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Food and Nutrition Bulletin

Food and Nutrition Bulletin, vol. 20, no. 3

United Nations University Press
The United Nations University
53-70 Jingumae 5-chome, Shibuya-ku, Tokyo 150-8925, Japan
Tel.: (03) 3499-2811 Fax: (03) 3406-7345
E-mail: mbox@hq.unu.edu

ISSN 0379-5721

Design and Production by Desktop Publishing & Design Co., Newton, MA USA
Printed by Webcom Ltd., Toronto, ON Canada

Public nutrition editorial: What's in a name?

Nutrition is now a well-accepted component of public health, but it is a misnomer to call it a single discipline, since it incorporates parts of the disciplines of biochemistry, physiology, genetics, physics, medicine, and the medical specialties, as well as the social sciences of anthropology, sociology, economics, and political science. Specialists who consider themselves *public health nutritionists* are already deeply involved in food and household security, food and nutrition policy, interactions of nutrition and infections, and aspects of biotechnology.

Those working in public health nutrition come from the variety of disciplines mentioned above. Despite this great diversity, some schools of public health and a few academic departments and research institutes nationally and internationally are able to provide relevant training programmes and academic and research opportunities. Individuals who have become identified with public health nutrition find positions in all of the international and bilateral agencies and many nongovernmental organizations (NGOs). *International nutrition* has become an extension of public health nutrition that has acquired its own identity and that places strong emphasis on longitudinal field studies, intervention studies, evaluation, nutrition policy, and nutrition and health communications.

This issue of the *Food and Nutrition Bulletin* contains 10 articles based on a workshop held immediately before the International Union of Nutritional Sciences (IUNS) 16th International Congress of Nutrition (ICN) in Montreal in July 1997. The argument of its organizers is that the confines of public health nutrition and international nutrition are too narrow for the scope of nutrition concerns in the modern world. There needs to be recognition of a new discipline, "public nutrition." The reader will need to read these papers and judge whether the term public nutrition meets a genuine need.

The introductory article by John Mason on the aims of public nutrition states that it "covers knowledge and research on nutrition problems, and controlling these by intervention," a goal identical with that of public health nutrition and international nutrition. However, it goes on to state that "it extends beyond the public health field to include, for example, aspects of economics and humanitarian assistance." This will be a surprise for public health nutritionists working with humanitarian agencies and for economists who have identified themselves with public health nutrition or international nutrition.

In the second paper, Dr. Habicht argues that the need for a new name derives from the two sources. The first is that "many current practitioners of public nutrition are constrained by the name of their discipline" because of its focus on health. The second is that the present names for those practicing a broader public health nutrition are confusing. He states that still another term, "population nutrition," has proved unsatisfactory at Cornell. Dr. Habicht also suggests that "International nutrition is not a good description for what we do in that field" and that "Community nutrition…is no longer descriptive of the wider concerns of today's community nutrition."

In the 1970s, the International Nutrition Program of the Department of Nutrition and Food Science at MIT was a joint one with the Departments of Economics, Political Science, and Urban Studies and the Harvard School of Public Health. The term *international nutrition* proved ideal for a programme of this scope and purpose. A few of its students were concerned only with nutrition problems and policy in the United States, but we considered that the United States was also part of the international community. Within the American Society for Nutritional Sciences, an interest section on International Nutrition emerged 10 years ago, and has grown rapidly since and become an independent division incorporated as the Society for International Nutrition Research (SINR), whose members are strongly concerned with the kind of field studies and intervention described in the papers on public nutrition in this issue.

Although the papers in this issue fit the definition of public nutrition, they are also clearly within the scope of conventional public health and international nutrition, as for example, the long-term implications of child

malnutrition, the mother's right to breastfeed, and community-based nutrition programmes. The paper by Kennedy on public policy in nutrition in the United States might seem to be an exception, but its content is well within public health nutrition as it is represented in the Institute of Medicine which functions as a United States National Academy of Medicine.

The *Bulletin* is publishing this special issue on public nutrition to stimulate further discussion and hopes that it will initiate a lively exchange through letters to the editor. What is or should be the relationship among "community nutrition," "public health nutrition," "international nutrition," and "public nutrition"? Are all of these terms needed? If so, how do they differ? When should each be used? What are the implications for training programmes? None of these entities constitutes a single conventional discipline, since all require persons of varied disciplinary backgrounds. In any case, it is encouraging that the scope and perceived importance of nutrition applied to health, to countries, and to public policy have increased to such an extent that it is not fully encompassed by any single term.

Nevin S. Scrimshaw

The aims and content of public nutrition

John B. Mason

Abstract

The meeting explored how greater professional solidarity and cooperation among those working in nutrition could accelerate progress in tackling malnutrition worldwide, with particular emphasis on problems of poor people in poor countries. The case is made in other papers that malnutrition merits renewed effort because of its profound biological effects, including intergenerational effects; its impact on educability and human capital formation; and the recognition of good nutrition as a human right. Although the recent past has seen a number of approaches, community-based programs and micronutrient interventions have proved especially successful; this has led to broad agreement on strategy, as articulated notably by UNICEF. The purpose of now bringing ideas and people together under the heading of public nutrition—which has the implications of population-level and of shared responsibility—is to build on experience and to contribute to improving nutrition much faster than at present. The scope of public nutrition covers knowledge and research on nutrition problems, and controlling these by intervention; it extends beyond the public health field to include, for example, aspects of economics and humanitarian assistance. How to apply knowledge to programmes and how to best foster effective interventions are key issues. A starting point is to support research (with priority to programme impact evaluations), training (curricula are being developed), and networking. Follow-up means the collaboration of those concerned with nutrition to generate momentum for public nutrition.

Introduction

Undoubtedly all of us working professionally in nutrition consider that the gravity of malnutrition in the world warrants major effort. Many of us feel that we could do more and be more effective. Expressing these views is like preaching to the choir at this meeting. But what may turn out new is that we could build on our feelings that with greater professional solidarity, and by strengthening our cooperation with colleagues in associated professions, we could begin a process of actually achieving more.

To convince the world at large to renew effort and focus for nutrition needs a compelling case that the problem is large and serious—and thus that there would be important benefits from redressing it—and that such efforts would actually work. We have seen evidence for this when there is a clearly heart-rending problem (in fact, whether or not this is highly prevalent) matched with comprehensible action that people can understand and support. The massive public responses to starvation among children, once images are seen, is one example. Another is the recognition of iodine deficiency, especially cretinism, coupled with the highly effective, inexpensive, and comprehensible intervention of salt iodization, which is leading towards a major success: the elimination of iodine-deficiency disorders. Progress in reducing vitamin A deficiency has many similarities.

Priority for iron deficiency contrasts: anaemia does not present dramatically, and interventions are tedious and not very effective. Tackling growth failure in children due to general malnutrition has an equally frustrating track record. Stunting and wasting, unless very severe, have historically been overlooked—witness the priority given earlier almost exclusively to kwashiorkor, which was and remains relatively rare, while moderate growth failure actually affected a majority of young children in Asia, and at least one in three in Africa. Yet iron-deficiency and general malnutrition (or protein–energy malnutrition [PEM]) marked by growth failure account for much of the misery, morbidity, and mortality that afflict young children in developing countries.

Although we may not need to convince ourselves, we should squarely address the question: Is malnutrition sufficiently important to the world at large that it

The author is affiliated with the Department of International Health and Development in the School of Public Health and Tropical Medicine at Tulane University in New Orleans, Louisiana, USA.

warrants a renewed and special effort, involving not just nutritionists but a number of other disciplines; and not just resources presently earmarked for nutrition, but influencing the use of those with other primary aims, such as improving health or enhancing livelihood?

The case can indeed be made forcefully and is the subject of papers by Martorell [1] and Rogers [2] in this issue. The meeting itself [3] stressed three related reasons for the importance of malnutrition as a focus for public action. First, the immediate and long-term biological effects of malnutrition are very extensive. Eliminating mild-to-moderate malnutrition would reduce child mortality by around 50% [4–6]. Malnutrition as a risk factor accounts for more disease burden, as measured by disability-adjusted life years (DALYs), than any other (around 20% of morbidity and mortality; the next is water and sanitation, at 8%) [7]. Moreover, the effect is intergenerational, whereby malnourished girls become small mothers, in turn having small babies. The impact of early malnutrition on educability and human capital formation, demonstrated most convincingly in Guatemala [1], accounts for a major negative effect of nutrition on social and economic success. This, together with the influence of current nutritional status on productivity, provides the second argument: improving nutrition would fuel socio-economic growth, through enhanced human capital development, as well as improved current physical fitness, energy output, and hence productivity.

