Nestlé Foundation REPORT 2018

REPORT 2018

Nestlé Foundation
for the study of problems of nutrition in the world

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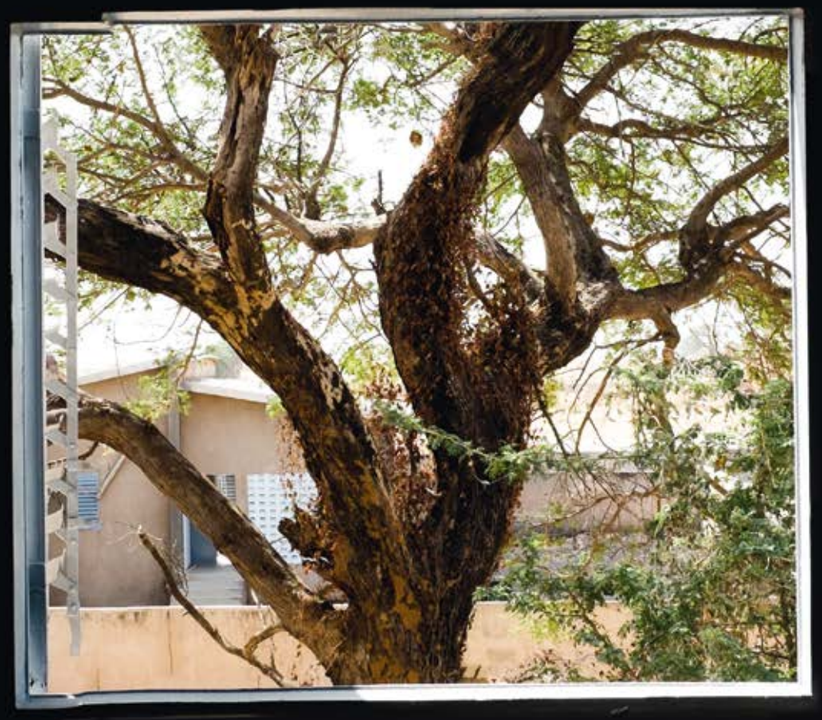
“Live as if you were to die tomorrow. Learn as if you were to live forever.”

Mahatma Gandhi



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PAGE 12: 1. Van Noorden R. Scientists may be reaching a peak in reading habits. Nature News, 2014 (doi:10.1038/nature.2014.14658). **PAGE 55 (ETHIOPIA Data Page):** Further sources: Statistical data at WHO / UNICEF / UNESCO / http://apps.who.int/gho/data/node.cco.ki-ETH?lang=en / http://www.healthdata.org/ethiopia / http://ethiopia.opendataforafrica.org/angyuuc/ethiopia-health-profile / Fischer Weltalmanach 2017 (ISBN 978-3-596-72917-3).

PHOTO:

Cover: A young girl in an enset (“false banana”, “Ethiopian banana”) plantation South of Hawassa (Ethiopia) - photograph by Paolo M. Suter

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

RESEARCH – HIGH-IMPACT RESEARCH FOR DEVELOPMENT

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

PUBLIC HEALTH ORIENTATED

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NUTRITION

PRESIDENT'S MESSAGE

"In the last few decades, inequality has increased everywhere in the world."

World Inequality Report 2018

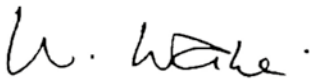
Any foundation supporting research in Low-and Middle-Income Countries (LMICs) is confronted with the problem of inequality, which even if it exists everywhere is especially severe in these countries. The World Inequality Report 2018 shows that between 1980 and 2016 the richest 1% of humanity captured 27 cents in every dollar of global income growth. By contrast the poorest 50% only captured 12 cents in every dollar. Inequality is not a recent fact. In an interesting study published in Nature in 2107 (1), Timothy Kohler and colleagues found that wealth disparities gradually increased already thousands of years ago during the transition from hunting and gathering to farming, supporting the notion that agriculture escalated social hierarchies. Owners of land and livestock could pass their wealth to future generations, a process that can make families richer over time. In today's globalized liberal world clever mechanisms tying wealth into future income have allowed 2% of the world's richest people to own more than half of global wealth. Astonishing and unsustainable!

LMICs are more profoundly affected by inequality, which has multiple facets, some of which are addressed herein in the Vision section and in the World Inequality Report mentioned above. Factors such as travel time to access vital resources,

rapid concentration of people in big cities, food production and distribution systems and their policies, and modes of transport, are different links of a deadly chain, which strangles the world population and even impacts global warming. Malnutrition in all its forms and consequences, from undernutrition to overweight and obesity, affects a significant part of humanity and is a major cause of poor health, which will only worsen in the future due to deleterious conditions triggered by climate change. More specifically, there is ample evidence that social factors, including education, employment status, income level, gender and ethnicity have a marked influence on access to food and how healthy a person is. Health inequities are fundamentally unfair and could be reduced by adequate political leadership strongly supported by citizens' will to implement beneficial policies and oppose powerful pressure groups. Again the situation is especially alarming in LMICs. According to WHO, 5.4 million children died before their fifth birthday in 2017 and children in this age range are 14 times more likely to die in sub-Saharan Africa than in the rest of the world; developing countries account for 99% of annual maternal deaths in the world; and 87% of premature deaths due to noncommunicable disease occur in these countries. Not surprisingly, these conditions are also intermingled with drastic inequalities in education. In countries where education is free and compulsory many of our children complain about having to go to school and do not realise that they are fortunate to be able to receive an education when about 263 million children and youth are out of school, according to new data from the UNESCO Institute for Statistics (UIS). More than 70 percent of children who do not attend school are from sub-Saharan Africa and South Asia, which are among the poorest regions in the world, and girls experience even more blatant inequalities when it comes to education.

No need to repeat here that problems of nutrition are associated and are often the cause of this inacceptable global situation, which represents an immense challenge for our research foundation for the study of problems of nutrition in the world. This situation calls for very focused actions with long-term impact to ameliorate as far as possible the condition of the poorest. This is the very reason why we do not fund so called "parachute research"—why not call it neo-colonial research—a scheme according to which research groups from high-income countries systematically collect data in LMICs and publish their results in the best journals with only little credit to the local research community. This does not mean that researchers from developed countries ought to stay out of LMICs. On the contrary, their contribution can help enormously through capacity building and skill development, but it is important that the allocated funds are spent in the poorer countries. More resources are needed there to strengthen generally weak research infrastructure and technical know-how. On the capacity-building and career-development front, the recipients of our financial support must be residents of, or be willing to relocate to, their home country. Obviously these are people with an extraordinary dedication who are able to cope with frustration and difficulties, such as limited funding, underperforming administrative systems, and under-developed scientific environments. In our Nestlé Foundation Research for Development Program (NF-R4D program; www.nestlefoundation.org), the proposed research topics must have high public-health relevance in the field of nutrition, be strongly endorsed by the host institutions and embedded in a solid strategic plan in which quality, feasibility, sustainability as well as importance are evaluated. Furthermore, the foundation conducts site visits to obtain in-depth information concerning all aspects of the proposed research programs, not least to provide advice and continuous help to implement those selected.

We imagine how much better the world would be if we could, through capacity building and research activities, unleash the intellectual power of the young generations in developing countries. The Foundation contributes its energy and resources to reaching this goal.



Walter Wahli

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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 2004: the enLINK Initiative. This encompasses a set of interrelated efforts:

PROJECTS INITIATED BY THE FOUNDATION

THE enLINK INITIATIVE

- Promoting local capacity for nutrition research
- Promoting access to information
  - The enLink library
- Nestlé Foundation Research for Development program (NF-R4D)

THE enLINK INITIATIVE

Sustainability and public-health relevance have been and will remain key aspects for all activities of the Foundation. Research projects need to result in short- and long-term public-health implementation. Knowledge and know-how have to be sustainable at all levels of the population, meaning that the knowledge has to be implemented and become part of daily life. Knowledge has to trickle down to 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 in 2004, an initiative 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 core competence and activity of the Foundation is the support of nutrition research in low-income countries. The enLINK initiative is an add-on to our key activities to improve the research capacity.

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 five main levels:

1. exploration in nutrition – building practical research capacity: This is the main purpose and aim of the Foundation.
2. education in nutrition: This level of the enLINK initiative also implies the creation of research-based evidence and subsequent transfer of the knowledge to the population.
3. the enLINK library: At present, after having shipped 217 library trunks to 34 countries, only digital content is provided (free of charge) in the enLINK digital library.
4. endurable nutrition: All activities should be implemented and sustainable.
5. Nestlé Foundation R4D initiative – research for development (NF-R4D): Sustainable, targeted, concerted support of young researchers and their institutions.

The digital enLINK library is currently offering free full-text access to a few nutrition journals and more than 30 e-books—many of them indispensable classic textbooks—in the newest editions available. The library is accessible free of charge to registered users who all receive a personal password; registration is also free as long as the applicant comes from a low-income country. The library is continuously updated

and adapted to specific needs and in response to user feedback. Evidence and content which make it into textbooks are usually more practice-related than the research knowledge from latest findings which is published in research journals. Therefore the weight of the library lies more in the e-textbook section to assure a good basic knowledge transfer as well as knowledge accessibility.

The approach of the Foundation in the enLINK initiative reflects the need for multidimensionality to solve the problems of under- and malnutrition. Knowledge and know-how are the basis and beginning of every and any improvement.

THE enLINK CIRCLE

WHY NOT OUTSOURCE TO THE ECOSYSTEM?

Despite all the progress that has been made worldwide, rates of malnutrition remain at an unacceptably high level: According to UNICEF data, nearly 50% of under-5 mortality is attributable to malnutrition, fatalities which sum up to roughly three million basically avoidable deaths (1,2). Further, a recent analysis of child growth failure using a geospatial approach warns that the Sustainable Development Goals (SDGs) may not be reached until 2030 (3).

Climate change will continue to aggravate malnutrition, and new diseases and disease patterns will emerge not only in low-income countries but also in the Northern hemisphere (4-7). According to the Lancet Countdown report "Tracking Progress on Health and Climate Change", "anthropogenic climate change threatens to undermine the past 50 years of gains in public health"(5). Not very encouraging, to be sure; however, the authors go on to say that a comprehensive response to climate change could be "the greatest global health opportunity of the 21st century"(5). So we all have to seize the opportunity for change before we pass the point of no return. The key question is: what should the "comprehensive response" be? In view of the often purely symptomatic, non-sustainable high-tech solutions for health problems in developed and especially also low-income countries (LICs), we forget about one of the most important partners for sustainable solutions: the ecosystem. Why not look for "ecosystem services" assistance?

Ecosystem services: Definition and potential

According to Wikipedia, ecosystem services (ESS or also ES) "are the many and varied benefits that humans freely gain from the natural environment and from properly-functioning ecosystems. Such ecosystems include, for example, agro-ecosystems, forest-ecosystems, grassland-ecosystems and aquatic-ecosystems. Collectively, these benefits are becoming known as 'ecosystem services', and are often integral to the provisioning of clean drinking water, the decomposition of wastes, and the natural pollination of crops and other plants"(8). Although the term ESS has existed for nearly 50 years, most of us are not familiar with the term–not in theory and even less so in practice. Here we would like to recall a few facts and concepts around ESS, avoiding details but rather discussing a typical example that underscores the hidden potential for health promotion by ESS and which could hopefully have an impact on our behaviour. There is no doubt that we have to respect and collaborate proactively with our environment to reduce malnutrition and achieve a better livelihood for all.

Evidence suggests that many of today's highly appreciated and heavily promoted solutions are actually tomorrow's problems: humans try to dominate ecosystems which have grown and developed over millennia to achieve their current balance and stability. Many different ecosystems (such as forest, agro-, grassland or also aquatic ecosystems, to mention just a few) were necessary for human evolution to achieve the present high level of perfection of our species, which we even classify as *Homo sapiens*, "wise man". In view of the climate and environmental changes due to negative anthropogenic interference with the different ecosystems, it is more than urgent that humans again become *sapiens* (wise): we have to stop the further modification and undermining of

the ecosystems to the disadvantage of billions of individuals, most of them in LICs but sooner or later also in the Northern hemisphere. Modern society likes to outsource all kinds of work and services, so why not "outsource" some assistance and support in a meaningful way to the ecosystem?

The agro-ecosystem

Food production has been and will be crucial for human survival. It is of utmost importance for human and planetary health that we can produce healthy, nutritious food at minimal environmental and climatic costs. It seems that agro-ecology might offer a thus far un- and under-used opportunity. According to Stephen R. Gliessman, Professor Emeritus at the University of California and one of the pioneers of agro-ecology, "one of the most complete definitions of agro-ecology today is the 'ecology of the food system'. It has the explicit goal of transforming food systems towards sustainability, such that there is a balance between ecological soundness, economic viability and social justice. However, to achieve this transformation, change is needed in all parts of the food system, from the seed and the soil, to the table"(9). As we all know, the present globalized food system unfortunately does not fit very well with these central aspects of sustainability, i.e. economic, social and environmental (9,10). Basically a redesign of the whole food system from the producer to the consumer, one based on the vast ecological knowledge of eco-system science, is urgently needed (11). Unfortunately different players have different definitions for (agro-) ecosystems and thus also different "solutions"(12,13). Often ecosystem-based solutions are not in agreement with economic aims and policies; however, in view of the uncontrollable climatic changes there is most likely only one approach, namely the respect of the natural environment, which assures biodiversity and a sustainable functioning of all ecosystems. The FAO speaks about ecosystem-based adaptations of agriculture (14).

Forest-ecosystem and child nutrition: A promising example

The interconnectedness of ecosystem services is indirectly reflected in the relationship between the different parameters in the enLINK circle (see Figure 1). Ecosystems play a crucial role in basically all aspects of life, which can be nicely illustrated using the example of forest ecosystems. Modern society has reduced the role of forests to simply timber production and space for the creation of new agricultural and farming areas. A dangerous approach, as we all know. The role of intact forest ecosystems is complex and crucial for climate as well as global health (2), as evidenced in a vast body of scientific literature.

