaluated the effect of maternal B12 supplementation on reduction of anaemia and improving immunity of their infants. In this study it is thus hypothesized that vitamin B12 supplementation plus iron-folate during pregnancy and vitamin B12 supplementation at 6 months postpartum would: (a) decrease anaemia among mothers and infants; (b) improve innate and vaccine-specific immunity in pregnant women; and (c) provide passive immunity to their infants.

The study is designed as a double-masked placebo controlled trial to investigate the added effect of vitamin B12 on the iron-folate supplementation among pregnant women. Anaemic (Hb level <11.0 g/dl) mothers at 11-13 weeks of gestation will be randomized into two groups: the supplement group will receive 5.2 µg (twice the RDA) vitamin B12 plus 400 µg folate and 60 mg iron; the placebo group will receive folate and iron only. The daily supplementation will continue up to 6 weeks postpartum. At 26-28 weeks of gestation mothers will be given inactivated influenza vaccine. Data on anthropometric indices of mothers and children, birth size, infant growth and morbidity (mothers and children) throughout the study period will be recorded. Biochemical indicators of anaemia including vitamin B12, haemoglobin, ferritin, folate and AGP, will be assessed in plasma of

mothers (pre- and post-supplementation) and infants (cord blood and 6-months). Additional measurements in mothers include serum transferrin receptor (sTfR) in plasma and methylmalonic acid in the urine. Plasma-vaccine-specific antibody responses will be measured in mothers (pre- and post supplementation) and in infants (cord blood and 6-months). The study might provide new insights into the role of vitamin B12.



One of the major aims of the Nestlé Foundation is the transfer of sustainable knowledge to low-income countries and capacity building in general. Again during 2009 several endeavours in this area were undertaken.

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 of USD 2,000 for each issue of the journal. The journal is only as a web-based publication available. The submission of original articles and other contributions can only be encouraged.

THE ORANGE enLINK TRUNK LIBRARY: ENGLISH AND FRENCH VERSIONS

The orange enLINK trunk has been provided to 32 different nutrition institutions in 17 different countries in Asia and Africa (see page 16). 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.

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 of USD 9,600.

AFRICA

REPORT

LATIN AMERICAN NUTRITION LEADERSHIP WORKSHOP

All continents need capacity and leadership in nutrition and nutrition research. To promote capacity in nutrition research the Foundation supported the 5th Latin American Nutrition Leadership Workshop which took place in November 2009 in Santiago de Chile. The workshop was held in association with the Latin American Nutrition Society (SLAN) Congress. The workshop had a vital and crucial role for the strengthening of the regional capacity and laid the foundation for future improvement of nutrition research leadership in Latin America.

IRANIAN FOOD AND NUTRITION LEADERSHIP PROGRAM

Capacity building and implementation depend on leadership and vision. To assist nutrition researchers to build a strong capacity building basis the Foundation supported the 1st Iranian Food and Nutrition Leadership Program (IFNLP). During this 5-day workshop in September 2009 15 Iranian food and nutrition specialists met in Teheran to discuss and learn capacity about topics such as creativity & innovation, communication, transformational & entrepreneurial leadership strategies, and social & entrepreneurial marketing.

IUNS 19TH INTERNATIONAL CONFERENCE ON NUTRITION, BANGKOK (THAILAND)

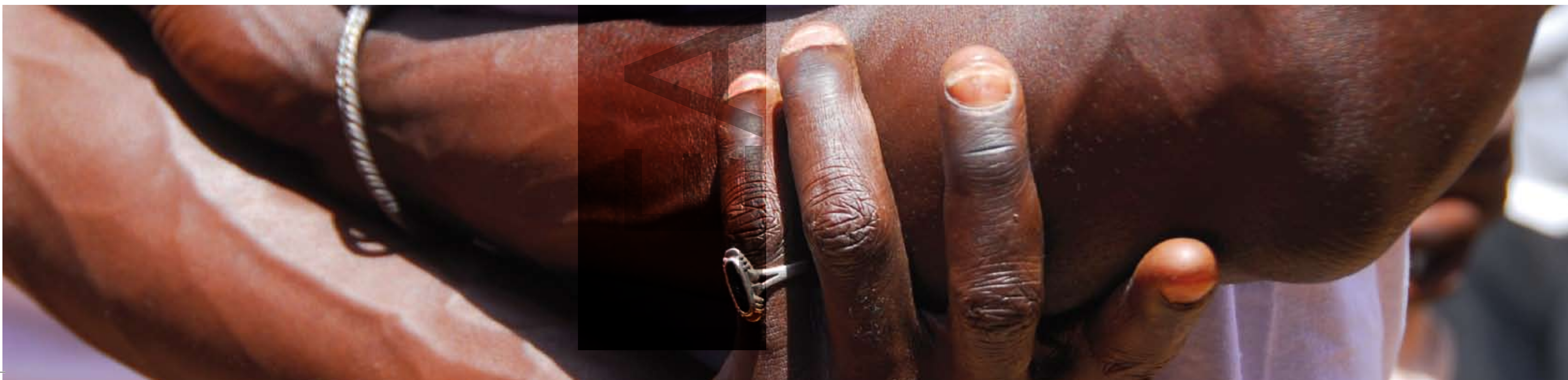
Organized quadrennially under the auspices of IUNS, the International Union of Nutritional Sciences, the 19th International Congress of Nutrition was held in Bangkok featuring the main topic "Nutrition Security for All". The Foundation supported the conference by sponsoring the travel and attendance of different speakers, chairpersons as well as the participation of researchers from Benin, China, Kenya, Indonesia, Bangladesh, Nigeria, Thailand, and Vietnam.

FORMATION INTERNATIONALE EN NUTRITION ET SCIENCES ALIMENTAIRES (FINSA)

In 2009 the FINSA course took place for the 18th time at the Department of Nutrition and Agricultural Sciences of the University of Abomey-Calavi (Benin). Since many years the Foundation supports 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 of 3 students from Cameroon and Ivory Coast. It is crucial that nutrition courses continue to be held in French to promote research capacity in the many French speaking countries of Africa.

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).





Prof. Eric Jéquier's analysis critically reviews the developments during the 26 years of his presidency. A look back is important, but more so the view into the future and his visionary suggestions for strengthening education and capacity building. Prof. Julio Frank, Dean of the Harvard School of Public Health, underlines also the role of education and the crucial primary role of "sending children to school rather than to work". Important, but often neglected, he also stresses the co-responsibility of all actors.

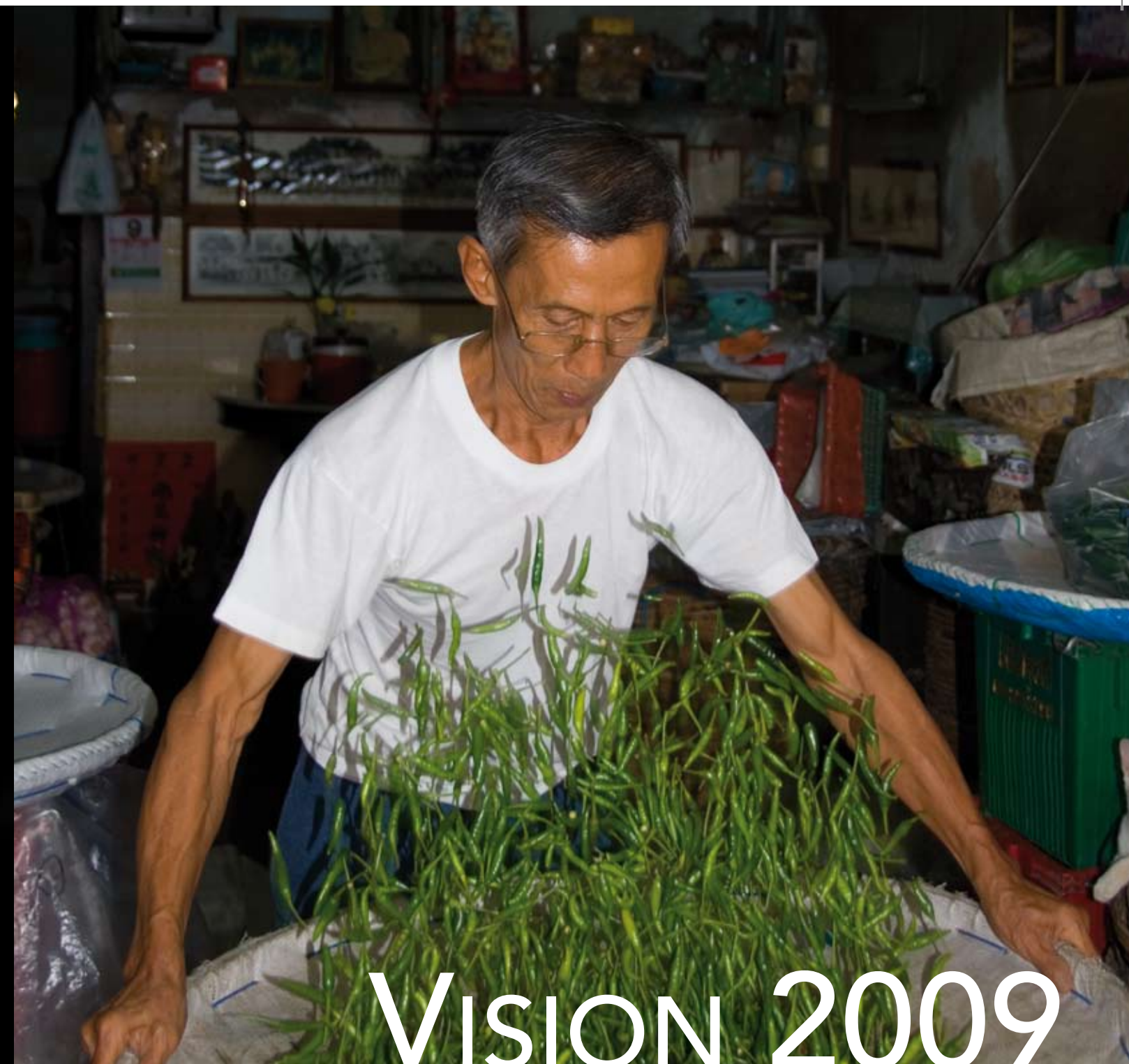
The ideal way to improve health and life in low-income countries is usually a matter of controversy. However, it should be obvious that "the solution comes from within": those concerned usually know what is needed but often they are not asked. Dr. Jacques Courtejoie and his colleagues know what they are talking about: more than 50 years of life and work in the Congo taught them the real needs and the role of local ownership.