The third is ethical: adequate nutrition is itself a human right [8]. This is clearly implicit in many international pronouncements—such as the Convention on the Rights of the Child—even if not as explicit as the rights to food, health, and survival. Arguing the ethical case is a balance to the economic development argument: it says that there are human aspirations more fundamental than economic development alone, as encapsulated in human rights, and that these bring obligations on the part of the international community to promote and protect these rights.

The case is clear to us and needs to be communicated convincingly. The solutions equally must be stressed where they are clear and researched where they are not. And far more people should be empowered with the knowledge and tools to work effectively on the issues. This is why we need to focus on the concept of public nutrition—public in a number of important senses. Public in the sense of a public, shared responsibility, of the state and of society. Public in the sense of for the people and by the people. Public in the sense of science and intervention at the population rather than only at the individual level. This has analogies in the "public" of "Hunger and Public Action" [9] and of "public health." It led to some of us proposing to adopt this approach [10], to a first suggestion of the scope of a curriculum [11], and to the meeting in July 1997 in Montreal, at which many of the papers in this issue were first presented, and whose conclusions are included here [3].

Evolution

The evolution of nutrition as a discipline in the scientific academic sense has always been intertwined with its search for identity and scope in application. In the late 1960s, John Rivers coined the phrase "from ribosome to combine harvester" to express this awesome potential range [J. Rivers, personal communication, 1969]. Around the same time, Len Joy put forward a magnificent (but impractical) scope of central and local action, complete with elaborate flow diagrams, which seemed to many to be subsuming most of national government's activities (and of international agencies) to the high objective of nutrition [12]. Nutrition planning came and went, with two branches [13]. One, championed by the Food and Agriculture Organization (FAO), elaborated the all-encompassing approach [14]; the other, with its roots in the US Agency for International Development (USAID) [15], used systems analysis to articulate complex pathways, leading to fairly focused (or limited-scope) interventions that seemed perhaps to be identifiable by less analytically complex methods. Both were heavy on data and lighter on application.

In practice, fairly specific nutrition programmes were gradually established in many countries through the 1970s and 1980s, and it became clear that a focus on local programmes, preferably with decision making genuinely at the local level, could have sustainable effects [16]. The World Bank was a major external supporter of nutrition programmes, committing relatively high levels of resources to a few countries, while UNICEF supported lower-profile programmes in many more countries. Frustrated with the slow application and perceived wrong focus of scientific research, Alan Berg in 1993 labeled the situation as nearing "malpractice" [17], and called for nutrition engineers to apply current knowledge. During this time, too, the epidemiological basis for nutrition had been steadily improving, both conceptually and empirically, so that it became possible to understand the situation, its causes, trends, and differentials, in a way that could support better policies and programmes. Some examples: the establishing of interactions of malnutrition and infection as a major underlying mechanism [18], the sound quantitative basis pioneered by Habicht [19], the demonstration that about half the infants dying in Latin America were malnourished [20], and many other applications of solid painstaking science, were key points allowing population-level nutrition to move ahead.

The formulation by UNICEF in the early 1990s of a coherent nutrition strategy of carefully judged scope, and its wide promotion and acceptance, was the next

important step. This provided for a common language and focus in which different players from different disciplines could see their place. What we then seemed to need was a name, as a rallying point to allow the many people by now working in a field that was defined at least by objectives—again as promoted by UNICEF out of the World Summit for Children of 1990—to identify themselves as part of the same movement [21]. With the defining of the subject, we have the opportunity to suggest the aims, scope, and content, the immediate priorities, and the processes and mechanisms for reaching the overall objectives.

Aims and processes

The purpose of developing the idea of public nutrition is to contribute to improving nutrition in the world much faster than at present, especially for the most severely affected populations, the poor in poor countries. The intent would be to achieve this by more effectively applying present knowledge and methods to policies and programmes relevant to nutrition. We probably all agree on such aims; the question now is can we agree on how we can best help to achieve them? Where do we want to get to as a professional group, and how do we start?

We need to work together more effectively, worldwide, which means creating a critical mass of professionals within and across countries, first by linking our ideas. As an essential aspect of this, we need some form of institutional development to give continuity, to ensure that we amass and build on a sound body of wisdom—conventional wisdom, in fact—that is influential in producing change in the human conditions that are our concern. This in turn requires mechanisms for consultation and mutual support with global scope—something in practice we are well placed to foster, given our affiliations with international departments and agencies and our habits of living on airplanes and the internet.

We want to establish a clearer professional identity. Here the label itself helps somewhat, as it is useful to be able to summarize one's work and interests in a word—we all need filenames—but this requires that the description be well recognized and have intuitive meaning. If the idea of public nutrition is right for enough people, it should spread of itself. Professional identity may lead to brokering agreement on standards, scientific and ethical, and assuring independence and objectivity. Institutional development may thus include a role in setting standards.

We will need mechanisms for consultation, defining and resolving issues. High on the priority list will be to figure out how to network effectively. These days we have the technology to be in contact constantly; what we have yet to achieve is the culture to make this work optimally. At the same time, working out a concrete agenda for action among the networking group will provide focus to move ahead. The possible content of this action is considered later.

The content of public nutrition

The scope for public nutrition, proposed in earlier publications and used to define the content of the meeting as shown in table 1, covers both knowledge of nutrition problems, to be extended by research, and controlling these problems by intervention. The issues on which conventional wisdom is now most needed concern the nature of effective interventions. This is more complicated than in the fields of, for example, population or infectious disease control. Many interventions depend substantially on local action and organization, and hence are very sensitive to context—which can sometimes be altered—and have a large component of behavioural change. The interventions where technical fixes can work, for some micronutrients, are the ones that are moving ahead most rapidly, and on these the conventional wisdom is reasonably clear; these are similar to family planning and immunization. The broader field of general malnutrition, as assessed usually by birthweight and growth failure (affecting a third of the developing world's children), is where we particularly need more consensus (including research) and application of knowledge.

The design of interventions is central to public nutrition, and we need to build on those thought to be effective, at the same time promoting much better evalu-

TABLE 1. The content of public nutrition

Public nutrition is concerned with improving nutrition in populations in both poor and industrialized countries, linking with community and public health nutrition and complementary disciplines. The term is proposed to include the following activities:

- » Understanding and raising awareness of the nature, causes, and consequences of nutrition problems in society
- » Epidemiology, including monitoring, surveillance, and evaluation
- » Nutritional requirements and dietary guidelines for populations
- » Public education, especially nutrition education for behavioural change
- » Timely warning and prevention and mitigation of emergencies, including use of emergency food aid
- » Advocacy and linkage with, for example, population and environmental concerns
- » Public policies relevant to nutrition in several sectors, for example, economic development, health, agriculture, and education

Source: adapted from ref. 10.

ation to improve the basis. The content of local interventions that improve nutrition has been established for years. Addressing immediate causes aims at maternal nutrition and antenatal care, breastfeeding protection and promotion, complementary feeding, growth monitoring, micronutrient supplementation, immunization, deworming, and similar actions. There is a reasonably encouraging literature on the positive effects of these programmes when run locally [16]. The cutting edge is *how* to foster and support such interventions. As presented at this meeting—for example, in the report from Thailand [22]—the interface between community-based programmes and basic services is crucial. Village volunteers, referred to as "mobilizers," working with village organizations (e.g., health and nutrition committees), must be supported in terms of training, supervision, and supplies by paid employees of governmental or non-governmental organizations (known as "facilitators"). The ratios of mobilizers to the population and of facilitators to mobilizers crucially determine whether there is an adequate intensity of activity to be effective; these ratios are becoming known, and values of 1:10–20 at both levels are recommended in the guidelines for at least one current large-scale, multicountry planning project [23]. But large-scale evaluations are needed.

Matching appropriate interventions to populations that will respond means taking account of context. As studies in South Asia have shown [24], contextual factors, such as the position of women, literacy, and local organization, crucially determine whether and which interventions work; a session at this meeting addresses such issues. In some cases, these factors can be improved by appropriate policy changes and programme interventions themselves, and these possible options should form part of public nutrition development.

The observation that many broad policies (such as macroeconomic policies) affect nutrition has often hampered progress, because the conclusion is that only major policy changes are worth having. In this respect, public nutrition is not unusual (health is similar), except that the approach should be to understand the broader connections and be ready to provide pressure when the opportunity arises, but not to hold back in the interim. Certain policies are particularly relevant, such as food policy, where nutrition is often an objective. Thus, in many situations, it can be persuasively argued that resources presently spent on food distribution would be better spent on nutrition [25, 26]. The point here is that such policy analysis is an important part of the public nutrition domain.