A recent study looked at the impact of forest ecology on children's diets (14). For many of us this might seem an absurd research question, but for the ecological mind and anybody who knows what a real forest is, it is in fact a logical and straightforward relationship. The authors collected data about dietary diversity in 43,000 households in 27 developing countries. They showed that a higher exposure to forests (as compared to no exposure) led to a more than 25% greater dietary diversity in the children's diet. This effect on dietary diversity is apparently comparable to the impact of nutrition-sensitive agriculture programs (14). Similarly, a study using data from twenty-one African countries reported a positive relationship between the tree cover rate and dietary diversity regarding intake of fruits and vegetables (not for animal source foods) (15). The study from Rasolofoson et al. (14) also reports favourable effects on vitamin-A and iron deficiency, the most frequent micronutrient deficiencies. In agreement, a study from Cameroon reported that forest foods contributed to over 90% of the vitamin-A intake of women and over 80% of iron, zinc and calcium intake (16). Further evidence suggests that living in close proximity to forests is

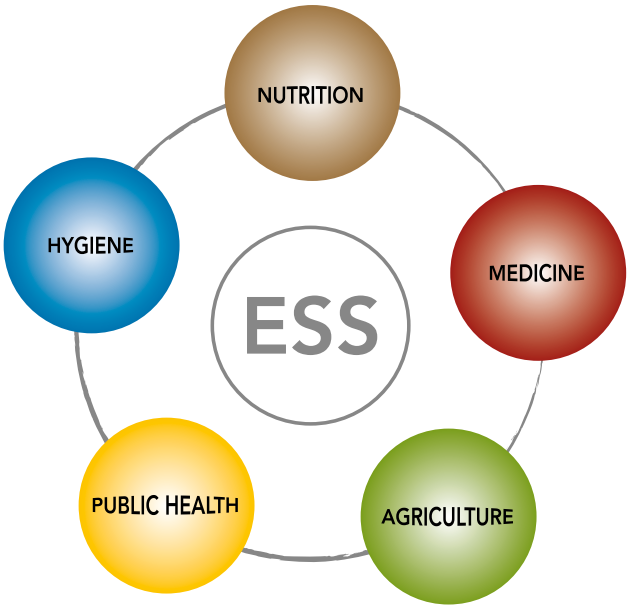

Figure 1
Use of ecosystem services (ESS) would positively affect all key components of the enLINK circle. A vast literature supports the concept that ESS has a key role in the livelihood and well-being of individuals, whole populations and the whole world.

associated with a larger agricultural crop diversity (15). Not surprisingly, a study using data from 15 Sub-Saharan African countries showed in certain geographic regions (such as West Africa) a negative association between deforestation and the diet of children aged 6 to 24 months, who experienced reduced dietary diversity (17).

For obvious reasons the impact of the forest ecosystem on diet (and finally health) cannot be viewed in isolation from other ecosystems, and other factors such as access to markets, road infrastructure and education remain— not surprisingly— important positive and/or negative modulators of the effect. Accordingly a low or lower education level (0-1 year of education) abolished the forest-ecosystem effect on the children's dietary diversity (14)! Nevertheless, based on these studies the causal driving force is apparently the intact forest ecosystem, which (if not damaged or destroyed) is in many places still there and available, "free of charge". The authors suggest that strategies of forest (and most likely in general tree) conservation should be integrated into nutrition interventions.

Forests modulate nutriture by means of forest food availability, pollinators, non-food forest products and mothers' time, as well as through agricultural techniques, poverty reduction and other factors (14,18). These findings hint at the huge potential of the complementary strategy of outsourcing "food assistance" and "health promotion" to a local existing agro-forestry-ecosystem service. Similar effects might be expected from other ecosystems.

Despite these impressive data, we need to remain critical and choose wisely how ecosystems could assist in the promotion of a healthy diet and even more generally overall health. As mentioned above, education seems to be an additional basic modulator and should be integrated in any program.

Conclusion

For the time being, the present knowledge on the role of the ESS should be applied and more data should be generated to understand these relationships. It is time to stop the further destruction of any natural ecosystem for the wellbeing of future generations and our world. The potential to reduce malnutrition by outsourcing strategies to different ecosystems is very high, but will require a functional ecosystem. Drawing on the title of a recent book, *Forests are gold* (19), it is appropriate to say that "any ecosystem is gold"—it is high time we begin to treasure our ecosystem as we do gold since any further inertia will make all of us sick (5).

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THE enLINK DIGITAL LIBRARY IN 2018

THE DIGITAL enLINK LIBRARY

During 2018 the digital enLINK library remained an appreciated source of information for many users in low-income countries. In terms of the number of books offered (at present 38 e-books), the library remained stable. There are only a few journals available and their usage is less significant than that of the books. The number of registered users increased slightly, to 532 registered users. The access to the library has remained stable and varies according to season and geographic area. The stabilization of the usage of the library could just be a temporary trend but nevertheless is one which has to be observed closely. It is unclear whether this is only a reflection of the observed levelling-off trend in scientific reading habits (1) or whether it reflects a change in the usage of information sources. In the modern world there are many information sources available and a quick check in Wikipedia is obviously faster than searching for an answer in a textbook. We carried out a short survey about the use of the enLINK library and some users mentioned that we do not regularly have new books in our digital bookshelf. This is true—the basic textbook knowledge in nutrition does change at a slower pace than in most other fields of research. A closer analysis revealed, however, that both the reading habits and also the choice of information sources are changing. Wikipedia and other less well-defined sources on the internet are replacing scientific textbooks—not an ideal trend, but often a dangerous necessity in a fast-paced world with time urgency.

The textbook section in the enLINK library should assist students and young researchers in the specific field of nutrition to acquire basic knowledge, i.e. the established textbook knowledge, to build on in their future work. Only a good basic knowledge will allow successful public-health-relevant nutrition research. Yet at the same time, much of today's research will never make it into a textbook and thus for students a blended reading approach which combines textbooks and research papers is most likely the best approach. The enLINK library offers this blended approach. Reading habits and skills are developed early in life and then eventually perfected during university studies. The enLINK library is a welcome tool to cultivate effective reading habits early in one's career.

enLINK user statistics (as of December 31, 2018):

- 532 registered users
- Registrations from over 50 countries
- Regular access from users living in Nigeria, Ghana, Kenya, Ethiopia, Uganda, Malawi, Sudan, Benin

Registration and use of the enLINK library are free of charge
www.enlink.org


LANATA

OTHER ACTIVITIES

NEW RESEARCH PROJECTS

INSTITUTIONAL SUPPORT

OTHER CAPACITY BUILDING ACTIVITIES

In 2018 the Council decided to fund five research projects, including one NF-R4D grant:

CHILD DEVELOPMENT

IRON TOXICITY

IRON DEFICIENCY

NEW RESEARCH PROJECTS

MALNUTRITION

AFLATOXIN DECONTAMINATION

NF-R4D: IMPROVEMENT OF THE IRON STATUS OF SCHOOL CHILDREN BY LOCALLY PRODUCED FOOD

CHILD DEVELOPMENT

Impact of preconceptual micronutrient supplementation on child growth and development

Phuong Hong Nguyen

Thai Nguyen University of Pharmacy and Medicine
Thai Nguyen
Vietnam

USD 100,000

Poor growth and development during early childhood continue to be significant public health problems worldwide. The objective of this study is to evaluate the effects of pre-pregnancy weekly Iron-Folic Acid (IFA) or Multiple Micronutrient (MM) supplementation on child growth and development at age 6-7y. The researchers will follow up the offspring of women who participated in the PRECONCEPT study that evaluated the "Impact of Pre-Pregnancy Micronutrient Supplementation on Maternal and Child Outcomes", a collaboration between Emory University and the Thai Nguyen University of Medicine and Pharmacy. In the parent study, 5,011 women were enrolled and randomly assigned to pre-pregnancy folic acid (FA-control), IFA or MM. Women who conceived were followed through pregnancy, delivery and age 2y (n=1,400). Results from the parent study showed that weekly preconception supplementation did not affect birth outcomes, but did result in increases in maternal and infant iron stores and improved maternal mental health among at-risk women. Furthermore, preconception supplementation with IFA improved linear growth and fine motor development at age 2y. The researchers propose to collect a comprehensive set of measures of child anthropometry including body composition and development that are known to predict later intellectual functioning and well-being. The primary outcomes include measures of: 1) child growth and body composition using anthropometry and bioelectric impedance analysis and 2) child cognition, global intelligence, performance and verbal scores. These data will allow the testing of novel hypotheses regarding the role of preconception nutritional status on patterns of child growth and development from conception through age 7y.

IRON TOXICITY

Efficacy of micronutrient powder formulation with low-dose iron in Bangladeshi children living in areas of high iron in groundwater

Faruk Ahmed & Sabuktagin Rahman

Public Health
School of Medicine
Griffith University
Queensland
Australia

Institute of Nutrition and Food Science
Dhaka University
Dhaka
Bangladesh

USD 109,184

Despite the high prevalence of anaemia (33.1%) in under-five children in Bangladesh, the prevalence of iron deficiency (10.7%) and iron deficiency anaemia (7.2%) are low. The good iron status in the Bangladeshi population was attributed to the intake of the high amount of absorbable iron from drinking groundwater. Groundwater contains a variable amount of iron, with a very high concentration in many parts of Bangladesh. Around 97% of the Bangladeshi population drinks groundwater from tube-wells. Currently, Bangladesh has large-scale home fortification programmes to control anaemia in children by providing micronutrient powder (MNP) containing five micronutrients, including iron. Children, particularly in high iron areas, consuming iron from MNP are additionally exposed to high amounts of iron from drinking water. Studies conducted in Africa suggest that unabsorbed iron from MNP and/or iron supplements adversely affect gut microbiome leading to increased incidence of diarrhoea, hospitalisation and gut inflammation. It is plausible that on top of the iron from groundwater, iron from MNP might build up in excess amount in the intestines, and affect the gut microbiome adversely. Given the very low prevalence of iron deficiency in under-five children, the current MNP programme with blanket coverage may have implications on the health and wellbeing of these children. In this connection, high prevalence of diarrhoea was reported in the MNP programme areas. Hence, the proposed study will assess the efficacy of MNP with a low dose of Fe for preventing anaemia in under-five Bangladeshi children living in areas of high iron in groundwater. In a double-blind randomized controlled trial the children will be randomly allocated to receive one of the two formulations as follows: 1) MNP-low-Fe (iron 2.5mg) and 2) standard MNP (iron 12.5 mg).

IRON DEFICIENCY

Iron-biofortified fast-cooking cowpeas to reduce iron deficiency among children in malaria-endemic areas in Ghana

Sylvester Addy

CSIR-Crops Research Institute
Kumasi
Ghana

USD 39,061

Iron-deficiency anemia (IDA) is the most common micronutrient disorder in the world. It is estimated that more than two-thirds of school-age children in Ghana are faced with iron deficiency. Poverty, malaria incidence and limited access to appropriate healthcare and treatment typically characterize these areas, while ability to access iron supplements and fortified foods constitute a huge challenge. In 2015, the CSIR-Crops Research Institute developed an iron-biofortified cowpea variety with the potential to address iron malnutrition in Ghana. Biofortification is the first agricultural methodology involved in developing food crops that fortify themselves. Cowpea is native to Ghana, is an integral component of the rural and urban food, matures in less than three months and is a cheap source of vegetable protein. An important trait of this iron-biofortified cowpea is its fast-cooking property, which has the potential to increase its consumption. Long cooking times of cowpeas has, over the years, hindered their per capita consumption in Ghana. In the light of this, a randomized, single-blind controlled trial with school children to test the efficacy of iron-biofortified fast-cooking cowpea to improve the iron status of schoolchildren in malaria-endemic areas in Ghana is being proposed. Schoolchildren between 6 and 12 years with a haemoglobin concentration greater than 70 g/L shall be selected and fed either iron-biofortified fast-cooking cowpea meal or long-cooking non-biofortified meal (control) three days a week for a period of seven months. At baseline and three months into the trial children will be dewormed and malaria antigen-anemia screening and treatment administered. Serum concentration of soluble transferrin receptor will be used as the major indicator of iron status. C-reactive proteins (CRP) and alpha-acid glycoproteins (AGP) will be used to evaluate the presence of inflammation among the children.

MALNUTRITION

Towards introduction of edamame (vegetable soybean) for more nutritious diets and food availability in Benin

Eric Etchikinto Agoyi

Faculty of Agronomic Sciences (FSA)
University of Abomey-Calavi
Cotonou
Benin

USD 20,000

Food security problems in Benin mainly pertain to inadequate diets rather than the quantity and frequency of meals. This is partly due to non-diversified food and the lack of bioavailable nutrients. The research trend is to seek biofortified forms of food items and processing manners that guarantee the bioavailability of most nutrients in the consumed food items. Edamame or vegetable soybean is a specialty soybean cultivar that is harvested while immature for direct human consumption. Edamame are very nutritious, as they are rich in protein and dietary fiber (38% and 5.23% respectively) and have a low fat content (5-7%). More importantly, a cup (155g) of edamame contains a complete set of micronutrients in amounts close to the daily needs. This makes edamame a better alternative to fresh beans and peas, which are also becoming expensive and inaccessible to the poor. This is a pilot project setting the ground for the introduction of edamame and the development of desired edamame cultivars in Benin. At this stage, the researchers aim to assess the prospects for adoption of edamame to provide diversified and adequate food products to the most vulnerable people in Benin. Specific objectives include: i) identification of soybean cultivars that are suitable for production of edamame in Benin and ii) assessment of acceptability and determination of preference criteria for edamame in Benin. .

AFLATOXIN DECONTAMINATION

Enhancing nutritional benefits and safety of maize to improve the health of Africans

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USD 19,910

In Sub-Saharan Africa, maize is the preferred staple food for one-third of all malnourished children and 900 million poor people worldwide. In East and Southern Africa, maize accounts for 30 and 50% of calories consumed, respectively. Its expansion as a major food source has paralleled the continent's economic and nutritional crisis. The focus population of the study will be women and children, who are more vulnerable to malnutrition and mycotoxin poisoning. Family capacity building and behavior change is the goal of this study. The reality of a maize-based diet must be faced: maize's contribution to human health is compromised by its limited bioavailability of certain nutrients and mycotoxin contamination. These challenges can be largely overcome through nixtamalization, an ancient methodology developed by Aztec and Mayan civilizations over 3,000 years ago. It uses slaked lime (calcium hydroxide) and wood ash (potassium hydroxide) to create an alkaline soak solution for maize. Nixtamalization has a fascinating potential to decrease osteoporosis (through increased calcium), kwashiorkor (by improving the bioavailability of protein), pellagra (through the release of niacin-B3) and cancers (by controlling aflatoxins and fumonisin contamination). Makerere University will conduct phase-one research on nixtamalization as a method of improving nutrient bioavailability and aflatoxin/fumonisin decontamination of maize. Once African nixtamal methods are determined, FARM STEW Uganda, a registered CBO and a Ltd. Company, will, in phase two, implement community-based, hands-on training to incorporate nixtamalization into the practice of maize utilization by local families and food industries.