Publish or perish. This saying is taken literally for many researchers "hunting impact factors" by doing

research in low-income countries. As Prof. Jennifer Hawkins reminds us, any research should lead to a real benefit for the "research subjects". This should be the case especially for health and nutrition research in low-income countries: without local implementation and sustainability, research has to be regarded nowadays as unethical.

Prof. Nelly Charpak from Columbia shows that an intercontinental South-South collaboration can lead to a sustainable change. Her call for a "kangarooization" of Africa seems to be heard.

Kitti Sranacharoenpong and colleagues report how modern communication technology (e-learning) reduces the risk for chronic diseases in Thailand. Despite the use of modern technology everybody who knows Kitti realizes that the success of his approach lies not only in modern technology but more so in his personality and his motivational capacities. One has to enLINK human capacities with modern technology and know-how for sustainable success, a strategy that the Foundation has pursued for more than four decades.



VISION 2009

BRIDGING THE KNOW-DO GAP

HEALTH, THE ECONOMY &
PUBLIC POLICY

PROMOTE LOCAL KNOWLEDGE

REAL BENEFITS

INNOVATIVE LEARNING TECHNOLOGIES

NORTH-SOUTH-SOUTH COOPERATION



A Look at several Achievements of the Foundation from 1983 to 2009

Eric Jéquier
President
Nestlé Foundation
Lausanne, Switzerland

As Chairman of the Foundation from 1983 to 2009, I will briefly review a few highlights of our activities over these 26 years. This is an opportunity to identify why certain activities were successful, and why others were less satisfactory. This analysis is based on the objectives that the Council established during this period. The Foundation has always shown great flexibility in the prioritization of its activities, and its

policies have adapted to meet the changing needs of human nutrition research in developing countries.

Between 1983 and 2000, the main focus of the Foundation was to identify important problems of nutrition that needed to be studied by using modern technologies in order to improve scientific knowledge. A major field of research was the requirements in protein and energy. At that time, dietary recommendations concerning energy and protein requirements were not based on adequate measurements. For instance, energy requirements were based on food intake measurements, a method that has been shown to be erroneous. The precise assessment of daily food intake requires weighing the exact amount of food and drinks that a person consumes at each meal and between meals. It is

impossible to do these measurements without interfering with the person's behavior, and therefore the results of these studies were not representative of actual living conditions.

The new approach to study human energy requirements consisted in measuring energy expenditure instead of energy intake. The development of new techniques for measuring human energy expenditure during 24-hour periods (or even over several days) has resulted in new data on energy requirements. It has been possible to revise the recommendations for energy requirements of newborns, infants, children, adolescents, adults and elderly people. The Foundation has played an important role in initiating and supporting many studies using either respiration chambers or the doubly labeled water technique to measure the daily energy expenditure of individuals both in developed and developing countries.

In 1986, the Foundation contributed to the creation of the International Dietary Energy Consultancy Group (IDECG) that was founded by the United Nations University and the International Union of Nutritional Sciences. The former Director of the Foundation, Dr. Beat Schürch, was Executive Secretary of IDECG for about 10 years. He edited a series of excellent publications on topics such as chronic energy deficiency, limits of adaptation to low energy intake, protein-energy interactions, and the impact of human aging on energy and protein metabolism and requirements. Between 1980 and 1990, the Foundation identified specific topics for investigation such as the specific energy requirements of pregnant and lactating women. Council members and experts of the Foundation were involved in these studies and contributed to establishing links between scientists from developed and developing countries to carry out these investigations. Contrary to most foundations that are only grant-awarding bodies, the Nestlé Foundation council members have been themselves active in human nutrition research to gain new knowledge in fields previously neglected.

It is interesting to recall why the research field of human energy requirements was of key importance, particularly for people living in developing countries. About twenty-five years ago, the concept of human adaptation to low energy intake was proposed by renowned scientists who claimed that marked variations in energy intake could occur without influencing body weight or body composition in adult individuals. The concept of "metabolic adaptation" was proposed; the belief was that, within certain limits, energy expenditure could adapt to changes in energy intake in order to reach energy balance. It was also hypothesized that malnutrition was mainly occurring in individuals with an insufficient adaptation to low energy intake, whereas others, with an efficient adaptation, were not affected.

The Foundation has been a key actor in this field by demonstrating that there is no evidence of a metabolic adaptation when energy intake is chronically restricted. Studies carried out (or supported) by the Foundation did not confirm the existence of an enhanced metabolic efficiency in populations affected by seasonal variations in energy intake. We showed that the small decrease in basal metabolic rate that was observed in individuals having an insufficient caloric intake was mainly explained by a loss of metabolically active tissue (such as muscle loss) as a result of the chronic negative energy balance. The conclusion was that the recommendations for energy requirements of adults in developing countries are not different from that for people living in developed countries. This new knowledge was an important component of the Report of the Joint FAO/WHO/UNU Expert Consultation on Human Energy Requirements, published in 2004. This document has had important strategic implications in public health interventions since it lays down the scientific basis to assess the number of malnourished individuals in the world.

Another field of scientific activities supported by the Foundation was research related to amino acid requirements in people living in developing countries. Data on the adult requirements of amino acids such as lysine, leucine, threonine, valine and methionine were obtained by using stable isotopic tracer techniques. The Report of the Joint FAO/WHO/UNU Expert Consultation on Protein and Amino Acid Requirements in human nutrition, published in 2006, is mainly based on projects supported by the Foundation. With these contributions, the Foundation has made much progress in our understanding of human energy and protein requirements.

Although the Foundation has always made efforts to encourage local scientists from developing countries to collaborate in studies that were designed and carried out mainly by universities and institutes from the western world, in 2002, with the advent of the new Director of the Foundation, Prof. Paolo Suter, it became obvious that the contributions of local scientists to the research projects that had been supported by the Foundation was only marginal. It was therefore decided to match our policy to the needs of scientists of developing countries. A new policy was implemented which aims at encouraging scientists from low-income countries to submit their own applications to solve local problems of nutrition that they identify themselves. This new approach has been successful over the last 7 years, since a mean of about ten applications from developing countries have been supported each year by the Foundation. When scientists submit their own research ideas and plans to study a local problem of nutrition, they gain a greater motivation than they had when they were only collaborators of western universities. The Director and Council members have been instrumental in helping many scientists to improve the design of the

submitted applications. The consequence of this new approach is a greater involvement of local scientists than before, but the impact of the recent publications on the scientific community is less than before. We have moved from a highly scientific to a more applied institution. We are also aware that outside collaboration should not be ruled out since often university departments of nutrition, especially in Africa, need external advice. Thus, it seems appropriate to keep contacts with renowned universities of the western world that can collaborate with scientists from developing countries to help them to carry out their research projects. The difference to the previous policy is that the main intellectual input should come from the local scientists and not as before only from their western colleagues.

It is sad to see that the gap in scientific knowledge between South and North is still existent despite many efforts to improve the situation. Visits to several universities in Africa have shown us a dramatic lack of recent scientific literature; the absence of scientific journals and of recent textbooks in libraries of many universities illustrates the gap in knowledge transfer from developed to developing countries. The Foundation has contributed to improving the education of scientists in low-income countries by providing internet access to scientific journals in the field of human nutrition and hygiene. This initiative has been a great success and each month, new scientists benefit from this enLINK digital library. In addition, a few years ago the Foundation created an enLINK library trunk, an orange metal trunk that contains more than 120 recent books, brochures and guidelines in the fields of nutrition, hygiene and internal medicine. This trunk is offered free of charge to universities, mainly in African countries. It is hoped that these initiatives will make a small contribution in bridging the scientific gap between North and South.