Action and supporting research, especially evaluation research, should be a major focus of public nutrition, along with the institutional development and networking needed to foster this globally. If that is agreed, we have to start somewhere.

Where to start

An early aim would be to define and agree on the specific actions to be advocated. This requires some prior steps, not least identifying institutionally who is doing the advocating—that is a subject for this meeting. But reaching the point that we are clear on what needs to be done may require some specific policy-relevant research. A number of topics are urgently in need of resolution for programme planning in most developing-country situations.

Many of these stem from the unsatisfactory state of evaluation research in this area. Bluntly, there has been far too little rigorous evaluation of the impact—or attribution of nutritional change to programme. This is not because of lack of suitable methods: for instance, 15 years ago a meeting at the Massachusetts Institute of Technology with a number of the same people who were at the Montreal meeting put forward adequate "Methods for Evaluating On-going Programmes"[27]. Evaluation research methods have been developed and adapted for application in health, population, and nutrition programmes increasingly in the past 30 years. But these have not been carefully or widely applied, in large part because of lack of financial support (not "malpractice"—there have been plenty of proposals). So, an emphasis on sound scientific impact evaluation—not on too many projects, but executed rigorously when they are done—would go a long way towards better public nutrition actions.

A number of generic policy issues keep appearing, and could provide an initial research focus. Many nutrition programmes still include supplementary feeding, and if so, this usually takes at least half the budget and even more of the staff attention; yet we have no conventional wisdom based on research as to whether, and when, supplementary feeding is worthwhile. We hear a lot about "food-based approaches" to controlling micronutrient deficiencies, whose advocates tend to disparage supplementation as the alternative. Yet there is no body of comparative research studies that corroborate the superiority of this approach, nor does there seem to be the required thrust to initiate the needed studies, even though these would be quite conventional and straightforward to do. Then there are crucial questions of how best to organize nutrition programmes at the community level: for example, are community organizations really more effective than relying on facility-based service delivery? Is it really feasible and sustainable to work through mobilizers who are largely volunteers, and what are the options for incentives and remuneration? These are the sorts of practical questions, whose answers will help real-world programmes, that we should be attacking if we want to foster public nutrition as a way to improve real programmes.

The other side of this coin is training—spreading

knowledge, skills, and concepts. Steps are being taken to generate discussion on curricula, which will help greatly in defining the field overall. We also must think about how to reach people with the skills and knowledge needed, who they are, and how to follow this through. A number of university departments, mainly (but not only) from North America and Europe, came together to help plan and carry out this meeting. We want to broaden and spread our cooperation, and we need to figure out how to do this. Undoubtedly new methods and materials for communication and distance learning will come quickly. We may be in a good position to ride this wave—public nutrition is not too extensive an area, expertise is widely dispersed, and yet the need for focusing a broad constituency is compelling: a good case for global networking.

Which brings us to follow-up to the meeting: we agreed that follow-up meant, what can everyone present do themselves, not what can they hope others will do on their behalf (or anyway). We have no resources yet except our goodwill, energy, and ideas. That should be enough to start, but there is no denying that financial resources will soon be needed to provide momentum. But let us get the ideas right first.

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Why public nutrition?

Jean-Pierre Habicht

Abstract

Good food security and nutrition of the population is an important objective for all those involved in public health, social welfare, and socio-economic development. Although the practice and study of public nutrition is well established, it has been defined by a myriad of names, such as "public health nutrition," "community nutrition," and "international nutrition." The result has tended to constrain practitioners or confuse the range of their work. The need for a new name that embodies the complex ideas and multitudes of activities of "public nutrition" is explained. Such a construct, in order to escape the fuzziness of jargon, should lead to clearer thinking and better action, that is, it should help develop better practice to improve the well-being of all populations, and the training and research to support that practice.

Why public nutrition?

The importance of public nutrition, however it may be called, is evident to everybody concerned with the public weal. Good food security and nutrition of the population is an important objective for all those involved in public health, social welfare, and socio-economic development. Some of the reasons for this importance were alluded to in our letter to the editor in the *American Journal of Clinical Nutrition* [1]. Some of those reasons will be discussed in greater depth here.

The practice and study of public nutrition is well established, but under a myriad of names, such as "public health nutrition," "community nutrition," and "international nutrition." So if public nutrition is already well established, albeit under different names, why do we need a new name?

A new name that embodies complex ideas and a multitude of activities may be called a "construct." A "construct" of public nutrition is only useful if it leads to clearer thinking and to better action. Ultimately this is the standard against which we must measure the construct of "public nutrition."

It is inevitable that a useful "construct" will become jargon. The difference between the two is that a "construct" is well defined and the definition is agreed upon among interlocutors, whereas a jargon is ill-defined and only serves the purpose of clique identification or consensus through fuzziness. I fear that "public nutrition" will become jargon if we are not careful to clarify what it is.

The need for a new name derives from two sources. One is logical—many current practitioners of public nutrition are constrained by the name of their discipline. This is particularly true of public health nutrition, which is constrained by its focus on health. The second reason for a new name is that the present names for those practicing a broader public nutrition are confusing. International nutrition is not a good description for what we do in that field. Community nutrition is a good description of that field's original community focus, similar to that of present-day community health, but it is no longer descriptive of the wider concerns of today's community nutrition. Just as public health describes a larger focus than community health, so public nutrition describes a larger focus than community nutrition.

This need for the broader construct provided by public nutrition has been evident for almost 15 years at Cornell, where in our training grants it is called "Population Nutrition," in contrast to Clinical and Biochemical Nutrition. We did not have trouble with granting agencies with this construct, and the name was therefore satisfactory for grant-writing purposes. It was not satisfactory in recruiting students, who were led astray by the long historical connection of the name "population" to demography.

What persuaded me that "public nutrition" was the right name was Bea Roger's use of it in writing a report about training needs and opportunities in international nutrition for the Pew Charitable Trusts [2].

The author is affiliated with the Division of Nutritional Sciences, Cornell University, Ithaca, New York, USA.

Under that name it became apparent that what she was describing applied just as well to what community nutrition is evolving towards. For instance, the table of contents of a recent textbook in community nutrition [3] is similar in intent and content to what we teach in international nutrition.

We hope this meeting is the beginning of the integration and development of a wider vision of public nutrition than has been available to us in the past. I see this development in two different dimensions. One is the focus of our concerns. We all agree that our concerns are broader. For instance, deficient food security and hunger do not lead to significant malnutrition in many of the wealthier countries today, even though hunger is sufficiently widespread to be a social problem. And there is good reason to believe that deficient food security is a determinant of obesity and hyperlipidaemia. I think there will be little disagreement that public nutrition should include concerns with hunger and all kinds of malnutrition that affect the well-being of a significant number of individuals and families in a population.

Public nutrition should, in my opinion, not only be interested in the determinants and consequences of malnutrition, but should see how malnutrition can be used as a proxy for other social issues that need to be dealt with, even though the appropriate interventions are not driven by nutritional concerns. For instance, the use of height-for-age is an excellent proxy for economic development among the poor, much better than any economic indicator, and is beginning to be used in deciding about targeting economic development investments. We in public nutrition need to be in that forum to be sure the investments also benefit nutrition. This kind of activity lies outside of the present training and experience of those in public nutrition today. We need to expand our efforts in this direction also.

The second dimension is broadening our scientific discipline base. Many of those in public nutrition already have a broader base in the biological, epidemiological, behavioural, and management sciences than any other professional discipline. However, there are still too many departments of nutrition that view the behavioural sciences as fluff and not as scientific disciplines. The management sciences are lacking as a scientific discipline relevant to nutrition, and are little taught to nutritionists.

Public nutritionists need to change these failings by seeing that good behavioural and management scientists are appointed as faculty in departments of nutrition or in associated departments. This means that public nutritionists must get in the university fray to have a voice in appointments. Even more seriously, there is only one faculty position in the world devoted to the discipline of nutrition policy, and none to nutrition economics. It may be helpful to remember that epidemiological expertise was not thought to be relevant to nutrition less than 15 years ago. Now all public nutritionists recognize its utility. My hope is that 15 years from now every public nutritionist will also have exposure to enough economics to understand its use as a descriptor and predictor of behaviour and as a tool for improving nutrition, that there will be a discipline of nutrition economics (not just food economics), and that nutrition policy will become a scientific discipline.