UGANDA

NF-R4D Grant

The main mandate of the Nestlé Foundation is the promotion and support of research in low- and middle-income countries (LMIC) which is designed to establish local know-how and capacity, and is aimed at improving the nutrition and health of the most vulnerable populations. It is well known that the lack of sustained institutional capacity for research continues to be a major weakness in many LMIC. Sustainable solutions have to be created locally and owned locally, and should not be sponsor-driven.
To build truly sustainable research capacity requires a three-partner commitment among the recipient, the hosting institution and the donor. To meet this challenge, the Foundation established a new funding mode, the Nestlé Foundation Research for Development (NF-R4D) grant. The first grant in this category will go to the team at the University of Sine-Saloum El Hadji Ibrahima Niasse (USSEIN) in Kaolack, (Senegal).

NF-R4D GRANT

IMPROVEMENT OF THE IRON STATUS OF SCHOOL CHILDREN BY LOCALLY PRODUCED FOOD

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Adama Diouf, PhD, Ndeye Fatou Ndiaye, PhD
Guillaume Antoine Balcoucoune, PhD
Amadou Tidiane Guiro, PhD

Université du Sine Saloum El-Hâdj Ibrahima Niass (USSEIN)
Quartier Sing Sing
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Laboratoire de Nutrition
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Dakar
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Institut de Technology Alimentaire (ITA)
Dakar
Sénégal

USD 295,500

Iron deficiency is a public health problem in developing countries affecting mainly children and women. In Senegal, iron deficiency affects 39% of women of childbearing age, and 46.7% of Senegalese women are anemic. The prevalence of iron deficiency and iron-deficiency anemia was 39.1% and 10.6% respectively for Senegalese children aged from 5 to 17 years. Iron deficiency decreases physical capacity, productivity and intellectual development, and causes stunting. This study aims to develop iron-rich complementary foods based on local ingredients to prevent iron deficiency. Different food processing methods will be used to develop the complementary foods. Chemical composition of the foods (moisture, proteins, fats, iron, zinc, calcium, polyphenols, phytic acid and vitamin C) will be analyzed. In vitro protein digestibility and iron availability will be determined. The foods' stability, sensory profiles, acceptability and microorganism contamination will be evaluated. Two complementary foods achieving the best nutritional, organoleptic and safety profiles will be tested by a case control design study using cohorts of school-age children. This sustainable project will strengthen the link between agriculture and the nutritional needs of the population in Senegal. At present the study is still being developed and will be the first large public-health-oriented nutrition study at USSEIN.

SENEGAL

INSTITUTIONAL OTHER

One of the major aims of the Nestlé Foundation is the transfer of sustainable capacity-building knowledge to low-income countries. During 2018 several specific capacity-building activities were supported.

DISSEMINATION OF RESEARCH RESULTS

During 2018 the Foundation supported several researchers in presenting results from their Foundation-supported research projects at different local and international scientific meetings (including ANEC VIII).

Publication fees and page charges were covered in different journals for research projects supported by the Foundation.

The Foundation supports expenses such as conference attendance or publication fees reimbursements only in connection with research projects supported by the Foundation.

BOOKS FOR UNIVERSITY LIBRARIESS

The foundation supported the shipment of nearly 100 textbooks for food technology to the research library of the Department of Nutrition and the main library of the University of Benin, Abomey-Calavie, Benin.

SUPPORT AND CAPACITY-BUILDING ACTIVITIES

4TH EDITION OF *DICTIONNAIRE MÉDICAL* POUR LES RÉGION TROPICALES FROM THE BERPS IN THE DR CONGO

The Dictionnaire médical pour les région tropicales was a most successful book published by the Bureau d'Etudes et de Recherches pour la Promotion de la Santé (BERPS) in Kangu Muyumbe, the Congo. Medical professors, students, researchers, nurses, midwives and many others appreciated the more-than-800-page dictionary. Despite the huge number printed, this affordable book, locally available nearly everywhere, was quickly sold out. A total of 65,300 dictionaries (three editions) have been distributed within the Congo to most of the 43 medical faculties and approximately 700 nursing and midwife schools. Everybody working in the medical or paramedical field knows the books and wants at least this book. It has to be remembered that in view of the non-existing purchasing power of young medical students or nurses the books was most often offered free of charge to assist the right to health for all! At present the book is no longer available. Accordingly, the former edition of the book was updated and corrected by a Belgian team and the local team around Dr. Jacques Courtejoie at the BERPS. The Foundation supported the updating, printing and also the local distribution of 4,000 copies, which will take place during the ongoing year. The book is locally very much appreciated since it is a locally produced book addressing local health problems using—whenever needed—also the specific local Congolese-French terminology. Such locally adapted educational tools are crucial, since knowing is not enough—one needs to understand—and this is assured by the local authorship and also the selected usage of local expressions. The Foundation is proud to support a local team which knows about the local needs and thus their (and also our) deeds. It is worthwhile to mention that Dr. Courtejoie will soon have been working for nearly 60 years in the Congo. For sure he must know what is needed!

This year's vision section addresses important inequalities which are starting to dominate the world. Wealth inequality as a driver for urban child malnutrition is increasingly global, as illustrated by Dr. Szabo. Inequalities in travel time to access key resources correlate with levels of poverty, as discussed by Dr. Nelson. Dr. Wood explains the importance of international trade to equal food-nutrient access. Further, Dr. Zhang calls attention to the dangerous trend of "food weaponisation" by the global superpowers to assure their own food security, a trend with a significant potential to create even more global inequality in food security—especially in low-income countries. In the article by Dr. Nabugoomu, the "community voices" remind us of key issues for a better livelihood: We all need to listen more to these voices in the communities—they tell us where the problems are. In another vein, Dr. Hawwash outlines how the applied methodology in many nutrition studies is still inadequate and emphasizes how crucial the implementation of well-defined methodological requirements is. Finally, Dr. Zaw from Myanmar, an alumnus of the Foundation, describes work being done at the Department of Medical Research (Ministry of Health and Sports) to advance nutrition and health in his home country.

VISION

WEALTH INEQUALITY

TRAVEL-TIME INEQUALITY

TRADE & NUTRIENT ACCESS

WEAPONISATION OF FOOD

COMMUNITY VOICES

RESEARCH METHODOLOGY

NUTRITION RESEARCH IN MYANMAR

WEALTH INEQUALITY

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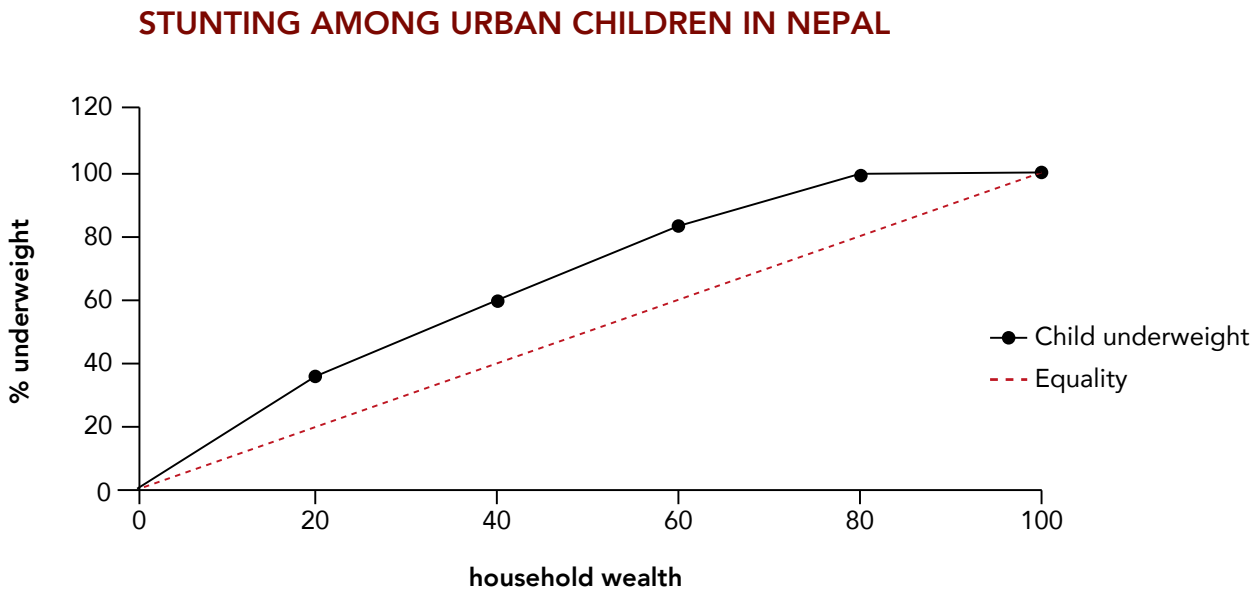
INEQUALITIES IN CHILD NUTRITIONAL STATUS IN RAPIDLY URBANISING ASIAN CONTEXTS

While the process of urbanisation has been generally perceived as positive, in recent years there has been growing evidence regarding the detrimental impacts of rapid, poorly managed urbanisation, in particular in the developing world. Many Asian countries are in the process of rapid demographic, epidemiological and socio-economic transitions and the pace of urban growth which they experience leaves the local and national governments unprepared for the consequences. While scholars have proposed different definitions of urbanisation, it can generally be understood as "a process of population

concentration, which has important demographic, social and environmental ramifications" (1). Recent evidence suggests that the effects of urban growth vary depending on countries' level of development and that the extent of inequalities in nutritional status can be linked to the pace of urbanisation. Urban poverty and intra-urban inequalities are also not limited to countries with large populations, such as India or Nigeria.



Over the last few decades, Nepal, for example, has been experiencing rapid urbanisation, which has also shifted many health and nutrition problems from rural to urban areas. While the overall prevalence of urban malnutrition has been decreasing, wealth-related inequalities remain significant (Fig. 1). In Nepal, 32% of children under age five living in cities and towns are stunted. At the same time, 51% of the total stunted under-five children from urban areas are from the poorest households and almost 50% of urban under-five children are anaemic (2). Moreover, only 48% of children between 6 and 23 months from urban areas satisfy the minimum dietary diversity requirement, and only 36% of these children meet the minimum acceptable diet requirement. The situation is even worse among the children from the poorest urban households, where only 23% of all children between 6 and 23 months had a minimum acceptable diet. Between 2001 and 2016, the percentage of urban stunted children from the lowest wealth quintile remained constant, while stunting, wasting and underweight among urban children from the second, middle, fourth and highest wealth quantiles has decreased almost by half in the same time period. Poverty, lack of livelihood opportunities, food insecurity and climate change have been major drivers for the migration of the rural population to urban areas and further contributed to urban child malnutrition.

Figure 1
Wealth-related inequality in the prevalence of unweight of children under 5 in Nepal. Data source: Nepal Demographic and Health Survey, 2016.

While Sri Lanka has been experiencing less rapid urban growth, it has seen a significant expansion of its main urban centres, in particular in the Western Province. The capital city of Colombo, which is the most populated city, and a few adjacent cities in the Western Province display signs of rapid urbanisation (3). A study conducted on the nutrition of primary-school children in Colombo revealed that their nutrition status is now shifting from undernutrition to overweight and obesity (4). Further studies conducted in urban schools showed that boys and older children around the age of 11 and 12 tend to face higher risks of overweight and obesity compared to their female counterparts and younger children (5). Sri Lanka is known for its welfare-oriented and well-established free health care policy and thus has achieved remarkable milestones in child health compared to its regional counterparts. However, evidence from Sri Lanka Demographic and Health Surveys shows that over the last 10 years stunting of children under age five in the rapidly urbanising centres such as Colombo, Gampaha and Kandy has increased. Case studies conducted in local schools reveal that it is the urban poor of Colombo and their children who suffer mostly from stunting and other malnutrition-related issues, while children from better-off families are at greater risk of overweight (3).

As the process of urbanisation is likely to continue in many of the developing countries, it is critical to invest in contextualized, risk-sensitive urban planning initiatives, linking the expansion of cities and peri-urban areas to food security and public-health strategies. In many countries in Asia, a significant proportion of the workforce operates in poorly paid informal settings, such as construction and factory work, rickshaw-driving and street-vending. Low education, low socio-economic status and lack of social support among such populations has put mothers and children at greater risks of malnutrition. Therefore, unless the concerned authorities decide to increase access to affordable nutritious food and health and social services, inequalities in urban malnutrition will continue to persist, thus threatening the health and livelihoods of the populations and hampering the progress towards the United Nation's Sustainable Development Goals.