One challenge that we have met is to convince scientists from universities that have little research experience to submit applications to us. It is noteworthy that in many universities the teaching load of the professors is so heavy that there is no time left for research. In addition, lack of equipment and know-how is a limiting factor. In spite of many efforts and the use of various strategies, such as inviting chairmen of nutrition departments to discuss their research needs and offering fellowships to young scientists, the outcome of most of these initiatives has been disappointing. Many reasons explain the difficulties in promoting the sustained development of universities in developing countries. Often, a young scientist who has obtained higher degrees abroad does not find local suitable research conditions when he/she comes back to his/her country. The desire to return to a western university is therefore very strong. I believe that in spite of many difficulties, we must continue our efforts to promote capacity building

in underprivileged universities to limit the brain drain to the western world. A concerted action with other foundations or funding bodies could be a new strategy because the needs are enormous.

The Foundation is aware that to improve nutrition research in developing countries, providing books and scientific equipment is not enough. We have selected a few universities for institutional-level support, to improve the teaching and research infrastructure. Such initiatives have been carried out at Makerere University in Kampala (Uganda), University of Benin in Abomey-Calavi / Cotonou, University Cheikh Anta Diop in Dakar (Senegal), and the National Research Institute of Child Nutrition in Pyongyang (North Korea). This institutional support has been quite successful but the main question remains the sustainability of the results in the long term.

Is there a risk of becoming discouraged when trying to improve the capacity of universities of developing countries to carry out their own research projects? It is true that local scientists face great difficulties due to lack of scientific information, poor access to modern information and communication technology, lack of competent human resources, insufficient scientific equipment and inadequate financial resources. It is therefore realistic to limit investigations to simple projects with a clear aim. During the last 40 years, the Foundation has supported research projects in more than 50 countries. We received feedback from all investigators and most often the results of the studies have been published in the scientific literature. Therefore, the Foundation has succeeded in promoting interest in the study of problems of nutrition and often helped propose solutions. We are aware, however, that the implementation of the results in a region or a whole country needs public health approaches that are beyond our capacities. The sustainability of improvements also needs the political involvement of the local authorities. This is a difficult but not an impossible task. A brilliant example is the compulsory introduction of iodized salt in China resulting from a series of excellent nutrition research projects carried out by an association of Swedish and Chinese scientists. I believe that the new policy of the Nestlé Foundation consisting in encouraging scientists from developing countries to submit their own research proposals is a promising approach. We should not be discouraged by a few failures that are inevitable, but we should continue our efforts to support small teams of investigators and institutional development. I wish full success to the members of the Council of the Foundation, to the Director, and to the new President, Professor Susanne Suter.





HEALTH, THE ECONOMY & PUBLIC POLICY

Health, the Economy and Public Policy

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During the past few years, health has come to occupy a central place in the most pressing dimensions of the global agenda: economic development, national security, democratic governance, human rights.

In this context of growing global visibility for health matters, their relationship with the economy has become the object of intense scrutiny. For decades, the connection between health and economic growth was viewed as a simple, unidirectional relationship: economic growth promotes health through better living conditions, improved nutrition, and increased access to education.

Reality, however, is more complex. We now know that good health is not only a consequence but also a condition for economic growth. Thus, health protects family assets, improves educational performance, increases productivity, enhances the investment climate and, by doing all these things, stimulates economic growth.

The relationship between health and the economy can lead either to a virtuous or a vicious cycle. Productive investment in equitable, efficient, and high-quality health services has a positive effect on all economic activities. In contrast, unproductive health spending increases inflation, reduces productivity and competitiveness, depletes savings, gives rise to inequalities, and diverts funds from better social uses. As we can see, there is a fundamental connection between the performance of the health system and the performance of the economic system.

This is probably why there has been a growing realization about the importance of health systems and a burst of new initiatives to strengthen them as a key strategy to accelerate progress towards the health-related Millennium Development Goals (MDGs).

Awareness about the importance of health and health systems comes at a time of unprecedented change. Low and middle-income countries are witnessing a complex epidemiological transition and facing a triple burden of ill health: first, the unfinished agenda of infections, undernutrition, and reproductive health problems; second, the emerging challenges represented by non-communicable diseases; and third, the health risks associated with globalization, including the threat of pandemics like AIDS and influenza, and the dissemination of harmful lifestyles leading to the silent epidemic of obesity.

Today there are more than one billion overweight adults globally. In the developing world this epidemic first affected the affluent middle-aged adults in urban settings, but it is now spreading to rural areas, affecting younger age groups, and rapidly turning obesity into a disease of the poor.

What is particularly baffling is the fact that this new epidemic is unfolding when several low- and middle-income countries were just beginning to control their under-nutrition challenges. We should not be overoptimistic in this last regard, since there are 850 million people worldwide still suffering from hunger. However, it is also true that there are several innovations in this arena that it is necessary to analyze and disseminate, as they contributed, through the generation of knowledge, to the improvement of health and nutrition.

Knowledge improves health through three main mechanisms. First, knowledge gets translated into new and better technologies, such as drugs, vaccines, diagnostic methods, and nutritional products. Second, knowledge is also internalized by individuals, who use it to structure their everyday behavior in key domains like personal hygiene, sexuality, child-rearing practices and feeding habits and nutritional practices. Finally, knowledge becomes translated into evidence that provides a scientific foundation for decision-



making both in the delivery of health services and in the formulation of public policies.

Two recent innovations implemented in Mexico can illustrate the uses of knowledge to improve health and nutrition. The first case is a comprehensive initiative implemented in the late-1990s to enhance basic capabilities of families living in extreme poverty. This program, called *Oportunidades*, creates incentives for families to invest in their children's human capital through cash transfers that are conditioned on the fulfillment of certain elements of co-responsibility: first, sending children to school rather than work; second, attending a clinic to receive a package of health promotion and disease prevention interventions; third, providing a specially formulated nutritional supplement to pregnant and lactating women, all children aged 6 to 23 months, and low-weight children aged 2 to 5 years. *Oportunidades* has grown to become one of the largest conditional cash transfer (CCT) programs in the world. It covers 5 million families—about 20 million persons—and has an annual budget of USD 3 billion.

In a decision that proved to be visionary, the Mexican government decided to evaluate its effects using a randomised design. An initial assessment carried out in 2000 showed that CCTs were associated with better outcomes in most domains. In the nutrition area, one finding was particularly relevant: children in treatment communities were on average 1.1 cm taller than children in control communities at 2 years of age.

The strong evaluation design has helped to turn *Oportunidades* into a model program throughout the world. In Latin America there are now similar programs in at least nine countries, benefiting 75 million persons.

However, in health matters we are always victims of our own success. Even as *Oportunidades* was proving its value in reducing poverty and improving health, the beneficiaries were experiencing new disease burdens. Ironically, a substantial proportion of the cash transfer received by poor families was being used to finance care that was not included in the initial basic package of interventions, which was mostly focused on the pre-transitional pattern of disease burden.

On the basis of the successful platform provided by *Oportunidades*, social protection for poor families needed to be expanded by taking the next bold step: universal health insurance. This was the focus of a structural reform initiative that was recently implemented in Mexico. The Mexican health system is increasing public funding by a full percentage point of GDP over seven years in order to provide universal health insurance. The vehicle for achieving this aim is a public scheme called *Seguro Popular*, to which 30 million people have enrolled by 2009.

Like its predecessor, the new reform has also been subject to a rigorous external evaluation. The first follow-up measurement has shown a significant reduction in catastrophic expenditures, especially among poor households.

The international dissemination of the *Oportunidades* and *Seguro Popular* evaluations and their use in the implementation of new initiatives throughout the world clearly show that the dilemma between local and global research is a false one. The process of globalization can turn knowledge into an international public good that can then be brought to the domestic policy agenda in order to address a local problem. Such application, in turn, feeds back into the global pool of experience, thus generating a process of shared learning.

This means that scientific evidence must guide the design, implementation, and evaluation of programs not only in national governments, but also in aid agencies, multilateral institutions, and NGOs. Better policy making will lead us to more equitable development, which implies better health and nutrition.





PROMOTE LOCAL KNOWLEDGE

Health Promotion in the Democratic Republic of Congo 50 Years in the Country: Projects, Successes and Failures

Jacques Courtejoie, MD
Roger Mabiala Zimuangu
Clément Nzungu Mavinga
Centre pour la Promotion de la Santé
Kangu – Mayumbe
Democratic Republic of Congo

In 1959, when Dr Jacques Courtejoie arrived in Kangu, his aim was to treat sick people. However, he discovered very soon that many diseases could have been prevented, or at least would have been less severe, with a change of behaviour, as well as

better habits in hygiene, nutrition and health. Thus, he thought it was important to improve people's knowledge about diseases and how to avoid them. So, he started providing advice to hospital patients.

A very practical example is the following. In that area, many people had tuberculosis. We all know that a diet rich in protein favours recovery from tuberculosis. As it happened, there were chickens in all the villages. The patients with tuberculosis only needed to be encouraged to eat eggs. In this way, they would benefit from a diet richer in protein, and recover more easily. Unfortunately, nobody used to eat eggs as there was such a strong taboo against doing so. It was the case in the village that the under nourished chickens constantly wandered, searching for food, and the few eggs people discovered had to be saved

for reproduction. If the people with tuberculosis were to start eating the eggs, there would soon be no chickens any longer in the village. The people understood that the advice given by the doctor was very good for himself and for the situation in Europe, but did not fit the framework of the village. Jacques Courtejoie quickly realised that the best solution was to keep silent, and to stop giving advice. Instead, the local elite should be asked how to adapt some messages about health in order to make them useful for the villagers. This is how Dr Courtejoie set up the Centre pour la Promotion de la Santé (Centre for the Promotion of Health), which is presently run by Clément Nzungu Mavinga and Roger Mabiala Zimuangu.