One useful outcome of dialogues among public nutritionists would be the development of a feasible curriculum at different levels of training that incorporates the necessary knowledge across the breadth of disciplines to produce both the nutrition engineers and the nutritional sciences necessary to train and support the engineers. A first attempt for graduate studies has been done by Bea Rogers, and a summary has been published [2].

The construct of "public nutrition" should thus help us develop better practice to improve the well-being of all populations, and to develop the training and research to support that practice.

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The nature of child malnutrition and its long-term implications

Reynaldo Martorell

Abstract

The problem of malnutrition in poor societies is best viewed as a "syndrome of developmental impairment," which includes growth failure; delayed motor, cognitive, and behavioural development; diminished immunocompetence; and increased morbidity and mortality. Growth retardation is often found in association with other problems, such as vitamin A deficiency and anaemia. These clusters of nutritional problems flourish during periods of vulnerability, namely in utero *and during the first three years of life, and affect at least a third of all young children in developing countries. Survivors of malnutrition in early childhood suffer functional disadvantages as adults, including diminished intellectual performance, low work capacity, and increased risk of delivery complications. The prevention of low birthweight and the promotion of adequate growth and development during early childhood will result in healthier, more productive adults. Such investments, because they build human capital, are best viewed as long-term economic strategies.*

Introduction

The objective of this brief article is to review why it is important for developing countries to improve child nutrition. The reasons are simple. First, child malnutrition is a very common problem in poor countries. Second, child malnutrition has short- and long-term adverse consequences that are of great significance for the individuals affected and for the societies in which they live. Third, if the nutrition of children is improved, future generations will be healthier and more productive, and this will be an asset for national economic development.

The nature of malnutrition in children

The problem of malnutrition in children is best viewed as a "syndrome of developmental impairment" caused by a complex of multifactorial factors [1]. The word "syndrome" implies that there is a group of signs and symptoms that occur together and that serve to characterize the problem of malnutrition. At the extreme of severity is severe, clinical malnutrition, illustrated by kwashiorkor and marasmus and their well-known clinical, metabolic, and anthropometric features [2]. These extreme conditions, although they are life-threatening medical problems with lifelong dysfunction for survivors, are less important, from the public health point of view, than the less severe forms of malnutrition. This is so because mild and moderate forms of malnutrition are many times more common than severe clinical malnutrition.

The hallmark of child malnutrition is growth failure, and the most commonly used indicator of growth failure is underweight, defined as a weight-for-age more than 2 standard deviations below the reference mean. In the reference curve, 2.3% of the population is below this criterion.

The Sub-Committee on Nutrition of the United Nations Administrative Committee on Coordination (ACC/SCN) estimates that 29.3% of pre-school children (i.e., < 5 years of age) in developing countries were underweight in 1995. This is lower than the 34.3% estimated for 1985. However, in absolute numbers, the number of underweight children changed little over this period, from 163.8 million in 1985 to 157.6 million in 1995. For South-East Asia, which includes Indonesia, rates of underweight are reported to have come down from 39.8% to 32.4% of pre-school children and the number of malnourished children to have decreased

The author is the Robert W. Woodruff Professor of International Nutrition in the Department of International Health in the Rollins School of Public Health of Emory University in Atlanta, Georgia, USA.

This article is based on presentations at the Public Nutrition Meeting, University of Montreal, 24–26 July 1997, and at the National Panel "Nutrition interventions in human resource development," Widyakarya Pangan, Jakarta, Indonesia, 18 February 1998.

from 39.8 million to 32.4 million between 1985 and 1995 [3].

Many young children in developing countries also suffer from a number of nutritional deficiencies. Often, underweight and nutritional deficiencies cluster in the same villages, families, and individuals. The older literature in Latin America referred to the problem of malnutrition in young children as the *síndrome pluricarencial* or "multiple deficiency syndrome," a very apt designation. Although less than 1% of pre-school children have clinical vitamin A deficiency, many more have subclinical vitamin A deficiency. Using the cut-off point for serum retinol of less than 0.7 μmol/L to define subclinical vitamin A deficiency, many countries are found where 30% or more of children are affected; 58% of pre-school children in Indonesia, according to a 1991 survey, were affected with vitamin A deficiency [4]. Anaemia, defined as less than 11 g of haemoglobin per deciliter, is estimated to occur in more than a third of pre-school children in developing countries [4]. According to UNICEF, about a third of babies born in 1990, or some 40 million infants, were iodine deficient in utero or in early childhood, but now this figure is much less because of the widespread use of iodized salt [5]. Other nutritional problems are also common in young children and include folic acid and zinc deficiencies [4].

Beaton et al. [1] called attention to the fact that the syndrome of child malnutrition includes, in addition to growth failure, other indications of impairment, such as delayed motor, cognitive, and behavioural development, diminished immunocompetence, and increased morbidity and mortality. The "complex of multifactorial factors" that cause child malnutrition includes three classes of underlying causes at household and family levels, which are known simply as food (i.e., insufficient access to food), health (i.e., poor water/sanitation and inadequate health services), and care (inadequate maternal and child-care practices). These in turn lead to deficient nutrient intakes and to infections and diseases, which are the immediate causes of child malnutrition [6]. Much has been learned over the last half-century about the causes of malnutrition, and this knowledge has improved our policy and programme recommendations. In the 1950s and 1960s, emphasis was placed on protein deficiency, followed by a period in the 1970s and beyond during which low energy consumption due to food insecurity was thought to be the most limiting problem in the diets of poor people. Today, poor dietary quality, which refers to inadequate concentrations of protein and micronutrients and/or to poor bioavailability, is recognized as an additional, important dietary limitation. Infections, particularly diarrhoeal diseases, are recognized as important causes of poor appetite in children and of metabolic and clinical disturbances that lead to poor nutrient utilization [6]. Finally, one of UNICEF's greatest contributions has been to underscore the role of caring behaviours in shaping the nutrition of young children [6]. Household food resources and health-care availability are necessary but not sufficient ingredients for good child health and nutrition; in addition, caretakers must use household resources wisely and meet the nutritional, health, and psychosocial needs of young children for children to be healthy and to develop normally [7].

Windows of greatest developmental vulnerability

Childhood malnutrition flourishes during periods of vulnerability. One such period is *in utero*. The prevalence of low birthweight (< 2.5 kg) is 18% in developing countries but is as high as 50% in Bangladesh [6]. These affected newborns are at high risk for serious morbidity and mortality during infancy. As adults, they tend to be smaller than others in the community by 5 cm and 5 kg, with reduced work capacity and strength [8].

There follows a brief period of relative well-being after birth, even in settings of marked poverty, but only if babies are breastfed. At some point in early infancy, by three to six months generally, growth rates begin to falter dramatically, particularly before one year of age. By the time children are two or three years of age, many are underweight and stunted. From three years of age into the school period, children from even very poor countries will grow generally as well as children from the United States, remaining small but neither falling further behind nor catching up appreciably [9]. Some catch-up occurs in some settings during adolescence and is associated with delayed maturation [10, 11]. Currently, there is no evidence that stunting can be reversed during adolescence through nutrition intervention programmes; on the other hand, adoption studies suggest that dietary interventions may accelerate maturation, shorten the adolescent growth period, and reduce final adult stature [12].

Thus, to prevent underweight and its consequences, efforts must be made to prevent low birthweight and to promote good growth and development in the first two to three years of life.

Why are children at greater risk of malnutrition during these windows of vulnerability? *In utero* the reasons include growing up in the restricted environment provided by a stunted mother, herself the product of a malnourished childhood. Maternal reserves of fat, lean tissue, minerals, and micronutrients will be poor. In addition, dietary intakes will often be deficient in quantity and quality, and prenatal care may be poor.

Why are children less than three years of age most vulnerable to malnutrition and its effects? One reason is that growth rates in the first few years are higher than at other times after birth, and thus adverse fac-

tors have a greater potential for causing growth retardation early in life than at later years. Young children have high nutritional requirements per kilogram of body weight, in part because of their needs for growth. Another reason for the vulnerability of young children is that their immunological systems develop and mature with time; young children are more susceptible to frequent and severe infections than older children with mature immune systems. Yet another reason for the vulnerability of young children is that they are less able to make their needs known and are more vulnerable to the effects of poor parenting [9].

Of particular relevance to the central nervous system is that the wiring of cognitive and emotional abilities, a delicate interplay of nature and nurture (i.e., stimuli), largely occurs during the early years of life. Thus, it is particularly important that young children live in an environment that provides the necessary security, experience, and stimuli for optimal growth and development of the central nervous system and associated intellectual, social, and emotional competencies.