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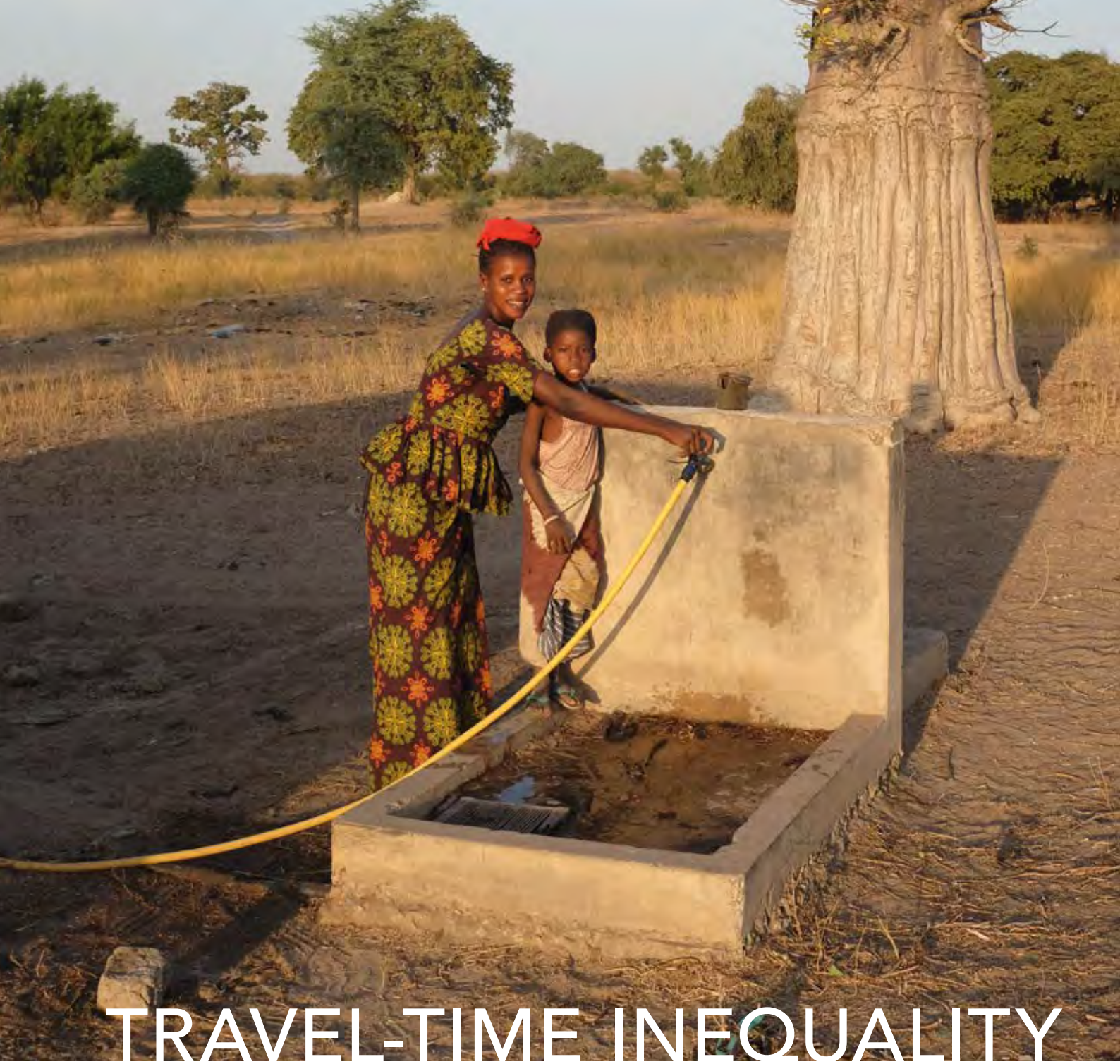

TRAVEL-TIME INEQUALITY

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LEAVING NO ONE BEHIND: THE ROAD TO 2030

We all spend some part of our day travelling; to our workplace, to school, to supermarkets and many other locations that provide the opportunities, services and resources that we often take for granted. These opportunities are largely concentrated in cities and the opportunity cost—the time spent on travelling to and from these opportunities—can be substantial. This cost may be a short commute into the city, but for those who live further away, there may be no alternative to spending several hours per day traveling. For others, the travel time to cities may be so large that the opportunities available within cities become practically inaccessible. Having good

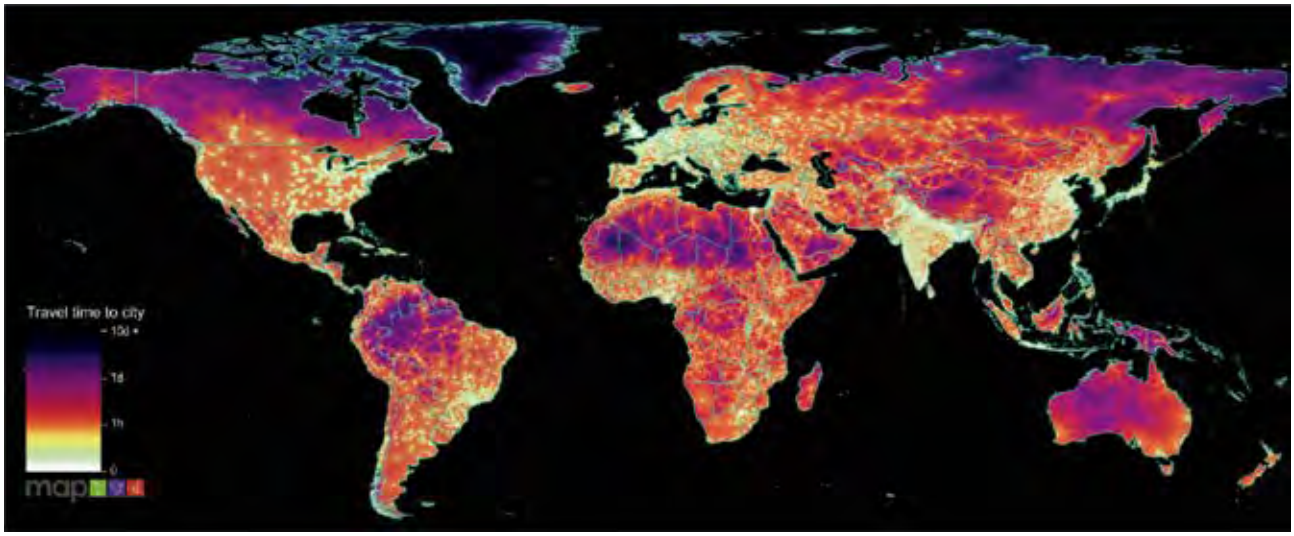
access to the most basic services and opportunities (food, water, schooling, healthcare and jobs) is important for people's livelihoods and for economic development in general. However, it is evident that not everyone has the same level of access to the opportunities and resources within cities, and this inequality in access is related to inequality in development.

Who has good access and who does not? How does accessibility relate to development and where are the opportunities to improve people's livelihoods through better access to resources? These important questions underpin the equity agenda of the Sustainable Development Goals (SDGs) of the United Nations by 2030 and answering both questions will require a better understanding of the spatial pattern of accessibility to urban areas. As such, our 2015 global map of accessibility to cities provides needed information for better informing development policies so that rural areas can benefit from urban development.

Mapping inequality in access to resources

The equity agenda of the SDGs motivated us to map out accessibility globally and explore its relationship with key measures of human wellbeing (1). We obtained the most recent and detailed spatial datasets to characterize the speed of travel across all types of land surfaces. This included land-based transport networks (roads, railways, rivers, canals and sea routes) as well as terrain and land cover types to account for foot-based travel. When combined, these data provided a global map of the time required to cross every 1 x 1 km square on the Earth's surface. We obtained a map of the world's cities and identified 13,840 cities with 50,000 or more inhabitants in the year 2015 and used these as proxies for where most opportunities and services are located. With these two pieces of information, we used Google Earth Engine—a global scale mapping and modelling

Figure 1
A global map of travel time to the nearest city in year 2015.



tool—to estimate the time required to travel from any location to the nearest large city, which resulted in a new global map showing the spatial variation in access to cities and the opportunities that these cities provide (figure 1).

When combined with data on the global distribution of human population and national income we saw that 90% of people in high-income countries reside within one hour of a city, but for low-income countries that figure drops to only 50%, suggesting large disparities in access to opportunities and a relationship between travel time and economic development at a national level.

These national level averages can hide important local variations and we conducted a more detailed analysis using household survey data from the Demographic and Health Surveys (DHS) programme from 1.77 million households in 52 low-to-middle-income countries. The results from this analysis illustrate the relationship between accessibility and household characteristics like wealth and education level. We observed consistent trends; household wealth and levels of household education both increased with greater access to cities (figure 2). Whilst we cannot make a causal link between accessibility and development, there are clear relationships between access to resources and key socioeconomic outcomes of sustainable development.

Are we there yet?

The map and our subsequent analyses suggest that access is related to many facets of human wellbeing and sustainable development, such as education, wealth, healthcare and the conservation of natural resources. For instance, better access to health services is associated with lower child mortality and higher vaccination rates. Other research has suggested that improving market access is an important strategy for increasing food security and reducing poverty (2). The map of accessibility can be used in combination with other information to assess where access to basic economic and social needs can be improved while maintaining the natural environment. The solution is not simply to build more roads; the world is already a well-connected place and poorly planned road construction often leads to deforestation and land degradation. Well-planned improvements to the existing transport network, however, can provide the most benefits with the least environmental impact. Alternatively, investing more in smaller cities and market towns can lead to a more equitable distribution of opportunities without large-scale infrastructural expansions. Our accessibility map and the geospatial modelling tools we freely provide support hypothesis testing that can directly address these issues and lead to improved development planning.

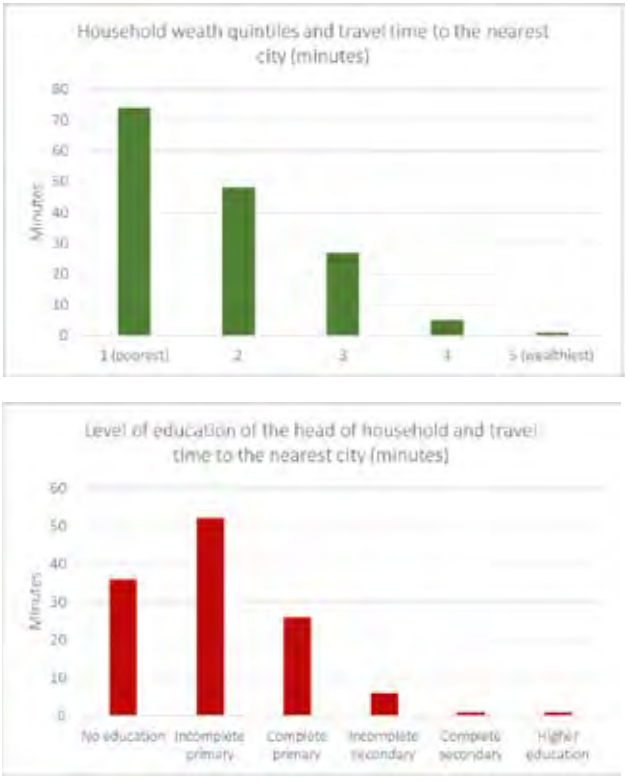


Figure 2
Travel time to the nearest city in relation to rural household metrics of wealth and education

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TRADE & NUTRIENT ACCESS

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THE IMPORTANCE OF TRADE TO EQUAL FOOD NUTRIENT DISTRIBUTION

The unequal burden of malnutrition is a pressing, but old, problem. Some people have always had less, and the moral imperative to assist those people has always been prominent. The challenge in our current era is shaped in part by a relatively new trend: the interconnectedness of the global food system, facilitated by technologies that enable the transport of foods over long distances.

This interconnectedness means that countries can sell food items to far-away countries, and not just non-perishable foods. This role of trade in the global food system creates both potential challenges

and potential gains. The challenge is that because wealthier countries have more influence in trade networks, nutrients could flow to countries with the most money, leaving poorer countries nutritionally behind. The potential gain is that countries could specialize in producing foods that are well-suited to their agroecological conditions, and use revenue from those goods to purchase food items that provide nutrients that might be difficult to produce locally. An example of the latter might be an arid country that does not have sufficient water to produce many fruits and vegetables specializing in arid cereals and legumes and importing fruits and vegetables.

In my research with colleagues (1), we wanted to know if trade was having a positive or negative impact on the equality of nutrients available for consumption among countries. We used data from the Food and Agriculture Organization on the amount of foods imported and exported by every country around the world over a ten-year period. We combined these data with information on the nutritional composition of each food item. This allowed us to study the amount of each nutrient imported and exported by each country.

We found that for almost all nutrients, the total global supply is enough to meet a global population of more than 10 billion extra people. Thus, we don't need more food; we just need better access to food. But it depends on the nutrient. For macronutrients, such as calories and protein, almost all countries have enough to meet their population's needs. For micronutrients, however, there are countries that only have enough micronutrients to meet 20% of their national needs, despite a global surplus of these nutrients.

But if you took away current trade relationships, the situation is more dire for low-income countries. Between 146 and 934 million fewer people might be able to be nourished—depending on the nutrient and country considered—if existing trade relationships were removed. Without trade, access to food nutrients among countries is always less equal. Low-income countries, in particular, tend to gain nutrients through trade relationships, the exception being for iron and folate. This is an important caveat, because these nutrients are in short supply for many low-income countries.

Of course, it is difficult to really know what the world would be like without trade. Our analysis creates a simplistic hypothetical world in which the world would be the same, just without imports and exports. In reality, the world would look very different if trade relationships were eliminated. Countries would drastically change their domestic production. So, we cannot truly know the impact of a world without trade, but it is pretty clear that short-term changes in trade relationships could have significant short-term effects on the ability of countries to meet their nutritional needs. This is an important message in a political moment when long-standing trade relationships are being re-evaluated by many countries.

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WEAPONISATION OF FOOD

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CHINA'S QUEST FOR FOOD SECURITY AND ITS IMPLICATIONS

Food security has always been one of the top priorities for policymakers of China, which is home to nearly 1.4 billion people. Decades ago, China embarked on a policy of achieving self-sufficiency in grain, influenced by the painful history of periodic famine and out of distrust towards the international market during the Cold War era. To achieve grain self-sufficiency, China has devoted enormous political and fiscal efforts towards China's grain production. Between 2003 and 2018, China's grain production increased by over 50%.

Notwithstanding the remarkable growth in domestic grain production, China's grain self-sufficiency rate has fallen well below the 95% official target, and it is increasingly clear that domestic production is unable to meet the rapidly rising demand. Overemphasis on grain production has already

resulted in very serious structural imbalances in the country's food supply. China has faced persistent surpluses in the supply of low-quality grains while failing to meet the growing demand for high-value foods, including high-quality rice and wheat. Consequently, the country's long-standing food security strategy, which centres on the concept of grain self-sufficiency, has been heavily criticised not only by liberal economists but also by some government officials. Faced with these challenges, China took a historic step to reform its food security strategy in December 2013 by redefining the country's food security strategy. For the first time, it opted for "domestic supply with moderate imports." While the rhetoric of the top leaders, including the Chinese president Xi Jinping, is that China must rely on itself to achieve food security, the country shifted its attention from pursuing actual domestic grain production to preserving overall grain-producing capacity. Essentially, China's long-lasting grain-sufficiency strategy is being replaced by a dual strategy that enhances domestic food production capacity on the one hand and better utilizes international agricultural resources on the other hand. Given China's supreme influence in global agricultural trade and food production, this paradigm shift in China's food security strategy is set to reshape the global food systems.