In 1959-1960, the unrest leading to the independence of Congo was important. The white men were quite convinced that they would soon have to leave. It was thus urgent to set up a good training program for the nurses and midwives who would soon be in charge. A transfer of responsibilities had to be rapidly organised as well, so that the departure of the white people could take place without major troubles.

The advice Jacques Courtejoie had provided the tuberculosis patients to improve their nutritional status was totally unsuited; similarly, the handbooks from Europe being used for teaching nurses and midwives were quite satisfactory for Europe, but very often unsuited to the local context. The problems being tackled in these materials did not correspond much to the local reality. Much stress was put on cardiovascular diseases, cancer, or aging (even though people there died at an early age), and little attention was devoted to malaria, bilharziasis, sleeping sickness, filariasis and other local illnesses.

Thus, a teaching method had to be devised that was adapted to the local conditions present in the rural environment and to the responsibilities that would be conferred to those nurses and midwives. To do that, it was important to have material suited to the local situation. This is how the team of the Centre for the Promotion of Health undertook, year after year, to create, test, expand and distribute a whole set of educational material, thanks to the help of numerous collaborators.

Were they successful? Yes, definitely. We often see that people feel much more responsible for their health and get deeply involved to promote their living conditions. For example, immunisations are no longer a problem. They are readily accepted. Women want to give birth with quality obstetrical help. When they can afford it, people also try to get more diversified and better quality food. Powdered milk as a food for the whole family has been progressively introduced. It is generally accepted, and as a result, within one or two generations, people's body height has markedly increased, good proof of better nutrition.



Among the young mothers in Congo, we have distributed 5,760,750 “body weight curve” files; they were devised according to the model of the WHO, renamed here “the right path to health”, and accompanied with adequate explanations.

After less than a generation, we have observed that quite many young mothers were eager to see their children remain on the right path of health, and worried if they saw them depart from it, as they were quite conscious of all the dangers they might encounter (thorns, snakes...). We feel that responsibility of the mothers has been a significant aid in improving adequate nutrition of the young.

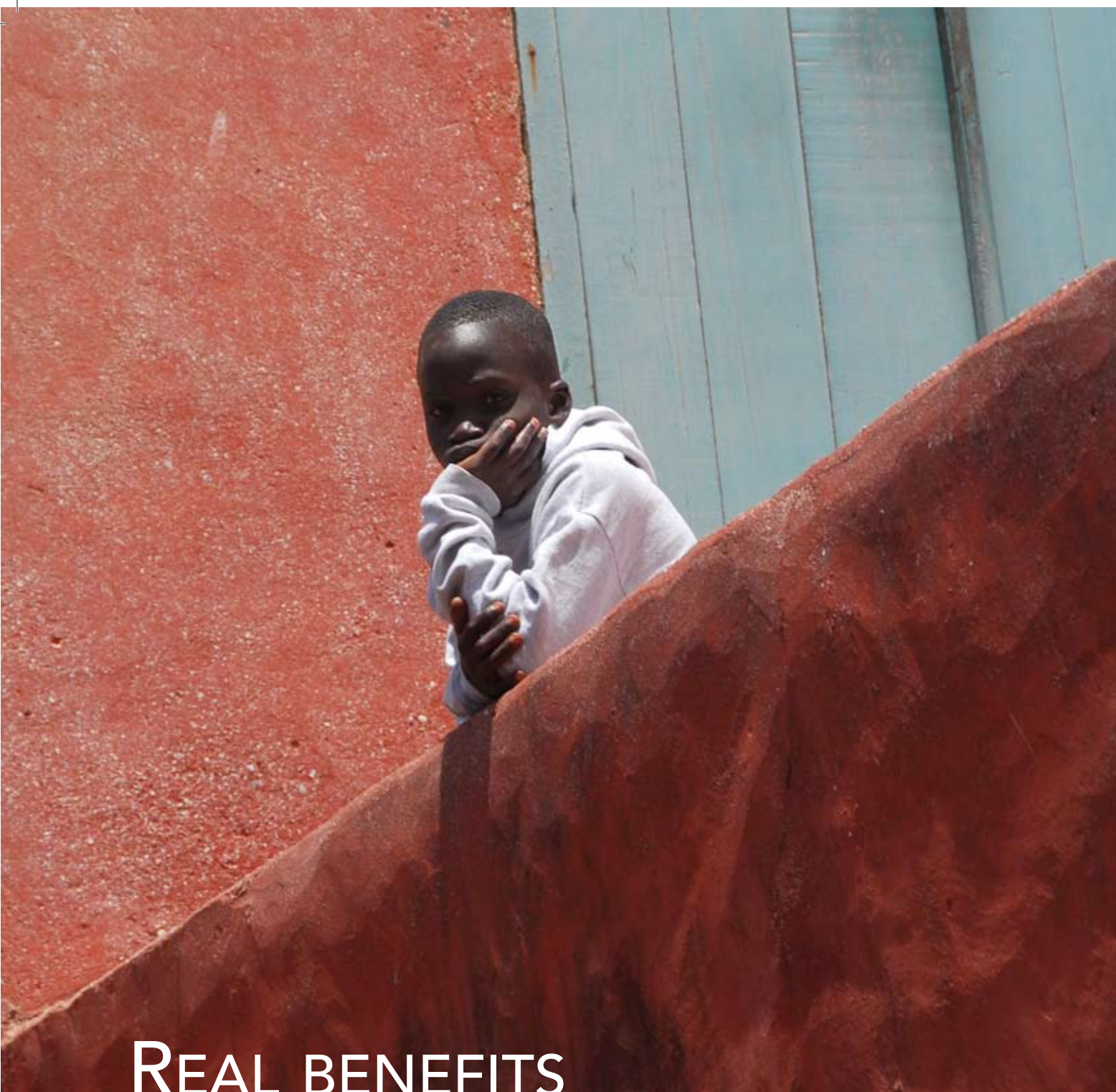
Still, there is much work yet to be done. Here is a very practical example. A few months ago, a domestic cat that had been tame started biting everyone around it. The people chased it, tried to hit it, and to lock it up, until it finally died. We immediately said it was quite certainly a case of rabies, and it was urgent to immunise all the people whom the cat had bitten or scratched. Human vaccine was then available (for USD 100) in Kinshasa (600 km away). Two people rushed immediately to Kinshasa to get the shot, but for all the others, the local nurses estimated that by carefully disinfecting the wound and properly dressing it with a clean bandage, they would be all right. A few weeks later, we counted up to 15 deaths in the village. It was also urgent to immunise the dogs and the cats of the village. At that time, we were asked “Why go to Kinshasa to get very expensive shots for a simple wound that will heal by itself?”, and “Why give injections to our dogs when we do not have enough money to feed our children?”

All that should not be a reason for being discouraged. Indeed, we can see that of the 345 nursing schools in Congo, 270 are equipped with books produced by our team, and that the training presently provided there is better suited to the local situation.

We understand that such a reorientation has to be pursued over a few generations, and, even if the results can already be perceived, they are slow. The process is going to go on for years, possibly for a few more generations.

As a conclusion, we think it is important to listen to people, without thinking we know the best solution. Quite the contrary, they often have solutions better suited to the local situation. Of course, we can suggest to them that they change some specific attitudes; they will do so if they think it is in their interest. Finally, it is up to them to choose. The process is long, but it is irreversible, and we are heading to better health. There is no doubt about it.





REAL BENEFITS

Real Benefits for Research Subjects

Jennifer S. Hawkins, Ph.D.
Associate Research Professor
Trent Center for Bioethics, Humanities,
and History of Medicine
Duke University
Durham, NC, USA

I am honored that I was asked to write a column for this year's Nestlé Foundation Annual Report. My work centers on research ethics, and in particular on the ethics of research in developing countries. This is familiar territory for The Nestlé Foundation since it

has been supporting nutrition research in developing countries for a long time. I am impressed with the Foundation's commitment to supporting research into sustainable interventions that will actually improve the lives of malnourished people around the world. Unfortunately, more and more human subjects research is being conducted in developing countries without the concern for implementation and long-term sustainability that is so central to the Nestlé Foundation's mission.

One of the more common ethical worries one encounters in the literature on clinical research ethics is a worry about exploitation. To exploit people is to use them unfairly, and clinical research certainly makes

use of people. Human subjects are used in our efforts to promote human knowledge and human health. By itself this need not be unethical or exploitative. Not all use is unfair use. But since researchers are in the business of regularly using people, they should reflect carefully about which uses are fair. The need for reflection is even greater when dealing with vulnerable populations, since we especially want to avoid exploiting those who are already in a poor position.