Consequences of childhood malnutrition

Some years ago, Scrimshaw et al. [13, p. 265] wrote that "Synergism between malnutrition and infection is responsible for much of the excess mortality among infants and pre-school children in less developed regions." Yet, infections, rather than the underlying malnutrition, are usually regarded as the cause of mortality in young children, and for these reasons, many estimates of the relative importance of causes of preschool mortality give little importance to malnutrition. Pelletier et al. [14] carried out an analysis demonstrating the "potentiating effect of malnutrition" on mortality rates. By their estimates, more than half of deaths among children less than five years old are due to malnutrition, mostly mild and moderate malnutrition. These estimates have received wide dissemination, and policy makers now have a better appreciation of the importance of nutrition for survival.

The improvement of vitamin A status has been demonstrated to lead to a reduction of 23% in mortality among children one to five years of age [15]. This is perhaps due to effects of vitamin A improvements on the severity of infections, particularly diarrhoeal diseases and measles. Recent research indicates that zinc supplementation in pre-school children leads to important reductions in both the number and duration of episodes of diarrhoea [16]. This probably means that improvements in zinc status have important effects on child mortality, but no studies on this question have been carried out to date.

Childhood malnutrition also leaves its imprint on the minds of those who survive it. A review of the literature reveals that poor nutrition during intrauterine life and the early years leads to profound and varied effects, which include delayed motor development, general effects on cognitive development resulting in lower IQ, and a greater degree of behavioural problems and deficient social skills at school age, as well as decreased attention, deficient learning, and lower educational achievement [17]. The bodies of survivors of child malnutrition are also affected, as demonstrated by studies conducted in rural Guatemala [18]. Improved nutrition during pregnancy and the first few years of life, achieved through the consumption of daily food supplements rich in energy, protein, and micronutrients, improved growth during early childhood and reduced stunting at three years of age. As adults, subjects who received dietary improvements were taller and had greater lean body mass, work capacity, and strength than those who did not receive dietary improvements. This is important for adults in several ways. In men engaged in hard physical labour, better work capacity and strength can lead to increased productivity. In women, more lean body mass will mean higher birthweights, and increased height and larger body frame may decrease the risk of delivery complications due to cephalopelvic disproportion. The Guatemalan study demonstrates that improving nutrition in early childhood is important, but not that improvement is necessarily achieved through food supplementation.

The benefits of improving micronutrient status are also great. Reference has been already made to some of the effects of deficiencies in vitamin A and zinc. Also important is the prevention of iron-deficiency anaemia in children and adults. Anaemia can result in impaired learning, diminished work capacity, and perhaps low birthweight and increased maternal mortality [19]. Iodine deficiency in pregnancy and early childhood, even when not severe enough to result in cretinism, can cause poor growth, delayed maturation, and diminished intellectual performance [20].

Improved child nutrition and economic development

The relationship between improved child nutrition and economic development is shown in figure 1. In this paper, the evidence justifying the arrow going from "improved child nutrition" to "enhanced human capital" has been reviewed. There is considerable evidence as well for other relationships depicted in figure 1. Economic growth, particularly that which leads to poverty reduction in urban as well as in rural areas, is one of the key factors driving change in nutrition at national levels [21]. But much more can be achieved, and more quickly, if governments invest in nutrition, health, and education programmes [21]. There are examples of successful community-based programmes [5, 6, 22–24], and we know much about what is needed for suc-

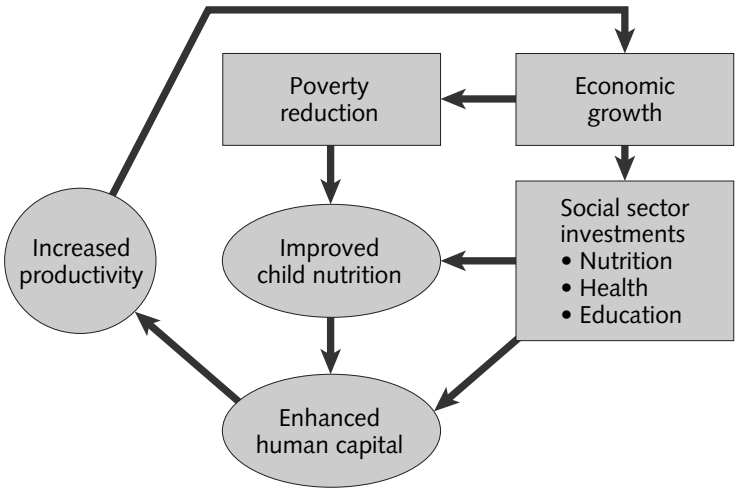

FIG. 1. Human capital diagram

cessful programme implementation [25]. Enhanced human capital, through improvements in nutrition and health, is thought to explain half of the economic growth of the United Kingdom, France, and other European nations in the previous two centuries [26].

Conclusions

Three points are emphasized in this paper. First, nutritional problems are very common in poor countries. Second, these problems lead to short- and long-term functional consequences that limit human potential. Third, improving child nutrition is a national priority and an important strategy for long-term economic development. As countries face difficult choices during times of economic crisis, it becomes imperative to advocate strongly for social sector investments, including nutrition programmes for mothers and young children. Dismantling effective programmes is a counterproductive, short-term coping strategy, just as would be said in the case of households in famine-stricken areas who consume the seeds needed for future plantings and who sell their agricultural tools. In both these cases, future productive potential is compromised. Whereas options may be limited in a famine, governments in economic crises have more latitude. Public nutritionists are compelled to seek continued funding for priority programmes as well as better use of the limited resources available (i.e., increased cost-effectiveness).

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A mother's right to breastfeed: Removing the obstacles

Michael C. Latham

Abstract

If breastfeeding is acknowledged to be the optimal way of feeding and caring for young infants and is critically important for infant development, including mental development, while also providing benefits to the mother, then the right of mothers to breastfeed their infants deserves to be accepted as a human right. This point is reinforced by existing human rights conventions, new scientific evidence on the advantages of breastfeeding, current ethical acceptance of women's rights, and the evolving human rights thinking. Any obstacles to breastfeeding, then, are infringements on human rights. Major negative influences on breastfeeding include the medicalization of infant feeding, manufacturers' promotion and marketing of breastmilk substitutes, societal failure to assist mothers to breastfeed, and lack of community support for breastfeeding. Although national legislation and actions provide a basis for protecting rights, ultimate success hinges on the actions of committed people and communities.

Introduction

There is emerging the belief that the rights of mothers to breastfeed their infants, and even the rights of babies to be breastfed, should be seriously considered as a human rights issue. This is in view of:

» existing human rights conventions;
» new scientific evidence on the nutritional, health, and developmental advantages of breastfeeding;
» recent ethical acceptance of women's and children's rights;
» evolving human rights thinking.

Here it is argued that mothers do have a right to breastfeed their infants, and therefore any obstacles to breastfeeding are infringements on human rights. The more difficult question of infants' rights to be breastfed also warrants discussion. Serious consideration therefore needs to be given to breastfeeding as a human rights issue.

Rights related to breastfeeding

Breastfeeding is acknowledged to be the optimal way of both feeding and caring for young infants [1]. Human breastmilk provides the ideal food for the human infant. There is no alternative. That it should be necessary to argue about the advantages of breastfeeding over other methods of infant feeding is wrong or even ludicrous. Do we argue in favour of breathing fresh air rather than oxygen from a respirator? In fact, to state that breastfeeding is "best" is to suggest that there are good alternatives. There are not. So rather we should state that other methods of feeding should be rare and used only in extreme circumstances. We should not be lauding the advantage of breastfeeding any more than we praise the practice of breathing air. Rather we should clearly be articulating the harm and disadvantages of any alternative. We should not be stating that breastfed babies are healthier and have better psychological development than bottle-fed babies. Rather we should be saying that formula-fed babies have more disease and lower intelligence than normal babies, and that mothers who do not breastfeed their infants have higher risks of certain cancers [2].

Breastfeeding, which is the art of feeding a baby from the breast, is a caring practice [3] and a unique form of infant care that has been shown to be very important for infant development, including mental development. Breastfeeding also provides benefits to the mother. These include clearly established health and psychological benefits, but also often social and economic benefits. Most breastfeeding mothers also state that it is enjoyable, some claiming that it is highly pleasurable. For these reasons, the right of mothers to

The author is affiliated with the Division of Nutritional Sciences at Cornell University in Ithaca, New York, USA.