Domestic reforms

China's domestic agricultural modernisation attempts, such as land reforms and fishery reforms, as well as massive investment in agricultural technology, have potentially significant impacts on the global food system and thus global food security and should not be overlooked. As China steps up its efforts to scale up and clean up the country's farmland, domestic grain production is unlikely to rise further and may even decline in the future. This means that China would have to import more grains from the international market. In addition, as bigger farms are replacing smaller farms, the smaller tractors which used to dominate China's agricultural machinery market are facing excess capacities, whereas bigger and high-quality tractors are in short supply. As a result, China has been pushing for more exports of small-to-medium tractors. Similarly, as China aims to achieve negative growth in the use of fertilisers and pesticides to save the farmland from further degradation, domestic overcapacity in the agricultural input sectors is pushing more Chinese fertiliser companies to seek demand overseas and invest in foreign countries. More profoundly, as the most prominent agricultural producer and largest developing country, China's mode of agricultural modernisation, regardless of success or failure, will shape the global discourse on agribusiness and peasants.

In terms of agricultural technology, while the public's deep-seated distrust toward GMOs will continue to create tensions and uncertainty in China's policy regarding GMOs, the central government appears to be determined to push forward the development of GM crops in China through an incremental approach. China's attitude toward GMOs will have far-reaching impacts on future GM research and global agriculture. China's massive investment in GMO research and the recent acquisition of Syngenta will not only contribute to its own agricultural modernisation but could potentially help the country seize the commanding heights of GM technologies. Also given that China has long been very active in transferring agro-technologies to less-developed countries, China's embrace of GMOs could have substantial spillover effects across other countries.

In addition, with limited land resources, China has been increasingly sourcing food from the seas. It is forecast that over half of the increase in total seafood and aquatic product consumption in the world will be due to China, which underscores the tremendous impact China will have on the global seafood industry. In the past decades, the "China impact" was mainly felt via the rapid expansion of China's marine fishery sector. The structural shifts—from inshore to offshore fishing and development of distant water fishing—have not only directly contributed to overfishing in China's domestic waters and beyond but also led to rising fishing incidents and conflicts involving Chinese fishermen in the South China Sea, East China Sea, Yellow Sea and as far as South American and Argentinian waters. As China launches its new round of reform efforts to control the domestic fishery sector, the country's rising demand for fishery products will also increasingly be met through imports. This means that China, which has been the largest exporter since 2002, could soon become the largest importer.

Global agricultural expansion

Over the past decade, China's overseas agricultural expansion has attracted wide international concerns and scrutiny. Nevertheless, the motives and patterns of China's overseas agricultural engagement have also been poorly understood. Numerous studies have failed to take into account the patterns, motives, and geographical differences of China's overseas agricultural engagement. Table 1 provides a summary of the key elements of China's global agricultural policy. In terms of overall pattern, China's global agricultural engagement has evolved from the traditional focus on land acquisitions to encompass investments in the entire supply chain, including processing, logistics, ports, and trading. Regarding the motives of China's overseas agricultural engagement, there appears to be a consensus among Chinese policymakers that

agricultural products from the country's overseas investment need not be transported back to China; as long as China's overseas agricultural operations could help harness the potential of global food production, the increase in the global food supply could be the bulwark against China's food insecurity. Therefore, while China tries to increase domestic production dramatically, it also aims to ensure that the rest of the world always has plenty of food and that China can get what it needs.

Policy Objective	1. Bringing in advanced technologies and foreign capital to modernize the country's agricultural sector 2. Expanding agricultural exports such as fruits, vegetables, and aquatic products; generating profits for its agribusiness 3. Supplementing domestic food production and gaining control over its overseas food supply chain 4. Expanding global food production 5. Contributing to a stable and favourable global food system
Geographical Focus	1. Prioritising the periphery (Belt and Road countries) 2. Deepening agricultural ties with South America 3. Consolidating agricultural cooperation with Africa 4. Thinking globally
Key Elements	1. Agricultural imports diversification 2. Expansion of overseas agricultural investment 3. Pushing forward the new model of global agricultural cooperation 4. Developing stable ties with strategic agricultural trade partners 5. Improving food pricing power
Entities	1.. State-owned agribusiness as the leading force 2.. Private sectors and enterprises as the main forces of investment in foreign agricultural resources

Regarding the geographical focus, although China's agricultural presence in Africa and Latin America has drawn most of the attention, Southeast Asia and the Eurasian region are key focal points of China's overseas agricultural expansion, thus deserving more attention. In fact, as the Belt and Road Initiative (BRI) has become central to China's international engagement and a core priority of President Xi Jinping, the country's global agricultural engagement is being shaped by (and shaping) the BRI. Clearly, since late 2013, the so-called Belt and Road countries are increasingly being prioritised in China's overseas agricultural engagement. For instance, China's Number One Document in 2017 clearly states that "with the Belt and Road countries and regions as priority, China will support agricultural enterprises to carry out transnational operations; establish overseas production bases and processing, warehousing and logistics facilities; and cultivate global agribusiness firms"; and in May 2017, the Ministry of Agricultural promulgated the "Vision and Action on Jointly

Promoting Agricultural Cooperation on the Belt and Road". Considering BRI's strong emphasis on infrastructure connectivity, investment, and trade cooperation, China's agricultural engagement with the BRI countries could potentially make big waves in the global food markets.

In contrast to other regions where China's global agricultural policy is boosting China's bilateral relations with major food exporters, food is increasingly being used as an instrument of foreign policy in the context of big-power politics. Agricultural and resource politics are still embedded in classic interstate realpolitik, particularly between China and the United States. With the food power balance tilting towards China, the Chinese government, which had long worried about being a victim of America's food power, started deploying food power against the United States, both as carrot and a stick to induce acceptable US behaviour. Using food as "carrots", China has used access to its domestic agricultural market to show goodwill to US president Donald Trump. Facing the punitive tariffs imposed by the US on Chinese goods, one of the key retaliatory measures taken by China is using food product as "sticks" against the United States (stopping the import of soybean and other agricultural products). Regardless of how the ongoing trade wars are eventually resolved, "weaponisation" of food appears to be a growing trend in the context of the strategic rivalry between the two superpowers. Against this backdrop, China is expected to step up its efforts to expand its agricultural presence in the BRI countries so as to reduce its overreliance on the United States and bid for control over the global food supply.

Furthermore, with its rapid rise and growing reliance on the international market for food, China is determined to play a bigger role in setting the rules of the game. This means that global agricultural and food sectors could emerge as one of the key battlegrounds in the US-China power struggle.

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COMMUNITY VOICES

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THE UGANDAN TEENAGE MOTHERS' STORY THROUGH COMMUNITY VOICES

As a high school teacher in Uganda, I am passionate about adolescents, especially young mothers, and how their well-being can be improved. Therefore right from the start of my plan to apply for a PhD program (Public Health and Health Systems) at the University of Waterloo (UW), my research interest was in line with adolescent maternal/child nutrition and health. To collect views about the experiences of young mothers and how they could be supported in the course of future interventions, over 100 participants in the Budondo sub-county of the Jinja

district (rural eastern Uganda) were individually interviewed.

Young mothers in rural Uganda face a number of negative experiences, including a lack of basic needs (food, clothing and shelter); economic, power and gender imbalances; harsh treatment; cultural beliefs which hinder girls from acquiring land; pregnant girls not being allowed to attend school; and poor health. Family members and service providers raised a number of challenges which hindered their support for young mothers, especially in areas of health and nutrition, including poverty, poor or no pay, poor working conditions, heavy workload, and lack of skills and facilities.

Yet the resilience and strength of both young mothers and stakeholders in the face of extreme conditions gives hope. Some of the young mothers, for example, were involved in agriculture or small home-based businesses, sought medical care, and followed instructions given by health-care personnel (such as attending antenatal care, taking medicines, and practicing proper breastfeeding practices). Family members supported young mothers to the extent possible by training them in making handcrafts, by caring for infants, and by sharing agricultural land with young mothers. Health-related personnel counseled young mothers; village health teams (VHTs) and traditional birth assistants (TBAs) provided additional comfort and care to young mothers; and family members helped care for the infants of young mothers who returned to school. NGOs in the study area such as the SOUL Foundation and PEFO Uganda are services which can benefit young mothers. The SOUL Foundation supports mothers and infants in areas of health education and agricultural livelihood projects, for example; while PEFO Uganda equips adolescent mothers with social and agricultural livelihood skills.

Suggested strategies to help improve the well-being of young mothers include: sensitization of family and community members to support young mothers; introduction of vocational skills in schools to motivate students to stay in school; health communication about pregnancy, how it occurs and its consequences for students; and training of students in social skills to equip them to resist temptations that lead to early pregnancies. Other suggestions include: motivation of community members with pay; community collective responsibility and policing for better health services; special schooling for young mothers; supervision of medical staff; a presidential directive addressing the issue of fathers who fail to assume financial responsibility for babies; the use of suggestion boxes at health centers to improve service delivery; creating employment opportunities for community empowerment to help prevent teenage pregnancies and lower school dropout rates; improved facilitation in agriculture (such as good quality seeds and better markets to benefit their hard work); payment of VHTs; and training mothers in hands-on income-generating skills like agriculture, making handcrafts and beautification. Other suggestions are: prioritizing the health sector within the national budget so as to improve the payment of personnel and supply of medicines, building medical staff houses, provision of medical equipment, supporting VHTs with protective gear especially during rainy seasons, use of nutrition and health education videos tailored to the local community, funding food preparation facilities, and having a designated space or health center for young mothers.

There are a number of service providers whose work in the community could be enhanced through capacity building. Avenues that were suggested in line with capacity building include: training health personnel to meet the needs of young mothers, training young mothers and VHTs or teachers in income-generating skills, use of adult VHTs who are settled in their communities, and training teachers and community workers to counsel parents on how to handle and support young mothers. VHTs were willing to use their homes to train young mothers in income-generating skills and preparation of foods for young mothers and infants. Training of local health-related personnel in the unique maternal/child health needs of adolescents and sensitization of teachers and community members to strongly advocate for reduced teen pregnancies and school dropouts, and allowing adolescent mothers to return to school were also suggested.

Any future interventions to enhance the well-being of not only Ugandan young mothers but also the schooling of adolescents in general should be welcomed and funded as community members were hopeful that the study would not only end at collecting their views (as has been the tradition). More importantly, community members would prefer interventions that target both female and male pupils and students who are still in school so that they do not fall victim to early parenthood. Examples of interventions suggested by stakeholders include: vocational skills to improve interest in school, developing social skills to improve young people's self-esteem and assertiveness in saying NO to early sex, encouraging them to focus on the benefits of completing school, and involving them in open communication about reproductive health.

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https://uwspace.uwaterloo.ca/bitstream/handle/10012/12946/Nabugoomu_Josephine.pdf?sequence=1&isAllowed=y

RESEARCH METHODOLOGY

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MINIMAL METHODOLOGICAL REQUIREMENTS OF NUTRITION RESEARCH STUDIES

Drawing on a large body of data and study designs, evidence that nutrition is the main risk factor for optimal health across populations worldwide is accumulating. Evidence regarding the importance of nutrition from human health, however, ultimately depends on the quality of the underlying research findings and data provided. It is clear that providing robust and high-quality evidence regarding nutrition and health is more challenging than expected.

Nutrition, and nutrition epidemiology, a relatively young science that links nutrients and diets with population health, is fraught with many concerns (1). There are issues with study quality throughout the entire research cycle, from inception and priority setting to data collection, analysis, and interpretation of findings. Training and capacity-building in nutrition course curricula typically focus on study design, data collection and analysis (2). Recently however, scholars have recognized issues that apply to the inception and dissemination stages.

With regard to study inception, concerns around study justification and conflicts of interest have been expressed. Of particular note is the influence of the private sector on setting research agendas and priorities. Indeed, there are various indications that nutrition research has been influenced by commercial-sector interests (3). As a minimum, transparency regarding funding sources and declarations of conflict of interest are essential to ensure the correct interpretation of findings.

In addition, there are inherent methodological limitations to nutrition research. The uncertainties in food composition and errors in dietary assessment are substantial and call for caution when interpreting study findings. Most of the evidence in nutrition and health originates from observational studies, with important residual confounding that challenges the causality of findings.

Transparency in communication of research, from inception to publication of findings is essential to allow for a correct interpretation of findings. This transparency should not be taken for granted. Evidence synthesis has gained ground in nutrition research to define uncertainties in study findings. Various systematic reviews, however, report how findings of original studies could not be used due to missing information regarding what was done and found in reports (4). Although the effect of missing information to date has not been quantified, it is clear that incomplete assessment of evidence may compromise correct its use and interpretation.

Over the last decades, scholars have ramped up efforts to increase completeness of biomedical research output. Research reporting guidelines have been developed and used as tools to increase completeness and transparency of research findings. A reporting guideline is commonly organized as a list, sometimes accompanied with a flow diagram, and details a minimum number of essential items when reporting research manuscripts. The first checklist, known as CONSORT, was published in 1996, followed by a steady increase in the development of reporting guidelines. In 2006, an international network known as EQUATOR , "Enhancing the QUAlity and Transparency of health Research", was launched to centralize existing reporting guidelines in biomedical research, and currently contains a collection of over 400 reporting guidelines. Importantly, reporting guidelines are developed to help during the write-up of manuscripts and not as an instrument to evaluate study quality or bias.

To improve the completeness of reporting, guidance for nutrition research has been developed in 2016. The STrengthening the Reporting of Observational Studies in Epidemiology-nutritional epidemiology (STROBE-nut) statement (4), comprises a set of 24 items, organized as a checklist, with minimal information to be included in manuscripts describing findings of nutritional epidemiology research and dietary assessment. The goal of STROBE-nut is to ensure all information is available to enable quality appraisal, correct understanding, effective replication and application of findings. For example, one of the items on the checklist reminds users to specify if supplement intake was considered when estimating nutrient intake. Although this is a seemingly simple piece of information to report, failure to specify such details jeopardizes the correct interpretation of findings.

Reporting guidelines can also be useful for editors and reviewers during the peer review process, and allow them to screen manuscripts for essential details. To date, some nutrition journals recommend the use of reporting guidelines and those of the BMC Springer Nature group (5) refer to STROBE-nut in their instructions for authors.