There are many dimensions of fairness. But one thing that makes a transaction unfair is if one party receives far less benefit than it seems he or she ought to receive. Even if all parties to a transaction benefit as measured against a no-transaction baseline, it can still be the case that the benefits and burdens of the interaction are inequitably distributed. If we apply this model to clinical research ethics, it invites us to think about what sorts of benefits subjects and their communities really ought to be receiving. Most clinical research offers some benefits, especially when it is conducted in poor countries, since many individuals in these places have no other access to health care. For them participation in research is much better than non-participation. But it would be wrong to assume that since subjects benefit the transaction is therefore fair. How much they benefit and in what ways also matter. Exploitative research is research that fails to provide subjects and their communities with enough of the right types of benefits.

Although these days researchers travel the world, the benefits of medical knowledge have not proven to be so easily transported. Thus it can happen that research conducted in one community has no long-term benefit for that community, but rather serves to improve health elsewhere in the world. This seems to many people a quintessential case of unfairness—when the very people who have partnered with scientists to help produce this knowledge cannot themselves benefit from it. This suggests that one crucial component of fair benefit is access to any interventions proven to be beneficial to health.

Indeed, in 1993, The Council for International Organizations of Medical Sciences (CIOMS) published guidelines for ethical conduct in research that required researchers to be sure in advance of carrying out their research that any interventions proven effective would be available to subjects and host communities post-trial. This requirement of "reasonable availability" has been discussed at length and has received a number of criticisms, but most of them do not argue with the substantive ethical intuition behind the requirement, but only with its particular formulation.

The most common concern was simply that researchers are not always in a position to assure post-trial availability. Clearly the model CIOMS had in mind was that of a private company doing research,

where the company can, if it so chooses, agree up front to make its products available post-trial should they be proven effective. But many not-for-profit government research entities (for example, the U.S. NIH) are mandated to focus exclusively on research and do not have the funding to put towards post-trial implementation. The Nestlé Foundation is another case in point. Its mission is research on nutrition to benefit people in developing countries, but obviously it cannot take upon itself the task of improving nutrition in all the places it studies. Instead, the hope is that the knowledge gained will be used by local governments or NGOs or other aid organizations.

Still, although many researchers may not be able to guarantee the implementation of effective interventions, it still seems that one of the things to consider when planning research is whether it is likely that some other organization will fill this role. If it is obvious from the outset that neither local government nor aid organizations are likely to take it upon themselves to ensure that an intervention is put to use, then it is probably not ethical to conduct the research. Researchers have long operated with a "division of labor" view that shields them from feeling any responsibility for implementation. "Our work," they think, "is the work of obtaining knowledge. It is for others to implement this knowledge, and we can't be blamed if they don't do so." But while this line of thinking can be tempting, we should resist it. Truthfully, we can often predict whether the resources and the political will are present to help implement an intervention should that intervention be proven effective. If we know that resources and will are lacking, then if we go forward anyway, we use people for the production of knowledge without adequately compensating them for their contribution. This will understandably lead to resentment on their side and help to strengthen the view of many people in such countries that western researchers are exploitative.

Of course difficult cases will remain where it is not clear whether or not something will be implemented. My claim is only that it is unethical to proceed if one is reasonably sure that beneficial interventions will not be implemented. But what about cases where one is not sure either way? Or where one thought it was likely to be implemented, but later this turns out to be wrong? All we can do is our best, based on the best knowledge we have. But taking the requirement for fair benefit seriously means that researchers actually inquire into these matters, and try to ascertain as best they can what chances there are. And this is already more than the old research ethics required, with its exclusive focus on informed consent and favorable risk-benefit ratio.

One further problem with the CIOMS guideline is that not all research leads to effective interventions. If we knew that something would be effective we wouldn't be doing the research in the first place. So even if

one thinks, as I do, that proven interventions should be available post-trial, a question remains about what “fair benefit” amounts to in the case where no proven intervention emerges. Some theorists have argued that exploitation is avoided as long as subjects and communities are offered some sort of benefits and these benefits are deemed adequate by the local population (the locals view the transaction as fair). Though I cannot comment at length on this proposal, I think it is crucial to keep in mind that individuals are typically selected as subjects because of health problems they have. Hence, any definition of fair benefit must, I think, be focused on health benefits, and on improving in some way or other the health of those who are helping us contribute to the health of others.





INNOVATIVE LEARNING TECHNOLOGIES

Innovative Learning Technologies to Prevent Chronic Diseases in Thailand: From Vision to Action

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Bangladesh, Thailand

and

Rhona M Hanning, Ph.D., RD
University of Waterloo, Canada

Information technologies have an extraordinary capacity for transmitting health information. Moreover, Internet-based approaches can be used to facilitate learning and provide ongoing education and

support. Connectivity has particular value in building capacity for health-related knowledge translation in developing countries. The last decade has seen significant growth in Internet access in both urban and rural areas of Thailand; community health care workers (CHCWs) now use it for communication and access to relevant health care information. There is tremendous potential for information technologies to support CHCWs' education and practice in health promotion and in prevention of chronic diseases. CHCWs in Thailand are fighting to address people's health problems, which increasingly include over-nutrition and chronic diseases, such as Type 2 diabetes. To build capacity for chronic disease prevention in Thailand through the application of learning technologies in the education, support and evaluation of CHCWs is an objective described in this article, which describes the

successful design, implementation and evaluation of a community-tailored diabetes prevention education program for CHCWs in Thailand. The research project also was offered a unique opportunity to develop a close collaboration among the University of Waterloo, Canada; St. Michael's Hospital, Canada; and the Institute of Nutrition, Mahidol University, Thailand; and was supported by the Nestlé Foundation in Switzerland.

It was clear that diabetes has become a crucial public health problem in Thailand. Diabetes prevention and promotion of health must be priorities and need to be addressed using approaches that can feasibly be integrated into the public health system. The results of formative evaluation indicated many barriers to current health promotion that might be obstacles for CHCWs in their Chiang Mai communities. It seems that health promotion programs are only instituted in Thailand when health practitioners are mandated to implement them by government policy or when the programs are government-financed. A related issue is that some programs have not been sustained because they were part of the work of CHCWs who have many responsibilities and have had to turn their attention to new government policies and mandated programs. Therefore, since there are currently no government policies or mandated programs aimed clearly at diabetes prevention, the concept of health promotion is not currently a focus for CHCWs and other health professionals. Their work is confined to the routine treatment of existing disease and, since 2004, screening for chronic disease risk factors.

On the other hand, the formative evaluation also indicated some areas of strength which would support a diabetes prevention education program for CHCWs. Some health professionals, including CHCWs, expressed concern that the incidence and prevalence of diabetic patients in their community has increased over time. Unfortunately, they have had no specific mandate to educate people about prevention or risk management. Moreover, CHCWs expressed a lack of knowledge and confidence in their ability to provide relevant advice on lifestyle issues. Hence, they recognized a need for diabetes prevention action, but also a need for their own further education to enable them to address diabetes prevention. Other supportive points that emerged from this formative study were the existence of a comprehensive, government-supported diabetes screening system, short course training at local hospitals, and the feasibility of using computers and the Internet to support CHCW education at the health-centre level.

The training course served as a basis of health education for the CHCWs. Thirty-five CHCWs of 69 were randomized to the intervention group and 34 CHCWs to the control group. The training was delivered over 16 sessions of 2.5 hours each within a four-month period. A mix of classroom and E-learning approaches (www.FitThai.org) was

used. The teaching and learning strategies included discussions, problem-based learning, community-based application assignments, self evaluations, and on-line support. It also encompassed key health messages for populations in their communities about diet, physical activities, and risk factors related to type 2 diabetes. The short-term impact of the four-month training program on the knowledge of CHCWs was assessed in intervention compared to control groups in Chiang Mai province, Thailand. At the baseline, the overall scores on a pre-tested knowledge test were very low in both groups (56% for intervention and 55% for control) and all CHCWs scored lower than 70%. No significant differences were found between the intervention and control groups. After 4 months, CHCWs in the intervention group demonstrated improvement relative to the control group (76% versus 57%, respectively, $p < .001$, $n=69$). The percent of CHCWs achieving a total score of 70% was 77% (27/35) in intervention and 0% in control groups. The pre-post knowledge tests confirmed that the overall program was helpful in improving CHCWs' health knowledge relevant to diabetes prevention. The innovative learning model has potential to expand chronic-disease-prevention training of CHCWs to other parts of Thailand. Ultimately, prevention of chronic diseases and associated risk factors should be enhanced.

Diabetes can potentially be delayed and prevented by targeting specific lifestyle behaviours within the context of communities. The training approach was an effective model for CHCWs to support their gain in knowledge and support dissemination to community members. This training format has potential for wide dissemination for other training needs. This model can also be adapted to other communities within Thailand. A well-designed CHCW training program is also only one part of a comprehensive strategy for diabetes prevention that should involve community organizations, health professionals, CHCWs, and Ministry of Health (MOH) as partners to prevent diabetes. The models and approaches need to be adapted based on the characteristics of the learners and their environmental and cultural context.