This paper is based in part on Latham MC. Breastfeeding—a human rights issue? Int J Child Rights 1997;5:397-415.

breastfeed their infants deserves to be accepted as a human right.

The 1948 Universal Declaration of Human Rights [4] is generally regarded as the basic contemporary outline of human rights, and it was elaborated on in a number of subsequent instruments. The original document and the International Covenant on Economic, Social, and Cultural Rights [5] are the basis for establishing the human "right to food." The Declaration states that "everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food." The Covenant recognizes "the fundamental right of everyone to be free from hunger."

Article 12 clearly describes "the right to health," which is defined as "the enjoyment of the highest attainable standard of physical and mental health." The Covenant continues by listing certain steps to be taken by the states party to the Covenant to realize this right to health. The 1978 World Health Organization (WHO)/UNICEF conference on primary health care held at Alma Ata resulted in the Declaration of Alma Ata [6], which states that health is a human right, and it defines health as "complete physical, mental, and social well-being, and not merely the absence of disease or infirmity."

A WHO/UNICEF meeting held at the Spedale Degli Innocenti in Florence in 1990 issued what is widely termed the Innocenti Declaration [7]. It recognizes that maternal milk provides an ideal nourishment without equal for the infant, that it contributes to the health of the mother and infant, and that it has many other social, health, and psychological advantages. It calls for world action to protect, promote, and support breastfeeding.

The World Food Conference held in Rome in 1979 addresses many world food issues in its final document [8]. Among others, it proclaimed that "no child will go to bed hungry, that no family will fear for its next day's bread, and that no human being's future and capacities will be stunted by malnutrition."

The World Declaration and Plan of Action for Nutrition unanimously adopted by some 159 nations attending the Food and Agriculture Organization (FAO)/WHO International Conference on Nutrition [9] in Rome in 1992 in its first paragraph states: "We recognize that access to nutritionally adequate and safe food is a right of each individual. We recognize that globally there is enough food for all and that inequitable access is the main problem. Bearing in mind the right to an adequate standard of living, including food, contained in the Universal Declaration of Human Rights, we pledge to act in solidarity to ensure that freedom from hunger becomes a reality. We also declare our firm commitment to work together to ensure sustained nutritional well-being for all people in a peaceful, just, and environmentally safe world."

These documents have been accepted by most nations, and they suggest that all humans everywhere have rights to adequate food. Although not always placed together, we know that inadequate intake of food leads to malnutrition, a form of disease or ill health, and therefore infringes on human "rights to health." Added to these earlier documents, the Convention on the Rights of the Child in 1989 [10] and, before that, the report of the Convention on the Elimination of all Forms of Discriminating Against Women in 1979 [11] also have some relevance to food rights and therefore to breastfeeding. The former lays out clearly the rights of children, and the latter stresses women's reproductive rights.

The newly established World Alliance for Nutrition and Human Rights (WANAHR) at its meeting held in the Norwegian Institute of Human Rights in 1993 addressed the broader rights, not only to food but to good nutrition. It included among its terms of reference one that deals with breastfeeding. This states: "Believing that obstacles to breastfeeding often serve as a human being's first hindrance to adequate nutrition, food, and care, the alliance pledges itself to further the principles of Innocenti Declaration on the Protection, Promotion, and Support of Breastfeeding." [7]

Surely, then, because for infants there is no other perfectly suitable food except breastmilk and because there are other health advantages for the infant resulting from breastfeeding, infants who are not breastfed because of obstacles to breastfeeding have suffered unnecessarily. Because there are health and other disadvantages to the mother resulting from not breastfeeding, obstacles to breastfeeding are also obstacles to the mother's and infant's human rights. All infants should where possible enjoy the right to be exclusively breastfed for the first six months of life and to be breastfed into the second or third year after other foods are introduced. All mothers deserve the right to breastfeed their babies for the length of time that they want, and this is considered desirable for both her and her baby.

There is one group of human beings, consisting of over 250 million infants in the world in 1997, who are at risk of malnutrition or ill health if they do not consume one particular food. No other food except breastmilk ensures their good nutritional or health status. Infants cannot satisfactorily be fed rice, wheat, or maize, balanced with legumes, fruits, and vegetables, in their first few months of life, as can adults. So, if infants are to enjoy the right to adequate food and nutrition, they have a right to food different from adults or older children.

The strange challenge to the right to breastfeed

That the right to breastfeed is even being discussed or challenged is strange and even aberrant. It is a challenge to nature, to natural law and natural practice,

and to our ecology and environment. Breastfeeding is a natural or God-given act (however we may regard nature or God). All mammals nearly always feed their young in this way, unless humans prevent them from doing so. All mammalian mothers enjoy this natural practice. All mammals, humans and animals, have the organs and the hormones, the anatomy and physiology, to allow them to nurture their young in this way.

That huge numbers of human infants are not breastfed, and that mothers are influenced not to breastfeed their newborn babies, is a distortion of nature. Do not human beings have a right to walk and to run; to laugh and to cry; to breathe the fresh air; and to do a thousand other things using the organs and body parts, the anatomy and physiology that nature bestowed on them?

That breastfeeding in some countries has become a minority rather than a majority way of infant feeding is aberrant. It is perhaps as strange as if in the year 2020 the majority of Americans ate no food but were fed a nutritious diet parenterally, through tubes. Adults then could attend day-long meetings without interruptions for feeding. Is this more ridiculous, or aberrant, than the fact that the majority of babies are never breastfed in many communities and some countries? Would we not be outraged if it became well known that a relatively cheap, widely available medicine was being withheld from millions of human beings who could benefit from this? Would we not seek early, urgent action if we understood that not using this product greatly increased premature deaths; resulted in much higher incidences of infections, other illnesses, and malnutrition; caused more allergies; added substantially to the risk of certain common cancers; contributed significantly to unwanted pregnancies; was a factor in impoverishing many poor families; and had an adverse impact on the environment in most countries? Increasing the prevalence and duration of breastfeeding would provide all these benefits. Breastmilk is not a medicine, but breastfeeding can prevent all these problems. Yet breastfeeding is being withheld from millions of infants. It surely is a moral imperative that the world community take action. A general acceptance of breastfeeding as a human right could spur such action.

Obstacles to breastfeeding infringing human rights

If women have a right to breastfeed their infants, then any obstacles or infringement to breastfeeding must constitute an infringement of this right. Eliminating the many obstacles to breastfeeding or lessening their adverse impact on breastfeeding are all actions that enhance the enjoyment of the rights of mothers to breastfeed their babies.

In all countries, there are many babies who could breastfeed but who are not. The reasons for this and the obstacles to breastfeeding are numerous. Some are common to all countries, others are more specific, and the relative importance of each obstacle varies from country to country, from culture to culture, and from community to community. There are four that are discussed in more detail below because they are important and because actions, albeit insufficient, to reduce the impact of these obstacles are under way. These four are:

- the medicalization of infant feeding, the negative impact of the medical profession on breastfeeding, and the lack of adequate support for breastfeeding in hospitals or other health facilities;
- the promotion and other marketing practices of manufacturers of breastmilk substitutes;
- failure to assist mothers to breastfeed and to work;
- lack of community support for mothers to initiate, sustain, and maintain breastfeeding.

There are of course many other obstacles to breastfeeding. In many developing countries, the decline has almost come to be regarded as part of modernization and industrialization. Western feminists have often opposed breastfeeding, on the false basis that it lessens women's freedom and is "unliberating." More recently, van Esterik [12] and the World Alliance for Breastfeeding Action (WABA) [13] have described breastfeeding as a feminist issue, and in fact empowering for women. Breastfeeding, and a woman's right to breastfeed, then becomes a part of her reproductive rights and is related to her sexuality.

The medicalization of infant feeding and hospitals that are not supportive of breastfeeding

Chimpanzees successfully suckle their infants without medical advice, they "room in" with their babies, and "bonding" appears to be important in the young chimpanzees' development [14]. Kung Bushwomen in the Kalahari of Botswana breastfeed their babies for three or more years, and they sleep with the child without having had hospital instructions regarding infant feeding.

Gradually, over many years, the medical profession has increasingly taken upon itself the role of arbiter of infant feeding. This happened first in the Western industrialized countries, and then increasingly in the developing nations. Doctors, nurses, and other health workers now play an important role in influencing mothers about their child-feeding choices and also setting national and international policy and "norms" on infant feeding. The medicalization of infant feeding has been defined as the "expropriation by health professionals of the power of mothers and other caretakers to determine the best feeding pattern of infants for maintaining maximum health" [12]. So what was pre-

viously, and naturally, largely the concern of mothers, has increasingly become "part of the medical domain." As Illich [15] and others view these issues, the medical community created a market for its services by expropriating certain practices, behaviours, or events as "diseases."