Widespread use of reporting guidelines, however, adds to the burden and workload of researchers, with a potentially considerable opportunity cost. Care should hence be taken to assess added value and user acceptability of introducing new requirements. Although development of minimal standards is a first step, further monitoring is needed to ensure their effectiveness and benefit vs burden ratio.

Although researchers are affected directly, quality of nutrition research is a shared concern among all stakeholders involved, including policymakers and funders of research. Poor and incomplete reporting in this regard should be considered unethical and a waste of (often public) resources. The researchers are accountable to ensure that the published results are of the highest possible quality and that uncertainties and study limitations are clearly defined. Incentive mechanisms for researchers can be powerful levers for systematic change. Specific recognition of sound and reproducible research instead of quantity of publications, and article-level metrics (instead of journal impact factor) would be a valuable step forward to foster the culture of research quality. Such efforts should reward authors who produce research and data that can be effectively re-used by others.

Research funders should develop mechanisms to ensure research adds as much value as possible, including transparency and completeness of research findings. Although progress has been made to remove financial barriers and to stimulate open access of research output, efforts by funders to ensure minimal standards for effective use and re-use of data are met have been minimal.

Capacity-building efforts are valuable to ensure adequate training in good research practices for researchers, peer reviewers and students in the nutritional sciences. For instance, awareness of reporting guidelines can be increased through early application by students while they are working on their theses.

To conclude, although the evidence regarding diet, nutrition and health is substantial, increased efforts are needed to ensure research is re-used maximally. The attention and recognition of the importance of nutrition research for human health provide a unique window of opportunity to reflect critically on the process and quality of nutrition research. Community-wide efforts and behavioural changes are certainly needed to address critical issues in nutrition research heads-on, which is imperative to ensure its credibility.

Although efforts to improve the reporting of study results are crucial and timely, they do not address other critical problems faced during research conduct, such as publication bias, selective reporting or mythological spin. A larger, comprehensive approach for nutrition research quality that integrates tools for minimal study requirements needs to be fostered by the nutrition research community in the years to come.

We hope this piece triggers further reflection on the quality of nutrition research. We believe it is an opportune initiative and adds to the current acknowledgment of the importance of sustainable and effective nutrition research during the Decade of Action on Nutrition.

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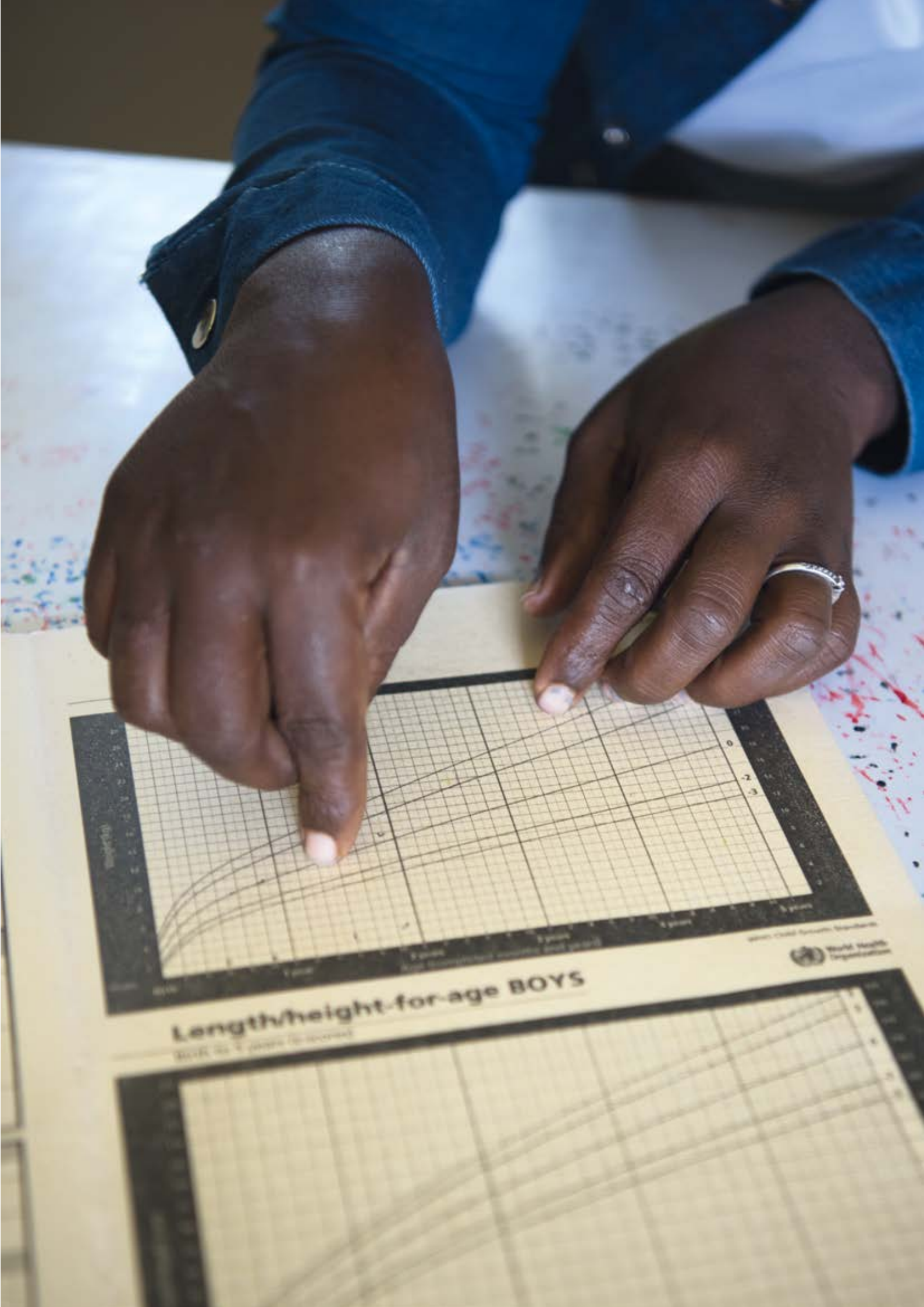
Length/height-for-age BOYS

NUTRITION RESEARCH IN MYANMAR

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NUTRITION IN MYANMAR: WHAT WE ARE DOING AND WHERE WE ARE

Myanmar, being in a transitional period, has faced many significant problems, including health issues. Like many other developing countries, Myanmar has been struggling with the double burden of malnutrition: both over- and undernutrition. Unfortunately, both are related to food intake, depending on the types and amount of consumption.

Based on the Myanmar Demographic Health Survey (2015-2016) (1) reported in 2017, 29% of children under five years are stunted, 7% of them are wasted

and 19% underweight. Meanwhile, according to the STEP survey (2014) (2), 16.9% of the adult population are overweight and 5.5% are obese. It can be said that the nutritional status of Myanmar's under-five children is seemingly improved but still needs to achieve the worldwide target; however, the over-nutrition and risk of non-communicable diseases are seemingly higher. Myanmar complies with the Myanmar National Strategy on Infant and Young Child Feeding (2011-2016) (3) which encourages mothers to breastfeed exclusively until the child is age 6 months without any water, other fluids, or food. Only half of infants under age 6 months are exclusively breastfed (51%). Ninety-two percent of breastfeeding children age 6-23 months have received complementary foods, as compared with 97% of non-breastfeeding children in the same age group.

Considering the importance of the first 1,000 days, Myanmar has emphasised the nutritional well-being of pregnant mothers and babies. Vitamin and mineral supplementation during pregnancy alongside nutritional education and counseling are the core components of nutrition-specific interventions. All children under five years are provided vitamin-A supplementation and deworming tablets biannually to prevent micronutrient deficiency. Community-based Infant and Young Child Feeding Counseling (CIYCF) has been executed widely across the country, aiming to expand the awareness and knowledge regarding the appropriateness of child feeding, and highlighting the progressive growth and development of children. Implementing the above-mentioned activities nationwide has helped prevent protein-calorie malnutrition among children.

From the aspect of nutrition-sensitive issues, Myanmar has been encouraging the agriculture sector to grow plants achieving a wide range of dietary diversity, besides being income-earning agriculture. Recently, nutrition-sensitive interventions such as measures for household food security have been initiated as well, using a multi-sectoral approach. Moreover, the Ministry of Health and Sports has collaborated with other related ministries such as the Ministry of Social Welfare, Resettlement and Rehabilitation; the Ministry of Agriculture; and the Ministry of Education to support nutrition-promoting activities by providing maternal nutrition support and nutrition education. The contribution of implementing partners such as the United Nations Organizations and international and national non-governmental organizations is documented, but the government sector plays the main steering role.

Valuing the strength of collaboration among the government sectors, international and national non-government sectors, and implementing partners, Myanmar has been tackling the over-nutrition and under-nutrition of the population with a wide range of activities. Non-communicable diseases among children have been growing even as issues of stunting and wasting decline. Nowadays, the strategic actions highlight the importance of physical activity and raise awareness to prevent the manifestation of obesity and its consequences among the population.

In conclusion, though Myanmar has many as-yet-unachieved nutrition goals, it is obvious that the nutritional status of Myanmar's children and general population has already improved. The implementation platform will be maintained and further improved in terms of collaboration and partnership.

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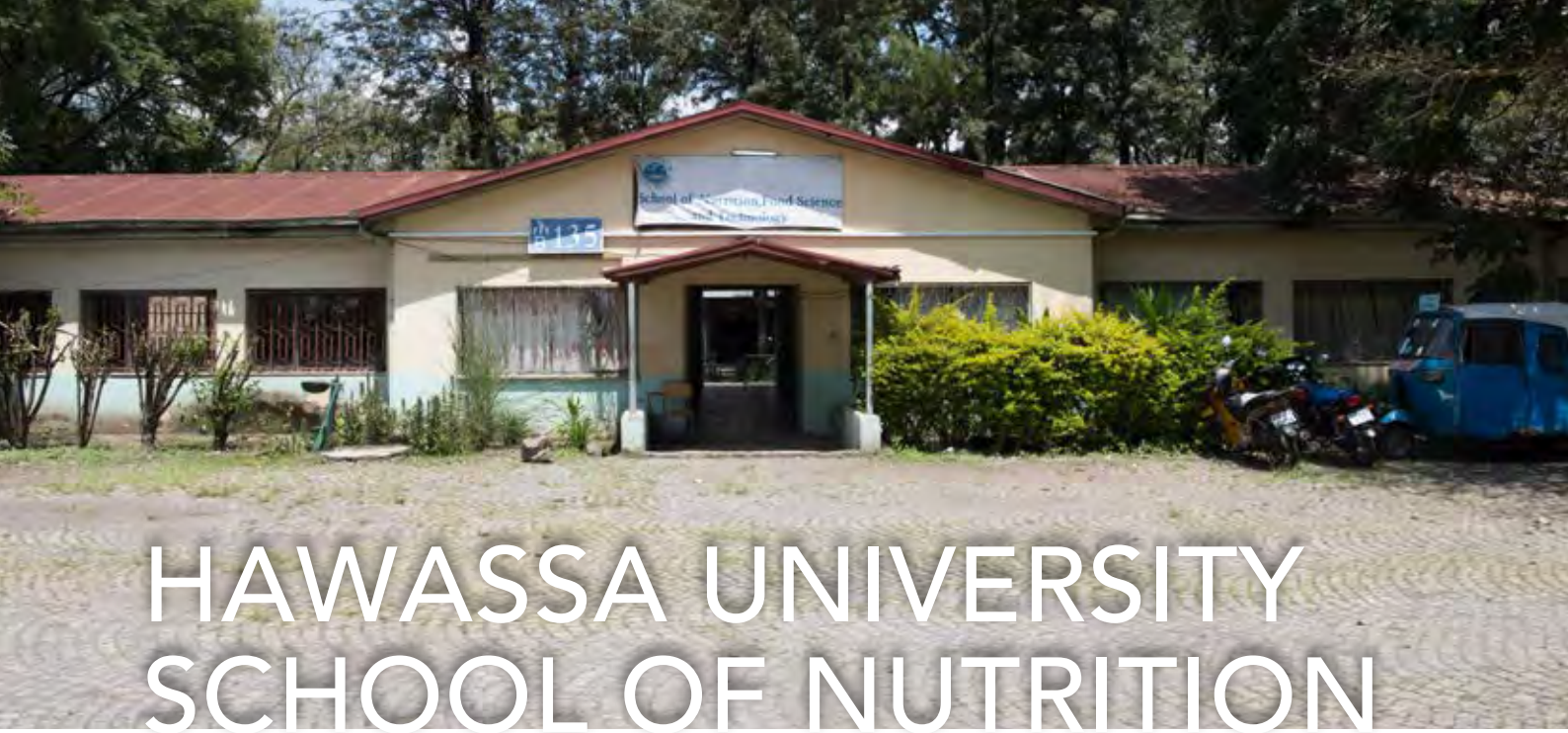
PROFILE OF A NUTRITION INSTITUTE



HAWASSA UNIVERSITY SCHOOL OF NUTRITION

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THE SCHOOL OF NUTRITION, FOOD SCIENCE AND TECHNOLOGY (SNFST) AT HAWASSA UNIVERSITY: AN ACADEMIC CENTRE OF EXCELLENCE FOR HUMAN NUTRITION IN ETHIOPIA

Located in East Africa, Ethiopia has varied agroecological zones and an ethnically and culturally diverse population. In the past two decades, the country has made great strides in reducing child malnutrition. When the first demographic and health survey was conducted in 2000, 58% of children under five years of age were stunted (short for their age). Stunting is an indication of chronic malnutrition and is often used as a proxy indicator for the nutritional status of the overall population. In 2005, the number of stunted under-five children had declined to 51%. The World Health Organization categorizes a stunting prevalence above 30% as an indication that undernutrition is of very high public-health significance in a country.