An Example of a North-South-South Cooperation: Implementation of a Kangaroo Mother Care Unit in Bamako, Mali

Nathalie Charpak, MD
Director of the "Fundación Canguro"
Bogotá, Colombia

Traditionally, cooperation in health is directed from north to south, but failures are frequent, a result of three basic issues. Sometimes the project falters once the financial support ends, especially if there was not sufficient thought given to long-term sustainability; sometimes the technology provided cannot be maintained;

and sometimes scientific evidence is not adapted in a way that makes it acceptable and applicable locally.

Actually South-South cooperation is expanding dynamically. Middle-income developing countries now have technical competencies and excellence centres in many crucial fields, including health care, and are claiming more participation in cooperation decisions. Knowledge transfer is better accepted and appropriate between southern countries because professionals have experience with a low level of development and they have often already been through similar situations in recent years. It allows for a more egalitarian knowledge transfer, more direct and more adapted to the local situation, with a greater chance of success.

Background

Developing countries bear 90% of the global burden of diseases; children and mothers are particularly vulnerable. Infant mortality rates in many developing countries can be 30 to 40 times and maternal mortality 20 times higher than in industrialized countries. Twenty million low-birth-weight infants (LBWI) are born each year, either because of preterm birth, impaired prenatal growth, or both. Of the 4 million infants that die every year, one-third of the deaths is caused by or associated with the delivery of LBWI and subsequent complications. Even when neonatal mortality decreases, LBWI remains as a main cause of death.

Kangaroo Mother Care (KMC) is an evidence-based approach that has been proven useful for ameliorating LBW effects on infant mortality and morbidity, nutrition and early development. Major components of KMC are the "kangaroo position" (prolonged skin-to-skin contact), "kangaroo nutrition" (breast-milk-based nutrition) and "kangaroo discharge policies" (early discharge maintaining kangaroo position at home or in a KMC ward with strict follow-up). KMC offers additional advantages regarding the mother's empowerment and family bonding. It allows for a better use of the human and technological resources available, decreasing the overall costs for the hospital and the family. It is an efficacious and safe alternative to neonatal minimal care units, rationalizing the use of limited human and technical resources in developing countries.

The Kangaroo Foundation

One of the major causes of the so-called 90-10 gap that separates affluent and less developed countries is the inadequate access to knowledge (knowledge transfer) and when accessible, the insufficient translation of that knowledge into action. A group of researchers and health-care professionals decided to tackle this double challenge by creating a NGO called the Kangaroo Foundation in 1994 in Bogotá, Colombia. Major goals of the Foundation are:

- a) Demonstrating the safety and efficacy of KMC. This has been accomplished by completing and publishing a set of clinical studies, permitting us to convince our colleagues that KMC is not the "poor man's alternative", but in fact a scientifically safe and efficient option that complements and enhances the usual neonatal care for LBWI.
- b) Disseminating knowledge of KMC to other institutions in developing countries by training health-care teams not only in KMC but in recording and monitoring key-quality indicators.

With external financial support, 50 multidisciplinary health-care teams from 25 developing countries have been trained in Bogotá in our centre. We especially thank one Swiss NGO, the "World Laboratory"; they supported the successful training in several African countries, including Cameroon, Senegal, Togo, Uganda, Kenya, Ethiopia, South Africa (Cape Town and Soweto),

Madagascar, Malawi and Mozambique. Some have already begun national KMC training programs in their countries. Trained teams were also provided with the basic tools for translating knowledge into health-care action.

Implementation of the Bamako KMC Unit through a North-South-South Collaboration Project

With 12 million inhabitants, Mali is one of the poorest countries of West Africa, and the infant mortality rate is around 130 per 1000 live births, one of the world's highest.

KMC training, using funds from the USA and France, was organized in various steps:

1. In 2007, a Malian team received KMC training at the centre in Douala, Cameroon (whose workers had been trained in Bogotá in 2002). The Malian team was introduced to the KMC implementation in a situation very similar to their own.
2. In 2008, a Malian team received KMC training in Bogotá.
3. In 2009, a KMC support team went to Bamako, Mali for 3 weeks to collaborate in the implementation of KMC. The Douala team overlapped for one week with the Colombian team.
4. In 2009, the Kangaroo Foundation carried out data analysis and observations of the KMC training of 5 regional centres (2 obstetric facilities in Bamako and 3 regional hospitals: Segou, Sikasso and Kayes). Their results were successfully presented during the last African national paediatric congress.

Conclusion

A worldwide "kangarooization" era has started. It is unusual in the medical world for a technique pioneered in a southern country like Colombia to become so popular not only locally but all over the world. This endeavour is unending; it involves long-term tasks in order to have a sizeable impact in the health of an entire population. It is focused on the most fragile segment of a population, the LBWI and its family. Despite the obvious benefits of such an undertaking, not enough donors are willing to commit themselves to the time necessary for such a program to be fruitful. The KMC unit of Bamako is functioning well under the direction of Dr M. Sylla with the KMC team and without any external help. As the institutional and human capacities are established, we hope to sustain the efforts of our Malian colleagues to achieve the MDG by 2015.

I want to acknowledge the KMC team for their work and commitment: Dr Awa Diall Bengaly, Dr Isabelle Traore Traore, Dr Djibril Kassogue, Nurse Djeneba Doumbia Soumaoro and Nurse Kamissoko Fatoumata Bagayogo.



PROFILE OF A NUTRITION INSTITUTE



PROFILE OF A NUTRITION INSTITUTE

The Nutrition Unit of the University Cheikh Anta Diop Dakar (Senegal)

Salimata Wade, PhD
The Nutrition Unit (Equipe de Nutrition)
Faculté des Sciences et Techniques
Université Cheikh Anta Diop de Dakar
Dakar-Fann
Senegal

The University Cheikh Anta Diop of Dakar (UCAD) (<http://www.UCAD.sn>), a public university, was established in 1959, and is now composed of six Faculties (Science and Technology; Humanities; Law and Politics; Economics and Business; Medicine, Pharmacy, and Dentistry; and Education), ten Institutes of higher learning (including Health and Development, Applied Tropical Medicine, Population and Reproductive Health, and Social Pediatrics, among others), and seven specialized Schools.

In 2004, UCAD initiated a review of the “Licence, Master, Doctorate (LMD)” program to harmonize the University’s degree requirements with regional norms, and the University began reorganizing the doctoral programs in 2007. The Masters and PhD degrees are now issued by specific Graduate Schools. For example, the graduate program in Human Nutrition is located in the Graduate School of Life Sciences, Health and Environment (ED-SEV) (<http://sev.ucad.sn>).

The Nutrition Unit (Equipe de Nutrition) at UCAD, chaired by Prof. Salimata Wade with the assistance of Prof. Amadou Tidiane Guiro, was established in 1990. The goals of the Unit are to increase human resources in human nutrition training and research, provide laboratory facilities, and build up a new generation of leaders in nutrition science in the sub-Saharan

region, with particular emphasis on Francophone countries. The graduate training program in Human Nutrition (Masters and PhD) was initiated in 1997 as a collaborative activity of the University and several national institutes of health, agriculture and food technology. The Nutrition Unit is composed of four permanent faculty members (two senior and two associate professors), a technician, an administrative assistant, and the graduate students. The training program involves the foregoing faculty members and collaborating faculty from the Faculty of Medicine, the Faculty of Sciences, the Faculty of Humanities, the National Nutrition Program of the Senegalese Government (PRN), the International School of Veterinary Medicine, and lecturers from the Institutes of Food Technology (ITA) and Agriculture (ISRA). The Nutrition Unit has established external links with Universities in France, Belgium, UK, USA and West Africa. Internal links were also developed with international bodies (such as MI, HKI, IZinCG).

The Nutrition Unit has a basic infrastructure for research in nutrition and food sciences, including lab space, study areas for students, instruments for nutritional status assessment (flame photometer, high performance liquid chromatograph, atomic absorption spectrometer, infra-red spectrometer, ELISA reader), some equipment for food composition analysis, independent water and power supplies, refrigerators and freezers for biological specimens, high speed internet connections and personal computers.

The training program has produced nine graduates with PhD degrees (one Mauritanian who is now a faculty member of the University of Nouakchott, and eight Senegalese – five women and three men – who are employed by the University, national programs, international agencies and NGOs). Twenty-nine (29) students (22 from Senegal, one from Niger, two each

SENEGAL

AREA

196,722 km²

Arable Lands	12.51%
Permanent Crops	0.24%
Irrigated Land	1,200 km ²

POPULATION

13,711,597 (2009 estimate)

urban population:	42%
below age 15:	5.8 million (42%)
median age:	18.6 years

POPULATION GROWTH RATE

1.0% (estimate for 2008)
Rural Areas: -1.5% / Urban Areas 3.3%
Fertility Rate : 5.1 children born/woman

GNP (per capita)
1,700 USD (2009 est.)