The natural, normal act of breastfeeding becomes part of the biomedical model, and words like "lactation" are used for breastfeeding, "mammary glands" for breasts, "insufficient milk syndrome" for breastfeeding difficulties, and so on. This medicalization of infant feeding played a major role in the decline in breastfeeding in the United States, in other Western countries, and to a varying degree in non-industrialized countries. There is very clear evidence that health professionals and hospitals have had a major negative impact on breastfeeding worldwide [16]. So doctors and medical facilities have been responsible for placing serious obstacles in the way of optimum infant feeding and thus have prevented many babies from enjoying their right to breastfeed. Too often the medical profession has been, and still is, more formula industry friendly than baby friendly. The harmful partnership of physicians with industry has resulted in a synergism that has been extremely harmful to the health, the nutritional status, and even the survival of infants all over the world. This is a serious violation of human rights, which for years was largely ignored and has always gone unpunished.

Happily, there have been some changes. More babies in some countries are enjoying their rights, while elsewhere the decline in the number of infants being breastfed, or optimally breastfed, continues. In March 1992, UNICEF and WHO launched a new initiative to help protect, support, and promote breastfeeding by addressing problems in hospitals. This new activity has been termed the Baby-Friendly Hospital Initiative (BFHI). It is designed to make hospitals help mothers and babies achieve their rights to breastfeeding, and it recognizes that hospitals and health professionals have often not fostered breastfeeding. It addresses the prevalent problems of hospitals being a major source of misinformation about breastfeeding, and practices in hospitals and approved by physicians and others which undermine breastfeeding [17].

The BFHI is a very encouraging and positive development. It is hoped that as it spreads, more and more hospitals all over the world will indeed be baby friendly and mother friendly as well. It is a rights approach. It should give the mother control over her child through rooming-in from birth, through making all infant-feeding decisions, and through ensuring that she will have a free choice of what to feed her baby. This implies that there will be no free supplies of a single brand of formula. It gives her complete, unbiased, and useful information that frees her from dependence on commercial advice.

The promotion and other marketing practices of manufactured breastmilk substitutes

A major contributing cause of the decline in breastfeeding worldwide has been and remains the promotion and marketing of manufactured breastmilk substitutes. This is a very profitable business, but profits have been put ahead of human well-being, including the health and even the survival of babies. The promotion of formula and its adverse results are similar to the promotion and marketing of cigarettes.

Public outrage in the 1970s began to develop over these tactics, and an increased understanding developed over the very harmful effects of bottle-feeding in developing countries. Most doctors and health workers both in the North and in countries of the South were at best unsupportive of the growing public pressure to rein in the promotional activities of the corporations, and at worst doctors sided with the manufacturers against the critics of the corporations.

In 1979, unable to resist the pressure, WHO and UNICEF organized a meeting in Geneva at which a handful of experts met with representatives of industry, representatives of non-governmental organizations (NGOs), and delegates from selected countries to discuss possible regulations to control the promotion of breastmilk substitutes. This meeting probably would not have taken place had it not been for the tireless efforts of certain NGOs and their enthusiastic staffs. At the 1979 Geneva conference, despite rearguard actions by the major manufacturers, a decision was made to develop a Code of Conduct, and some of the main principles of a Code were agreed upon. Several meetings followed to develop wording for the Code. On 21 May 1981, the World Health Assembly overwhelmingly adopted the International Code of Marketing of Breastmilk Substitutes [18]. The Code is surely a minimum requirement and was a compromise between industry and those who believe that all promotion of infant formula should be banned. Many formula manufacturers violate the Code, and they interpret the different provisions to suit their marketing strategies so as to maximize sales and profits, and have little conscience about ignoring the spirit of the Code that they played a role in developing. All of these promotional activities are obstacles to breastfeeding and therefore infringements on mothers' human rights to breastfeed.

Failure to assist mothers to breastfeed and to work

In most countries North and South, mothers have to make difficult decisions in an attempt to fulfil their responsibilities both to provide proper child care and to their work. Mothers have productive and reproduc-

tive responsibilities. All mothers work, and therefore their breastfeeding as part of optimal child care impinges on their work. Often the challenge is greater for those who have paid employment away from home.

Some countries have made it easier for working women to breastfeed, and employers of female labour have facilitated breastfeeding for mothers. These are exceptions, but they should be the rule. The Declaration from the FAO/WHO International Conference on Nutrition held in 1992 [8] acknowledges the "right of infants and mothers to exclusive breastfeeding," and the final report states that governments and others should "support and encourage mothers to breastfeed and adequately care for their children, whether formally or informally employed or doing unpaid work. ILO conventions and regulations covering this subject may be used as a starting point."

The International Labour Organization (ILO) Convention recognized the rights of women to maternity leave and to breastfeed their infants. However, in many countries, serious obstacles are placed in the way of mothers' rights to breastfeed. Just as child labour is illegal, the world should move to a view that hindering a woman's right to breastfeed is also intolerable. Among the common obstacles are very short maternity leaves, or no maternity leaves for casual employees; loss of jobs for those who do take maternity leave; a lack of child-care facilities, which should be available in places where large numbers of women are employed; a failure to provide breastfeeding breaks for women who could breastfeed during a long work shift; and open targeting of working women by formula companies to persuade them to formula-feed rather than breastfeed their infants.

For the majority of women in many countries, there are obstacles to breastfeeding for those who have to work, especially when they have paid employment away from home. These several obstacles are infringements of mothers' rights to breastfeed. So in the same way that actions are being taken to make hospitals baby friendly and supportive of breastfeeding, it is also important for all societies to make their workplaces more baby friendly and more supportive of breastfeeding. Any successful actions in this direction are assisting women in their right to breastfeed and babies' likelihood of being breastfed.

Lack of community support for breastfeeding

Community support can help mothers to initiate, sustain, and maintain breastfeeding, and lack of community support can be an obstacle to satisfactory breastfeeding. Mothers who get much support from those in their community to initiate and sustain breastfeeding are overall more likely to be more successful in breastfeeding. A community that becomes supportive of breastfeeding can change a non-breastfeeding culture into a breastfeeding culture. As more mothers exclusively breastfeed for six months and plan to continue breastfeeding into and beyond the second year, and have positive attitudes towards and experiences with breastfeeding, the community itself changes and becomes increasingly baby friendly. Community obstacles to breastfeeding are infringements on the right of babies to be breastfed and of mothers to breastfeed.

In many developing countries, especially in rural areas where there is still a breastfeeding culture, there is a need in communities to protect mothers from forces that may influence them not to breastfeed or that in some way may undermine breastfeeding. In other communities, the prevalence and duration of breastfeeding have declined, and obstacles to successful breastfeeding exist. In these communities, breastfeeding support groups can be very helpful, and they now exist in many countries. There may also be a need for promotion of breastfeeding.

Conclusions

"Human rights" are sometimes termed entitlements. Internationally they include recognition of certain items or forms of treatment that all persons deserve or to which they are entitled. It is then expected that societies will take steps to ensure that their members enjoy these rights or entitlements. This may be achieved in part by national legislation and national actions. But in the end it takes people and communities to ensure compliance and to take actions to help all enjoy their rights. The assumption is that all members of a community deserve at least certain minimal rights.

Certain basic rights have been included in international declarations, have been promulgated by authoritative international bodies as Codes or Standards for all societies or all nations, or have been incorporated in national constitutions (for example, in the new 1996 South African Constitution, which is very strong on human rights).

In this paper some of these rights have been outlined, ranging from the 1948 Universal Declaration of Human Rights to the 1989 "Convention on the Rights of the Child." These and many other international documents establish the rights of human beings to health and food, and even to good nutrition. If we accept these rights, then this paper argues that it is logical to infer that mothers have rights to breastfeed. Breastmilk is the only ideal food to ensure the good health, proper development, and well-being of young infants. Breastfeeding also contributes to women's health.

This logic then leads to acceptance that any obstacles to breastfeeding are infringements of human rights. Major negative influences on breastfeeding therefore

contribute to loss of this human right, and any persons who place obstacles in the way of breastfeeding are parties to infringements of human rights. Major negative influences on breastfeeding include the health profession, hospital practices, and the medicalization of infant feeding; the promotional and marketing practices of manufacturers of breastmilk substitutes; the failure of nations and communities to assist mothers both to breastfeed and to work away from home; and the lack of community support for mothers to initiate, sustain, and maintain optimum breastfeeding.