Hawassa University is located at Hawassa, southern Ethiopia, 273 km from Addis Ababa. The university's nutrition program in the College of Agriculture was conceived and started by Dr. Yewelsew Abebe. Since 2005, Dr. Abebe has run a collaborative research project focused on micronutrient deficiencies, in collaboration with professors from Oklahoma State University and the University of Colorado, College of Health Sciences in the United States and the University of Otago in New Zealand. The studies carried out by the project produced data on the prevalence of micronutrient deficiencies in Ethiopia and emphasized the need for committed action to address undernutrition. Furthermore, two of the collaborators in the project, Dr. Barbara Stoecker and Dr. Rosalind Gibson, supported the program by teaching courses and supervising student research. At that time there was a dire shortage of trained instructors as no training program in nutrition

ETHIOPIA

AREA

Total:	1,104,300 km^2
Agricultural land:	36%
Arable land:	15%

POPULATION

Total (July 2018 est.):	108,386,391
Urban population (2018):	21%
Under age 15:	43%
Median age:	18 years (male 17.8 years / female 18.2 years)
Net migration rate (per 1000) (2017 est.):	-0.2
Rate of urbanization (annual rate of change, 2015-2020 est.):	4.6%

POPULATION GROWTH RATE

Total (2018 est.):	2.83%
Total fertility rate (2018 est.):	4.91 children born per woman

GDP

(per capita, PPP) (2017 est.):	USD 2,200

LIFE EXPECTANCY AT BIRTH

Total: 63 years

Male: 60.5 years / Female: 65.5 years

MORTALITY RATES

Neonatal mortality rate:	41/1000
Infant mortality rate (at birth) (2018 est.):	48.3/1000
Under-five mortality rate:	59/1000
Maternal mortality rate (2015 est.):	353/100,000 live births

MICRONUTRIENT DEFICIENCIES

Households consuming iodized salt (DHS 2016):	85.6%
Vitamin-A supplementation (full coverage):	74%

OTHER PARAMETERS

Population below poverty line (2014 est.):	29.6%
Rate of urbanization (rate of annual change):	4.63%
Mother's mean age at first birth (2016 est.):	20 years
Contraceptive prevalence (2017):	35.5%
Health expenditure % of GDP, 2014):	4.9%
Physician density per 1000 population:	0.03
Immunization, measles (% of children ages 12-23 months):	65%
Proportion of children < 5 years sleeping under insecticide-treated bed nets:	45%
Total adult literacy rate:	49.1%
Population using improved sanitation facilities, 2015, total:	28%
Population using improved sanitation facilities, 2015, urban:	27.2%
Population using improved sanitation facilities, 2015, rural:	28.2%
Adult HIV prevalence (2017 est.):	0.9%
Obesity (adult prevalence rate 2016):	4.5%
Internet users (% of the population, 2016 est.)	15.4%

existed in the country. To address this urgent and critical problem, Hawassa University established the first-ever nutrition training program in Ethiopia at the College of Agriculture with the founding of the Applied Human Nutrition graduate program in 2007. The graduate program was the only nutrition training program in the country, both at the graduate and undergraduate level. In 2009 the School of Nutrition, Food Science and Technology (SNFST) was established by combining two programs, Human Nutrition and Food Science. The SNFST started an undergraduate program in Human Nutrition in 2009, and launched a PhD program in Human Nutrition in 2016. Currently, there are 16 PhD candidates admitted in three cohorts, most of them coming from Ethiopian universities with Human Nutrition programs.

Table 1
Student enrolment and alumni information for SNFST

Program name	Type of degree	Currently enrolled	Alumni
Human Nutrition	B.Sc.	150	480
Food Sciences and Postharvest Technology	B.Sc.	190	600
Applied Human Nutrition	M.Sc.	82	260
Food Sciences and Technology	M.Sc.	26	105
Human Nutrition	PhD	16	-

Due to its capacity, history, and international collaborations as well as laboratory facilities, the Human Nutrition program at Hawassa University was selected to be an Academic Centre of Excellence for Human Nutrition on 3 April 2015, chosen from among all the nutrition-training universities in Ethiopia. Since its inauguration as an Academic Centre of Excellence for Human Nutrition, it has supported ongoing national initiatives through the provision of manpower for key national positions in the health and agriculture sector; support of the national nutrition program, national school feeding strategy, and national food and nutrition policy development; hosting national and international conferences; and providing laboratory services for newly opened universities and services for community and government sectors.

In a country such as Ethiopia where 80% of the population reside in rural settings and are mainly engaged in agriculture, nutrition-sensitive agriculture is very important to reduce undernutrition. The location of the school at the College of Agriculture makes the nutrition program unique in the country. This has enabled the school to cultivate collaborations with faculty from other departments in the College of Agriculture. Moreover, since its inception, the school also has had strong collaborations with faculty from Health Sciences. Such multidisciplinary teams are important to tackle nutrition-related problems, as these tend to be caused by a multitude of factors.

The SNFST has always set a high standard for research conducted at the school by faculty and graduate students. Some of the earliest studies that assessed micronutrient status and functional consequences of micronutrient deficiencies in an Ethiopian study population were carried out at Hawassa University. Some of these studies pre-date the nutrition program at the school and have set a benchmark for community-based problem-solving research and have shaped the research projects carried out at the school.

Since its establishment, the school has cultivated strong ties to surrounding communities through research and community engagement activities. The


NUTRITION, FOOD SCIENCES AND TECHNOLOGY
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USAID
Jhpiego
Save the Children

research carried out at Hawassa began with baseline studies to assess nutritional status and has evolved into implementing longitudinal and experimental research studies. The main research areas at the school include: Maternal and child nutrition, nutrition-agriculture linkages, micronutrients research, non-communicable diseases, school feeding programs and nutrition in the school, value addition and postharvest research, food technology applications in agriculture and nutrition, and food safety and quality.
Some of the important research work that has been done in the school and which has influenced national policy is listed below:

- First studies that assessed the micronutrient status of Ethiopian pregnant women. These studies provided the first documentation of their zinc, iron and iodine status.

- Several studies that assessed iron-deficiency anaemia in Ethiopia and provided evidence that although anaemia is high, iron-deficiency anaemia is uniquely low in Ethiopia. These findings have informed the implementation of the Ethiopian food fortification program.

- Studies that showed that the iodine status in schoolchildren and pregnant women in Ethiopia is very low. Ethiopia did not have a universal salt iodization (USI) program when the studies were undertaken. In 2012 a USI was implemented in Ethiopia.

- First studies that quantitatively assessed the diets of infants and young children, pregnant women and women of reproductive age as well as carrying out dietary method validation studies.

- Additional nutrient analysis for local foods to include mineral and phytate analysis that is not included in the Ethiopian Food Composition Tables.

- Some of the first longitudinal studies in the country, including nutrition education intervention studies and randomized controlled trials (focusing on pulses, zinc, iodine, Vitamin D, and aflatoxin).

In 2008 the Ethiopian Ministry of Health released the National Nutrition Strategy, which was the basis of the first National Nutrition Program (NNP) in 2012. Currently the second NNP is being implemented. Successes in the past decade and a half include achieving the Millennium Development Goal number four, by reducing child mortality and the prevalence of stunting to 38% in 2016. We believe that SNFST has contributed to these achievements both through research and training nutrition professionals. Graduates from the program currently hold key leadership positions in the area of nutrition. Furthermore, alumni and faculty continue to advocate for and guide the national nutrition agenda in Ethiopia. In addition, graduates from the program have helped other Ethiopian universities to open Human Nutrition programs. The school also runs a national agriculture-to-nutrition online forum for Ethiopian scholars to promote the exchange of ideas and collaboration between different scholars and institutions in Ethiopia and globally. The forum has more than 2,500 registered scholars.

Despite all the progress made, there are still some challenges that the school faces. Our school, as well as other nutrition programs in Ethiopia, struggles to attract faculty members with PhD degrees. Another major challenge is securing grants for research projects both for faculty and graduate students. There are a limited number of grants available for global research and they are highly competitive. A possible solution we are planning to implement in the future is to select thematic research areas to reduce waste by sharing funds. Other challenges include difficulty finding PhD supervisors, shortage of laboratory equipment for biological sample analysis and limited internship placement for undergraduate students.

In the future, the school plans to continue striving to provide quality nutrition training in Ethiopia. We plan to expand the type of training provided from conventional undergraduate and graduate training to providing short-term in-service training and offering online courses. Currently, the school is working to get its laboratory accredited to meet the international standards for laboratory quality and provide quality services for students, community, industries and research institutions. We also plan to continue strengthening our community service through community-based nutrition research, school health and nutrition program evaluation and developing food processing and packaging technologies.

Acknowledgments

We would like to take this opportunity to acknowledge the tremendous contribution of Dr. Yewelsew Abebe for the establishment of the nutrition program at the school. Furthermore, the program would not be what it is today if it were not for the support of collaborators in other countries who volunteer to teach at our school and supervise student thesis and dissertation projects. We would thus be remiss if we do not take this opportunity to acknowledge the support of the individuals who are listed below. The research projects initiated through these collaborations have supported many graduate students and have enabled Hawassa University to become a pioneer in nutrition training in Ethiopia.

- Dr. Barbara Stoecker, Oklahoma State University, Stillwater, OK, USA (who has taught a graduate class at the school every year since 2007)
- Dr. Rosalind Gibson, University of Otago, New Zealand
- Dr. Carol Henry, University of Saskatchewan, Saskatchewan, Canada
- Dr. Gordon Zello, University of Saskatchewan, Saskatchewan, Canada
- Dr. Susan Whiting, University of Saskatchewan, Saskatchewan, Canada


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ONGOING PROJECTS

	TITLE	PRINCIPAL INVESTIGATOR
MICRONUTRIENTS		
1	2011 / Effect of soybean supplementation, parasite control and nutrition education on iron status of adolescent girls in rural China	Lei Li Medical College of Xiamen University, Siming District, Xiamen, China
2	2014 / Minimizing the negative effect of iron supplementation and fortification on gut microbiota using local resources	Siti Helmyati Gadjah Mada University, School of Health and Nutrition, Faculty of Medicine, Yogyakarta, Indonesia
3	2015 / The effect of mixed green leafy vegetables powder on vitamin A and anemia status of Ghanaian schoolchildren	Godfred Egbi University of Ghana, Noguchi Memorial Institute for Medical Research, Legon, Ghana
4	2015 / Nutrition promotion for improving iodine status of children in an iodine-endemic area in West Java, Indonesia	Leily Amalia Furkon Bogor Agricultural University, Bogor, Indonesia
5	2018 / Efficacy of micronutrient powder formulation with low-dose iron in Bangladeshi children living in areas of high iron in groundwater	Faruk Ahmed Griffith University, Public Health, School of Medicine, Health Sciences, Queensland, Australia
6	2018 / Iron-biofortified fast-cooking cowpeas to reduce iron deficiency among children in malaria-endemic areas in Ghana	Sylvester Addy CSIR Crops Research Institute, Kumasi, Ghana
INFANT AND CHILD NUTRITION		
7	2010 / Intensive nutrition and hygiene education for improving nutrient intake of children (6-11 months)	Dwi Nastiti Iswarawanti SEAMEO Regional Center for Food and Nutrition, Jakarta, Indonesia
8	2012 / Food-based approaches to reduce childhood nutrients-energy malnutrition in Bangang community, Cameroon	Marie Modestine Kana Sop University of Douala, Faculty of Science, Douala, Cameroon
9	2013 / Infant and young-child feeding and care practices of caregivers in the province of Albay, Philippines	Joyce Louise Cruz Ignacio University of The Philippines Los Banos, College of Economics and Management, Laguna, Philippines

INFANT AND CHILD NUTRITION

10	2013 / Formulation and characterization of infant flours using spirulina powder as a replacement for multivitamin-mineral complex	Evariste Mitchikpe University of Abomey Calavi, Department of Nutrition and Food Sciences, Cotonou, Benin
11	2014 / Effects of feeding style and fiber content of complementary foods on the appetite of Ethiopian infants	Kaleab Baye Addis Ababa University, Center for Food Science and Nutrition, Addis Ababa, Ethiopia
12	2014 / Effect of personalized nutritional counselling on child growth and feeding practices in Burkina Faso	Yassinme Elysee Somasse Polytechnic University of Bobo-Dioulasso, Department of Public Health, Bobo-Dioulasso, Burkina Faso
13	2017 / Nutrition, anaemia, growth and oxygen weaning in low-birth-weight oxygen-dependent infants in a Kangaroo Clinic	Nathalie Charpak The Kangaroo Foundation, Bogota, Colombia
14	2018 / Development of complementary foods based on local products to improve iron status of childbearing age women and school-age children in Senegal – NFR4D	Moussa Ndong & Amadou Tidiane Guiro USSEIN University of Sine Saloum El Hadj Ibrahima Niasse, Bureau de Liaison, Dakar, Senegal

MATERNAL NUTRITION

15	2010 / Urinary iodine concentration of pregnant women in Zambia as an indicator of their iodine nutrition status	Cyprian Katongo Copperbelt University, School of Mathematics and Natural Sciences, Kitwe, Zambia
16	2010 / Pre-conceptional vs gestational food supplements and pregnancy outcomes in rural Vietnam	Tu Ngu National Institute of Nutrition, Department of Applied Nutrition and Nutritional Surveillance at the National Institute of Nutrition, Hanoi, Vietnam
17	2013 / Impact of pre-pregnancy micronutrient supplementation on infant growth and development	Phuong Hong Nguyen Thainguyen Medical School, Thainguyen, Vietnam

	TITLE	PRINCIPAL INVESTIGATOR
MATERNAL NUTRITION	18 2016 / Improving child growth and development through nutrition and psychosocial intervention in early childhood education (PAUD) settings in rural areas	Ali Khomsan Bogor Agricultural University, Department of Community Nutrition, Bogor, Indonesia
	19 2017 / Underlying causes of poor dietary intake, nutritional status and birth outcomes in pregnant adolescents and adults	Annan Reginald Adjetey College of Science KNUST, Department of Biochemistry and Biotechnology, Kumasi, Ghana
	20 2018 / Impact of preconceptual micronutrient supplementation on child growth and development	Phuong Hong Nguyen Thainguyen Medical School, Thainguyen, Vietnam
CHILD BEHAVIOURAL DEVELOPMENT	21 2012 / Maternal zinc nutrition: Its influence on human health and development in Peruvian children	Nelly Zavaleta Instituto de Investigacion Nutricional, Lima, Peru
	22 2013 / Food-based intervention and psychosocial stimulation to improve child growth and development: First follow-up study	Umi Fahmida University of Indonesia, SEAMEO RECFON, Jakarta, Indonesia
BONE HEALTH	23 2016 / Effect of daily consumption of dried bean curd and nutrition education on bone health of postmenopausal women in China	Lei Li School of Public Health, Xiamen University, Xiamen, Fujian Province, China