LIFE EXPECTANCY AT BIRTH

male: 57.1 years / female: 60.9 years

UNDERNOURISHED PEOPLE

24.4%

MORTALITY RATES (2007)

Births attended by skilled health personnel 58%

Neonatal Mortality Rate

35 / 1000

Infant Mortality Rate (under 1)

72 / 1000

Under-Five Mortality Rate

149 / 1000

Maternal Mortality Ratio

400 / 100,000 live births (2003 - 08)

UNDERWEIGHT

Newborns with low birth weight	19%
Children under 5 moderately or severely underweight	17%
Children under 5 severely underweight	3%

INFANT AND YOUNG CHILD FEEDING

Exclusive breastfeeding rate (<6 months) 34%
Timely complementary feeding rate (6-9 months) 61%
Children who are still breastfeeding (20–23 months) 42%

KEY NUTRITIONAL ANTHROPOMETRY

Stunting in children under 5 years (moderate & severe) 16%
Prevalence of wasting (moderate and severe) 8%

MICRONUTRIENT DEFICIENCIES

Prevalence of goitre (all ages) 23 – 34%
Percentage of households consuming adequately iodized salt 41%
Prevalence of subclinical vitamin A deficiency in preschool children 61%
Prevalence of vitamin A supplementation in children 94%

OTHER PARAMETERS

Total adult literacy rate (%)	43%
Primary school net enrolment /attendance	58%
% of population using improved drinking-water sources, 2006, rural	65%
% of population using improved drinking-water sources, 2006, urban	93%
% of population using improved sanitation facilities, 2006, total	28%
% of population using improved sanitation facilities, 2006, urban	54%
% of population using improved sanitation facilities, 2006, rural	9%

from Chad and Togo, and one from Cameroon) also received Masters degrees. Half of these graduates are women. Currently, all of them are employed.

In 2009, the Nutrition Unit elaborated a strategic training plan to train three cohorts of Master Degrees in 2009-10, 2010-11; 2011-12, 2012-13; and 2013-14, 2014-15. A new cohort of Masters students (12) has started this year (2009-10).

The Unit runs also short training programs. Fourteen (14) participants were trained in 2007, and fourteen in 2009 on the rehabilitation of acute severe malnutrition and body composition.

The training program and laboratory facilities were supported by the University Cheikh Anta Diop, the French and Belgium cooperation, IAEA (International Atomic Energy Agency), and the Nestlé Foundation.



ONGOING PROJECTS

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TITLE

PRINCIPAL INVESTIGATOR

MICRONUTRIENTS

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, Democratic People's Republic of Korea
7	2004 / Effects of multi-vitamin and multi-mineral supplementation on pregnant women and their infants in Chongqing, China	Ting-Yu Li Chongqing University of Medical Sciences, Children's Hospital, Chongqing, China
8	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
9	2004 / Vitamin A value of spirulina carotenoids in humans	Guangwen Tang Tufts University, Human Nutrition Research Center on Aging, Boston, Massachusetts, USA

MICRONUTRIENTS

10	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
11	2005 / Environmental supplementation of iodine by iodination of irrigation water in the Ferghana Valley	Maksuda Abidjanova Association of Endocrinologists, Kokand City, Uzbekistan
12	2005 / Stability and efficacy of vitamin-A-fortified cooking oil on nutritional status of Vietnamese children 36-60 months	Cao Thi Thu Huong National Institute of Nutrition, Department of Micronutrient Research & Application, Hanoi, Vietnam
13	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
14	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
15	2006 / Assessment of iron status of children in rural communities in Abia State, Nigeria	Ignatius Onimawo Ambrose Alli University, Biochemistry Department, Ekpoma, Nigeria
16	2006 / Efficacy of multiple micronutrients supplementation on anaemia in 6-23-months-old rural Burkinabe children	Hermann Ouedraogo Inst. de Recherche en Sciences de la Santé, Ouagadougou, Burkina-Faso
17	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
18	2008 / Improving micronutrient status of Chinese children using dietary spirulina	Shi-an Yin National Institute of Nutrition & Food Safety, Beijing, China



TITLE

PRINCIPAL INVESTIGATOR



TITLE

PRINCIPAL INVESTIGATOR

MICRONUTRIENTS

19	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
20	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
21	2009 / Effect of maternal zinc supplementation during pregnancy and lactation on infants' immunity	Mohammad Bakhtiar Hossain ICDDR, B, Clinical Research Division, Mohakhali-Dhaka, Bangladesh
22	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
23	2003 / Evaluation of two counselling 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
24	2008 / Information and education to support and promote exclusive breastfeeding	Ada C Uwaegbute Michael Okpara University of Agriculture, Umuahia, Nigeria

BREASTFEEDING

REHABILITATION FROM MALNUTRITION

25	2001 / Oral rehydration solution containing amylase resistant starch in severely malnourished children with watery diarrhoea due to Vibrio cholerae	Nur Haque Alam ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
26	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, Dépt. de Biologie Animale, Dakar, Senegal

INFANT AND CHILD NUTRITION

27	2003 / Comparison of the efficacy and acceptability of three types of micronutrient supplements added to complementary foods for infants in Ghana	Anna Lartey University of Ghana, Department of Nutrition and Food Science, Legon, Ghana
28	2005 / Food-based approach for the control of stunting among preschool children	Chineze Agbon University of Agriculture, Department of Home Science & Management, Abeokuta, Nigeria
29	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
30	2006 / Promoting breastfeeding: a formative study among women and their husbands having infants aged 0-6 months in urban households	Judhiastuty Februhartanty University of Indonesia, SEAMEO-TROPED RCCN, Jakarta, Indonesia
31	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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| 32 | 2007 / Potential of amaranth grain seeds to improve the nutrition and health status of school children | John Muyonga
Makerere University, Department of Food Science and Technology, Kampala, Uganda |
| 33 | 2007 / Improving nutritional status of children 6-18 months in a semi-arid area in Kenya: the potential of amaranth seed flour | Alice Mboganie Mwangi
University of Nairobi, Applied Nutrition Programme, Uthiru-Nairobi, Kenya |
| 34 | 2008 / Nutrition, anaemia, growth and oxygen weaning in low-birth-weight, oxygen-dependent infants in a kangaroo clinic | Nathalie Charpak
Fundacion Canguro, Bogota, Colombia |
| 35 | 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 |
| 36 | 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 |
| 37 | 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 |
| 38 | 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 |
| 39 | 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 |

MATERNAL NUTRITION

- | | | |
|----|---|---|
| 40 | 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 |
| 41 | 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-TROPED RCCN, Jakarta, Indonesia |
| 42 | 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 |
| 43 | 2009 / Impact of daily consumption of vitamin-A-fortified oil on breast milk vitamin A concentration and vitamin A status of lactating Moroccan women | Najat Mokhtar
Ibn Tofail University, Nutrition Unit, Kenitra, Morocco |
| 44 | 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 |

CHILD BEHAVIOURAL
DEVELOPMENT

- | | | |
|----|--|---|
| 45 | 2001 / Cognitive performance of iron deficient, non-anaemic Peruvian infants | Theodore Wachs
Purdue University, Department of Psychological Sciences, West Lafayette, Indiana, USA |
| 46 | 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 |
| 47 | 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 |

TITLE

PRINCIPAL INVESTIGATOR

IMMUNE DEFENSE
AND INFECTION

EPIDEMIOLOGIC
TRANSITION

BONE HEALTH

TITLE

PRINCIPAL INVESTIGATOR

- 48

2002 / Nutrition assessment of children orphaned from HIV/AIDS

Judith A Ernst
Indiana University, School of Health & Rehabilitation Sciences, Indianapolis, Indiana, USA
- 49

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
- 50

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
- 51

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

Claude Godard
INTA, Unidad de Endocrinología Infantil, Santiago, Chile
- 52

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
- 53

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
- 54

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

Zhaohui Cui
University of Sydney, The George Institute for International Health, Sidney, Australia
- 55

2003 / Heritability, nutrition and adolescent bone health

Ghada El-Hajj Fuleihan
American University of Beirut, Calcium Metabolism & Osteoporosis Program, Beirut, Lebanon

NUTRITION
INTERVENTIONS

NUTRITION
EDUCATION

OTHER RESEARCH
AREAS

- 56

2003 / School-based nutrition intervention pilot program

Dien N Le
Fonterra Brands, Ho Chi Minh City, Vietnam
- 57

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
- 58

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
- 59

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
- 60

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
- 61

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
- 62

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

TITLE

PRINCIPAL INVESTIGATOR

PUBLICATIONS

Alam NH, Islam S, Sattar S, Monira S, Desjeux JF. Safety of rapid intravenous rehydration and comparative efficacy of 3 oral rehydration solutions in the treatment of severely malnourished children with dehydrating cholera. *J Pediatr Gastroenterol Nutr* 2009;48:318-27.

Arabi A, Zahed L, Mahfoud Z, El-Onsi L, Nabulsi M, Maalouf J, Fuleihan Gel-H. Vitamin D receptor gene polymorphisms modulate the skeletal response to vitamin D supplementation in healthy girls. *Bone* 2009;45:1091-7.

Ayoya MA, Koné KM, Traoré AK. Urinary schistosomiasis and iron deficiency anemia among Malian school children. *AJFAND* 2009;9 No. 9:1845-58 (e-journal only).

Ayoya MA, Spiekermann-Brouwer GM, Traoré AK, Stoltzfus RJ, Habicht JP, Garza C. Multiple micronutrients including iron are not more effective than iron alone for improving hemoglobin and iron status of Malian school children. *J Nutr* 2009;139:1972-9.