FORGOTTEN CROPS / AGRICULTURE

24	2014 / The efficacy of biofortified pearl millet in a randomized controlled trial with children <2y in rural Eastern Kenya	Mueni Hellen Ndiku & Sabaté Joan University of Eastern Africa, Baraton School of Science and Technology, Eldoret, Kenya Loma Linda University, School of Public Health, Loma Linda, California, USA
25	2014 / Promoting food sovereignty through a cooperative model for sustainable organic farming in the Mayan region, Mexico	Cristina Osorio-Vazquez , Universidad Intercultural Maya de Quintana Roo, Quintana Roo, Mexico

OTHER RESEARCH AREAS

26	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
27	2011 / Effectiveness of nutrition package in improving growth of rural children (6-23 months): A cluster randomised trial	Kissa B.M. Kulwa Sokoine University of Agriculture, Department of Food Science and Technology, Morogoro, Tanzania
28	2012 / Prenatal and young-child nutritional supplementation and early childhood body composition, growth and development	Momodou K Darboe MRC International Nutrition Group, Banjul, Gambia
29	2012 / Consumer acceptability of spirulina in Zimbabwe, and the effect of cooking on spirulina provitamin-A carotenoids	Tawanda Muzhingi Tufts University, Avondale, Harare, Zimbabwe
30	2012/Effectofnutrient-densecomplementary food on catch-up growth of Indonesian moderately stunted children	Duma Octavia Fransisca University of Indonesia, SEAMEO RECFON, Jakarta, Indonesia
31	2013 / Child-centered counseling and home-based food production to improve dietary adequacy and growth of young children in southwestern Ethiopia	Abebe Gebremariam Jimma University, Department of Population And Family Health, Jimma, Ethiopia

OTHER RESEARCH AREAS

	TITLE	PRINCIPAL INVESTIGATOR
32	2013 / Behavior change and nutrition associated with integrated maternal/child health, nutrition and agriculture program	Manolo Mazariegos Institute of Nutrition of Central America and Panama (INCAP), Guatemala City, Guatemala
33	2013 / Healthy kitchens, healthy children: A school-based cluster randomized controlled trial	Nadine Sahyoun & Hala Ghattas University of Maryland, Department of Nutrition and Food Science, College Park, Maryland, USA and American University of Beirut, Center for Research on Population and Health, Beirut, Lebanon
34	2013 / Nutrition and food security: Impact of soil fertility and productivity of home gardens on family nutrition (resubmission)	U R Sangakkara †, continued by Janaki Mohotti University of Peradeniya, Faculty of Agriculture, Peradeniya, Sri Lanka
35	2014 / Nutrition gap map: A comprehensive mapping, quality assessment and summary of nutrition-relevant systematic reviews	Zulfiqar Ahmed Bhutta Aga Khan University Hospital, Center of Excellence in Women and Child Health, Karachi, Pakistan
36	2014 / A cohort analysis of the sustainability of food insecurity control programs in the northwest of Iran	Saeed Dastgiri Tabriz University of Medical Sciences, Faculty of Medicine, Tabriz, Iran
37	2015 / Participatory prototyping of complex agro-ecosystem designs to produce diverse food products in East Java, Indonesia	Uma Khumairoh University of Brawijaya, Faculty of Agriculture, Malang, East Java, Indonesia
38	2015 / Removing inorganic arsenic from rice	Andrew A. Meharg & Habibur Rhaman Queens University Belfast, Plant and Soil Science, Belfast, Northern Ireland and Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh
39	2015 / Formative evaluation of an intervention to enhance nutrition and health status of pregnant adolescents in eastern Uganda using education, cell phone communication, and income generation	Josephine Nabugoomu School of Public Health and Health Systems, Waterloo, Canada
40	2015 / Maternal folate supplementation and epigenetic changes in the offspring	Phuong Hong Nguyen Thainguyen Medical School, Thainguyen, Vietnam

OTHER RESEARCH AREAS

	TITLE	PRINCIPAL INVESTIGATOR
41	2015 / Effect of vitamin-B12 supplementation during pregnancy and 6-month postpartum to improve B12 status and child development	Towfida Jahan Siddiqua ICDDR, B, Nutritional Biochemistry Lab, Laboratory Sciences Division, Dhaka, Bangladesh
42	2016 / Vitamin-A status in pregnant women eating traditionally prepared spirulina (Dihé) in Chad	Imar Djibrine Soudy Institut Universitaire des Sciences et Techniques d'Abéché, Laboratoire de Biotechnopôle de IRED (Tchad), N'djamena, Chad
43	2016 / Risk factors and the associated cost of preventing childhood stunting: A case study of Buhweju district, Uganda	John Bukusuba (Mukisa) Makerere University, School of Food Technology, Nutrition and Bioengineering, Kampala, Uganda
44	2016 / Processing and preservation of Moringa oleifera leaves for combating micronutrient malnutrition in Tanzania	Oscar Kibazohi University of Dar es Salaam, Department of Chemical and Mining Engineering, College of Engineering and Technology, Dar es Salaam, Tanzania
45	2016 / Viral contamination of vegetables eaten raw: Sanitary impacts on the vulnerable population in Usme (Bogota)	Carlos Arthuro Guerrero-Fonseca Universidad Nacional de Colombia, Molecular Biology Virus Laboratory, Faculty of Medicine, Bogota, Colombia
46	2017 / Improving vitamin-A intake in Northern Cameroon through nutrition education on food habits	Richard Aba Ejoh University of Bamenda, Department of Food and Bioresource Technology, College of Technology, Bambili, Cameroon
47	2017 / Designing improved complementary feeding for infant and young children from locally available foods in rural western Ethiopia	Fekadu Gemede Habtamu Wollega University, Food Science, Nekemte, Ethiopia
48	2017 / Development of a bio-control approach for mitigation of aflatoxin in groundnuts using atoxigenic strains of Aspergillus spp in Tanzania	Juma Mfaume Naliendele Agricultural Research Institute (NARI), Mtwara, Tanzania
49	2017 / Consumer attitude and perception of the consumption of edible insects in western Kenya	Fanuel Kawaka Technical University of Mombasa, Department of Pure and Applied Science, Mombasa, Kenya

	TITLE	PRINCIPAL INVESTIGATOR
50	2017 / In search of an EEG neural fingerprint of early malnutrition: A 50-year longitudinal study	Pedro Antonio Valdes-Sosa Cuban Neuroscience Center, Havana, Cuba
51	2018 / Towards the introduction of edamame (vegetable soybean)for more nutritious diets and food availability in Benin	Eric Etchikinto Agoyi University of Abomey Calavi, Cotonou, Benin
52	2018 / Enhancing nutritional benefits and safety of maize to improve the health of Africans	Archileo N. Kaaya Makerere University, Department of Food Technology and Nutrition, Kampala, Uganda

OTHER RESEARCH AREAS

PUBLICATIONS

Bukusuba J, Kaaya AN, Atukwase A. Modelling the impact of stunting on child survival in a rural Ugandan setting. BMC Nutrition 2018;4:1-10.

Chirdkiatisak M, Sranacharoenpong K, Churak P, Praditsorn P. Thai diabetes prevention education program: development and validation of the Thai physical activity questionnaire for at-risk people. J Public Health 2018;1-9.

Egbi G, Gbogbo S, Mensah GE, Glover-Amengor M, Steiner-Asiedu M. Effect of green leafy vegetables powder on anaemia and vitamin-A status of Ghanaian school children. BMC Nutrition 2018;4:1-10.

Helmyati S, Yuliati E, Wisnusanti SU, Maghribi R, Juffrie M. Condition of gut microbiota among stunted school children in West Lombok. J Gizi Pangan 2017;12:55-60.

Helmyati S, Rahayu ES, Kandarina BJI, Juffrie M. No difference between iron supplementation only and iron supplementation with synbiotic fermented milk on iron status, growth, and gut microbiota profile in elementary school children with iron deficiency. Current Nutr & Food Science 2019;15:1-8.

Khumairoh U, Lantinga EA, Schulte PO, Suprayogo D, Groot JCJ. Complex rice systems to improve rice yield and yield stability in the face of variable weather conditions. Sci Rep. 2018;8:1-7. DOI: 10.1038/s41598-018-32915-z.

Li L, Zhong W, Kong H, Sun J, Zhang X, Su Y. Evaluation of the effect of sprout soybeans on the iron status of anemic adolescent girls in rural China. Plant Foods Hum Nutr 2018 1-7. DOI: 10.1007/s11130-018-0697-7.

Nabugoomu J. Adolescent maternal nutrition and health in Uganda: voices from the community. PhD thesis of Philosophy in Public Health and Health Systems (Supervisor Rhona Hanning), University of Waterloo, Waterloo, Ontario, Canada 2018;309pp.

Nabugoomu J, Seruwagi GK, Corbett K, Kanyesigye E, Horton S, Hanning R. Needs and barriers of teen mothers in rural Eastern Uganda: Stakeholders' perceptions regarding maternal/child nutrition and health. Int J Environ Res Public Health 2018;15. DOI: 10.3390/ijerph15122776

Osorio Vazquez MC, Bressers H Th, Franco Garcia ML. Promoting food sovereignty through a cooperative model in the Maya region. J GénEros 2018;23:35-78.

Soudy ID, Minet-Quinard R, Mahamat AD, Ngoua HF, Izzedine AA, Tidjani A, Ngo Bum E, Lambert C, Pereira B, Desjeux JF, Sapin V. Vitamin A status in healthy women eating traditionally prepared spirulina (Dihé) in the Chad Lake area. PLoS ONE 2018;13:1-12.

Sranacharoenpong K, Praditsorn P, Churak P. Developing a diabetes prevention education program for community health care workers in Thailand: translation of the knowledge to at-risk people. J Public Health 2018;1-8.

Valdés-Sosa PA, Galler JR, Bryce CP, Rabinowitz AG, Bringas-Vega ML, Hernández-Mesa N, Taboada-Crispi A. Seeking biomarkers of early childhood malnutrition's long-term effects. MEDICC Review 2018;20:43-48.

Vossenaar M, van Beusekom I, Alvey J, Doak CM, Solomons NW. Several problem nutrients are identified in the complementary diet of 6 to 11 month old breastfed children in Western Guatemala. Asia Pac J Clin Nutr 2018;27:1084-1094.

Young MF, Nguyen PH,3, Gonzalez Casanova I, Addo OY, Tran LM, Nguyen S, Martorell R, Ramakrishnan U. Role of maternal preconception nutrition on offspring growth and risk of stunting across the first 1000 days in Vietnam: A prospective cohort study. PLoS ONE 2018;13:1-13.

The publications are available free of charge upon request.

PUBLICATIONS

Jean-Pierre Flatt
1933-2018

Scientific Advisor:	1989-1994
Council Member:	1994-2005

During 2018, two of our distinguished long-term Council Members, Prof. Prakash Shetty and Prof. Jean-Pierre Flatt, passed away. Prakash and JP (as friends called Jean Pierre Flatt) were involved in the activities of the Foundation as board members for 21 and 16 years, respectively. Both were globally recognized specialists and experts in their research fields. With their very personal and innovative research, they filled many scientific gaps in the areas of energy requirements and metabolism.

Prakash and JP not only had in common the same general topic of research, but both also wanted their research findings do not just fill dusty bookshelves, but that the newly acquired knowledge trickle down for implementation benefiting disadvantaged and vulnerable populations for a better livelihood. With their research they went down to the roots of physiology and pathophysiology. They were able to translate research into practice. In numerous professional and private discussions they brought many of us back to the priorities of research activities and key questions of life. One further common character trait of these two distinguished Council Members was their curiosity for science and for indeed everything in the world. Their critical evidence-based approach towards any problem and especially their focus on solutions were a guiding light for all of us. Both of them knew that friendship, honesty and genuine interest in fellow human beings are the basis for a better life and finally a better world.

They lived this in persona.

The Foundation will always remember these two colleagues and wonderful friends; their bright spirits and courageous hearts will live on.

Thank you Prakash and JP!

Prakash Shetty
1943-2018

Scientific Advisor:	1994-2004
Council Member:	2005-2015

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

THE FOUNDATION

GUIDELINES FOR GRANT APPLICATIONS TO THE NESTLÉ FOUNDATION

PURPOSE

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

The Foundation expects research proposals to be primarily the initiative of local researchers from the developing countries. However, the Foundation will be inclined to consider favourably those applications made jointly by scientists from developed countries

with those from developing countries provided it is clear that the initiative will result in capacity building and human-resource development in the latter and that the bulk of the budget is spent in the developing country.

CURRENT POLICY

Sustainable improvement in human nutrition is one of the major issues in the portfolio of the Foundation. During more than 50 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.

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.

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. All 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):

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

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

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

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

THE COUNCIL

Walter Wahli, Ph.D.
President Nestlé Foundation
Professor Emeritus, University of Lausanne
Founding Director of the Center for Integrative Genomics (CIG), University of Lausanne, Lausanne, Switzerland
Professor of Metabolic Disease, Lee Kong Chian School of Medicine, Imperial College London and Nanyang Technological University, Singapore

Benjamin Caballero, MD, PhD
Professor of International Health and Maternal and Child Health, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland, USA

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Professor of Pediatrics, Children's Hospital, Child Development Disorders, University of Geneva, Geneva, Switzerland

Reynaldo Martorell, PhD
Robert W. Woodruff Professor of International Nutrition, Hubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, Georgia, USA

Ann Prentice, PhD
Director and Head of the Nutrition and Bone Health Group, MRC Human Nutrition Research (HNR), Elsie Widdowson Laboratory, Cambridge, UK

DIRECTOR

Paolo M. Suter, MD, MS
Professor of Medicine, Clinic and Policlinic of Internal Medicine, University Hospital, Zurich, Switzerland

SECRETARIAL OFFICES

Catherine Lieb
Assistant to the Director

AUDITOR

Ernst & Young AG, Bern, Switzerland

From left to right: Ann Prentice, Ben Caballero, Walter Wahli, Petra Hueppi, Reynaldo Martorell, Dominique Darmaun, Catherine Lieb, Paolo M. Suter