Ayoya MA, Stoltzfus RJ, Spiekermann-Brouwer GM, Nemeth E, Traoré AK, Ganz T, Garza C. Hepcidine et infection due à *Plasmodium falciparum* chez un groupe d'écoliers anémiés du Mali. *Bull Soc Pathol Exot* 2009;102:219-20.

Cournil A, Coly AN, Diallo A, Simondon KB. Enhanced post-natal growth is associated with elevated blood pressure in young Senegalese adults. *Int J Epidemiol* 2009;38:1401-10.

Davidsson L, Sarker SA, Jamil KA, Sultana S, Hurrell R. Regular consumption of a complementary food fortified with ascorbic acid and ferrous fumarate or ferric pyrophosphate is as useful as ferrous sulfate in maintaining hemoglobin concentrations >105 g/L in young Bangladeshi children. *Am J Clin Nutr* 2009;89:1815-20.

Godard C, del Pilar Rodriguez M, Diaz N, Lera L, Salazar G, Burrows R. Assessing physical activity of obese and non-obese children by a clinical score. *Rev Med Chile* 2008;136:1155-62.

Hong TK, Dibley MJ, Sibbritt D. Validity and reliability of an FFQ for use with adolescents in Ho Chi Minh City, Vietnam. *Public Health Nutr* 2009;1:8.

Ma AG, Schouten E, Wang Y, Xu RX, Zheng MC, Li Y, Sun YY, Wang QZ. Anemia prevalence among pregnant women and birth weight in five areas in China. *Med Princ Pract* 2009;18:368-72.

Ma AG, Schouten EG, Wang Y, Xu RX, Zheng MC, Li Y, Wang Q, Sun Y. Micronutrient status in anemic and non-anemic Chinese women in the third trimester of pregnancy. *Asia Pac J Clin Nutr* 2009;18:41-7.

Monira S, Alam NH, Suau A, Magne F, Nair GB, Karmakar PC, Rahman M, Pochart P, Desjeux JF. Time Course of Bacterial Diversity in Stool Samples of Malnourished Children With Cholera Receiving Treatment. *J Pediatr Gastroenterol Nutr* 2009;48:1-8.

Muyonga JH, Nabakabya D, Nakimbugwe DN, Masinde D. Efforts to promote amaranth production and consumption in Uganda to fight malnutrition. *Int Union of Food & Technology* 2008;Chapter 8.

Ouedraogo HZ, Traore T, Zeba A, Dramaix-Wilmet M, Hennart P, Donnen P. A local-ingredient-based, processed flour to improve the energy, iron and zinc intakes of young children: a community-based intervention. *Int J Food Sci Nutr* 2009;60:87-98.

Ouedraogo HZ, Traore T, Zeba AN, Tiemtore S, Dramaix-Wilmet M, Hennart P, Donnen P. Development of an improved local-ingredient-based complementary food and technology transfer to rural housewives. *Food and Nutrition Bulletin* 2009;30:153-60.

Phuka JC, Maleta K, Thakwalakwa C, Cheung YB, Briend A, Manary MJ, Ashorn P. Postintervention growth of Malawian children who received 12-mo dietary complementation with a lipid-based nutrient supplement or maize-soy flour. *Am J Clin Nutr* 2009;89:382-90.

Rim H, Kim S, Sim B, Gang H, Kim H, Kim Y, Kim R, Yang M, Kim S. Effect of iron fortification of nursery complementary food on iron status of infants in the DPR Korea. *Asia Pac J Clin Nutr* 2008;17:264-9.

Sranacharoenpong K, Hanning RM, Sirichakwal PP, Chittchang U. Process and outcome evaluation of a diabetes prevention education program for community healthcare workers in Thailand. *Educ Health (Abingdon)* 2009;22:335.

Sunarti Euis. Peningkatan Kepedulian Ibu, Kader dan Remaja untuk Perbaikan status Gizi Anak. Fakultas Ekologi Manusia, Departemen Ilmu Keluarga dan Konsumen, Institut Pertanian Bogor, 2009;207 pp (ISBN 978 602 8665 03 2).

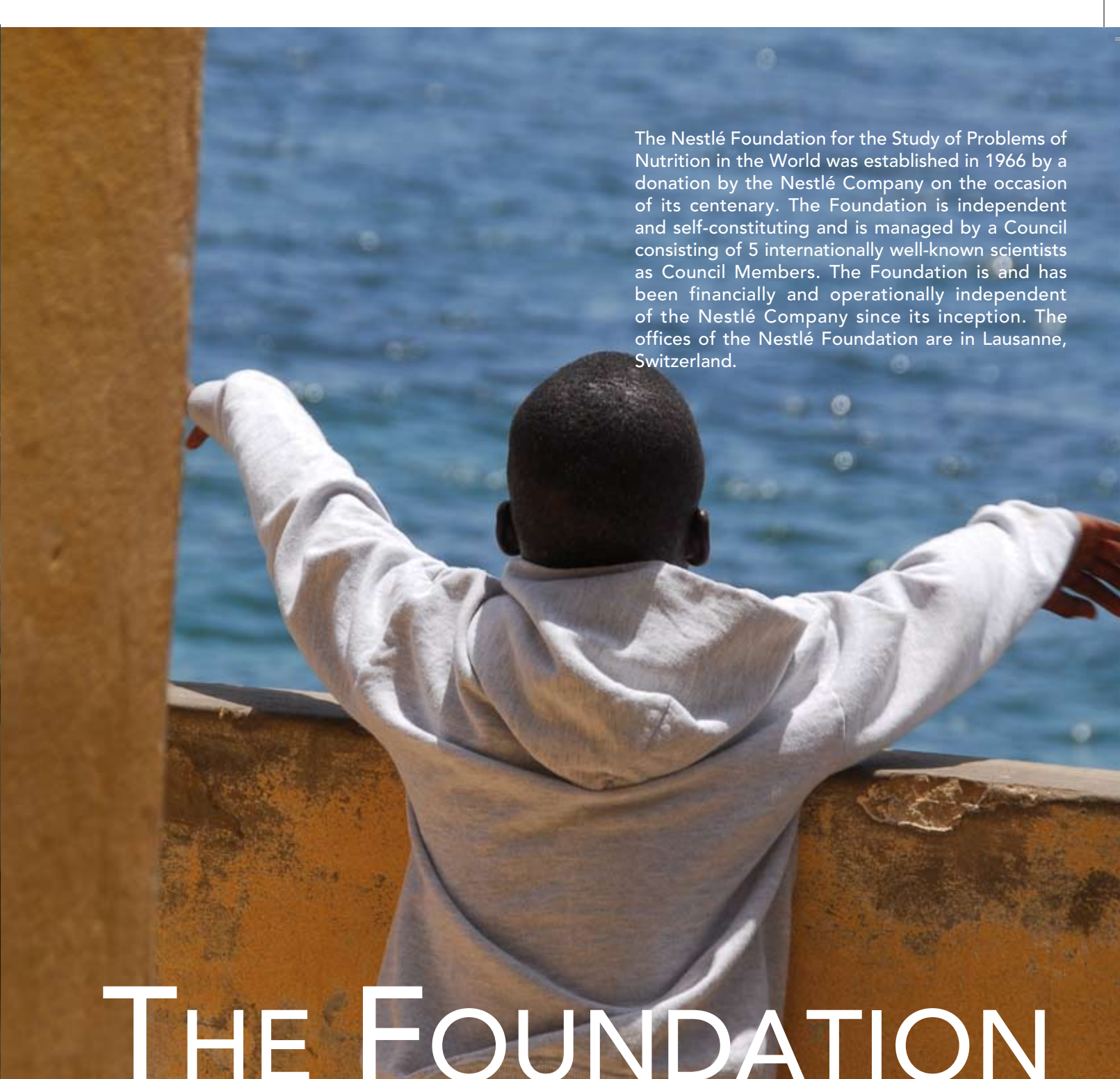
Sunarti Euis. Care Empowerment to mothers, cadres, and premarried women to improve children nutritional status. Faculty of Human Ecology, Department of Family and Consumer Sciences, Bogor Agricultural University, 2009;203 pp (ISBN 978 979 15786 6).

Trang NH, Hong TK, Dibley MJ, Sibbritt DW. Factors associated with physical inactivity in adolescents in Ho Chi Minh City, Vietnam. *Med Sci Sports Exerc* 2009;41:1374-83.

Yan L, Schoenmakers I, Zhou B, Jarjou LM, Smith E, Nigdikar S, Goldberg GR, Prentice A. Ethnic differences in parathyroid hormone secretion and mineral metabolism in response to oral phosphate administration. *Bone* 2009;45:238-45.

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 5 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. 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 all year round, 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 5 Council Members and 2 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 by the Director and the President of the Foundation.

COUNCIL MEMBERS

Eric Jéquier, MD

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University of Lausanne
Lausanne, Switzerland

Jehan-François Desjeux, MD

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Member Académie nationale de médecine, France

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Professor Emeritus
Wageningen University, The Netherlands

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

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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
Editor in Chief Nutrition Reviews

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Professor
Mahidol University, Salaya Campus, Nakhon Pathom, Thailand
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Clinic and Policlinic of Internal Medicine
Department of Medicine, University Hospital Zurich, Switzerland

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Assistant to the Director

AUDITOR

Ernst & Young AG, Bern, Switzerland