The contention here is that mothers have a human right to breastfeed their infants and that obstacles to this are infringements on this right. As with other rights, states have responsibilities and obligations to respect, protect, support, and promote this right. The WHO/UNICEF Innocenti Declaration on the Protection, Promotion, and Support of Breastfeeding [7] provides a useful framework for nations to achieve these states' obligations.

This paper does not discuss in detail the possible tensions between infants' rights to be breastfed and mothers' rights to choose not to breastfeed their newborn children. The WABA Global Forum on Children's Health, Children's Rights held in Thailand in December 1996 wrestled with this issue [19]. The Forum agreed to include the following wording in its recommendations:

> Combined with the fact that breastfeeding is in the best interest of children and mothers, WABA interprets these general provisions of the CRC as implying that children have a right to mother's milk as the only fully adequate food, and that mothers and children have a right to enjoy conditions that facilitate breastfeeding. States Parties have an obligation to respect, protect, and facilitate or fulfil the right to enjoy such conditions by the removal of obstacles to breastfeeding and to appropriate complementary feeding and by the creation of a supportive social and economic environment for parents and children.
>
> This shall in no way be understood or perceived as the mother having a duty to breastfeed since it is the circumstances which lead to the choice not to breastfeed that must be altered.

It is certainly not proposed that mothers who choose not to breastfeed their infants be penalized, ridiculed, and certainly not prosecuted. Mothers need to have freedom to choose how to feed their babies. But it is argued that almost all mothers living under optimally baby-friendly conditions would make the choice to breastfeed. This is shown in countries as diverse as Norway and Tanzania, where almost all babies are breastfed. Therefore, what is needed are actions to remove those obstacles to breastfeeding, many of which are discussed in this paper.

As a rights issue, the argument made is that mothers have a right to breastfeed their babies if they choose to do so. In contrast, infants' rights to optimal health and nutrition may be jeopardized if they are not fed on human breastmilk, or even if they are not breastfed. But this should be viewed more in terms of ethical, moral, or civic rights, not legal rights. Many other rights are not fulfilled, and few attempts are made legally to fulfil them. The right to vote is usually voluntary, and in ideal circumstances almost every eligible citizen would exercise this right. But individuals may choose not to vote.

So we should help mothers understand the benefits of breastfeeding to themselves and their infants. We can then agree that states have responsibilities and obligations to respect, protect, support, and promote the removal of all obstacles to breastfeeding. It is predicted that when this is achieved, it will be unusual for infants not to be breastfed.

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The practice of public nutrition: Key contributors and the need for a shared understanding of the problems

Micheline Beaudry

Abstract

The effective resolution of major nutrition problems requires interdisciplinary and intersectoral approaches, and is of public interest; therefore a "public action" approach such as that described by Drèze and Sen in "Hunger and Public Action" is proposed to help define the key contributors required. Public action comprises action taken by members of the public, not merely for the public. It could include actions of very diverse public institutions, both collaborative and adversarial, in addition to those of government and the private sector, provided they can influence communities, families, and individuals, are taken in collaboration, and share a common purpose. Conditions of effective collaboration, including the need to arrive at a broad and shared understanding of the problem, are highlighted. The potentially critical role of academic and research institutions is briefly reviewed, and it is suggested that they may not be fully contributing to the necessary advances in broadening the understanding of nutrition problems.

Introduction

Addressing more effectively the problems of malnutrition in young children, nutrition-related chronic diseases, and food insecurity probably constitutes our major agenda to improve the nutrition of populations over the next decade. Regrouping forces under the umbrella of "public nutrition" can help to get it done, clarifying who will do it and how to facilitate the necessary collaboration.

Important progress in reducing malnutrition in young children has now been observed in a number of countries from different regions. Global progress, however, or even progress in each region, remains insufficient to significantly improve the nutrition situation of the majority of those affected, or to achieve, within agreed time frames, the existing commitments by the world community (such as those made at the 1990 World Summit for Children, the 1992 International Conference on Nutrition, or the 1996 World Food Summit) [1]. Important changes in approaches as well as in levels of commitments are necessary to increase the rate of progress towards these ambitious goals.

Concurrent with the problem of undernutrition in young children, and probably linked [2], nutrition-related chronic diseases, which have now been prevalent in industrialized countries for some time, are rapidly progressing in developing countries. As industrialized countries have been discovering, to reverse this tide and improve population health, it is necessary to develop and implement approaches that go beyond health care and that address the social determinants of health and of lifestyle factors, including eating patterns [3]

Another important phenomenon that defines the task on hand is the resilience of food insecurity in developing countries and its reappearance in industrialized countries [4, 5]. A common thread linking these three problems is the interdisciplinary and intersectoral nature of their aetiology, where a complex set of social causes is intertwined with the biological ones. This has important implications in the search for more effective solutions.

Among those in the nutrition community who study progress and the conditions of progress in these areas, there is already a certain degree of consensus around what needs to be done for each of these problems. That actions are required at different levels from the international to the local, and from different sectors besides health, is no longer disputed. How to arrive at the right mix still requires much attention. It is in this context that this paper addresses the issue of the different contributors required and some conditions for bringing them together effectively.

The author is Professeure Titulaire in the Département des Sciences des Aliments et de Nutrition, Faculté des Sciences de l'Agriculture et de l'Alimentation in Université Laval in Québec, Canada.

The contributors needed

It is perhaps useful to remind ourselves that it is individuals, families, and communities who ultimately bear the brunt of the nutrition problems on our agenda. Their situation and the decisions they make are influenced by several actors besides nutrition specialists and by actors from several sectors besides health, and often more so than health; these actors are also frequently outside of government. To redress malnutrition in young children, for example, requires strategies that lead to daily, *deliberate* actions undertaken by caretakers, generally mothers, or, in the case of chronic diseases, by all individuals, especially those responsible for feeding the household. Although micronutrient adequacy is undoubtedly a component of each of these problems, none of them can be solved without also giving adequate attention to macronutrient adequacy, and this must come from foods, from their appropriate intake every day, and from conditions that facilitate this, especially in the case of young children. What follows is thus premised on the need to foster strategies that also favour macronutrient adequacy in addition to micronutrients. For the need in macronutrients to be met, ultimately things must happen in communities themselves, in such a way as to actually reach families and individuals. This is made easier if they themselves are active participants and if forces that bear on them reinforce each other and complement their actions instead of competing against each other.

Given the fairly accepted view that the resolution of problems leading to nutritional deprivation is a straightforward public-interest issue, Drèze and Sen [6], in their important treatise "Hunger and Public Action," ably argue for the need for several forms of public action if these problems are to be confronted effectively. The results of recent analysis of progress in reducing malnutrition [7] or in implementing successful community-based nutrition-oriented programmes [8] and, more specifically, analysis of the exceptional progress achieved in Thailand [9] suggest that Drèze and Sen's conclusions on "public action" are relevant to improving the practice of public nutrition. Although the government frequently comes to mind as responsible for such "public action," and relevant government sectors certainly cannot be excluded, public action is a great deal more than activities of the state; it also goes beyond the still prevailing political debate regarding state-versus-private sector action. Rather, public action also comprises social actions taken *by* members of the public, both collaborative and in some cases adversarial actions, and not merely action *for* the public; it thus includes the directly beneficial contributions of social institutions, but also the actions of pressure groups and political activists.

For Drèze and Sen [6], examples of institutions of "the public" range from multiparty political systems and a free press to such traditional institutions as the extended family and the community. For our purposes, and depending on the desirability and feasibility of different courses of action in each situation, "the public" could also include institutions as varied as churches (see, for example, the "Brazilian Child Pastorate" in Brazil in ref. [10]), consumer groups, unions, professional associations, academic and research institutions, and a variety of non-governmental organizations, in addition to the "for profit" private sector. Although the latter should not be seen as an alternative to state action, and the conflicts between the reliance on markets and that on state action should be fully acknowledged, Drèze and Sen [6] emphasize that these two avenues should not be seen in constant combat with each other. The private sector admittedly has profit or internal efficiency as an initial motive; yet its influence on communities, families, and individuals cannot be negated and thus needs to be taken into account, since communities, families, and individuals ultimately take action on the balance of influences received. The recent experience in many countries with the successful iodization of salt is an excellent example of collaboration between the private sector, the state, and other social institutions of the public, each contributing different elements of the solution but all working for a common purpose, with a shared view of the problem [11]. The challenge is to mobilize similarly successful examples of intersectoral collaboration for the more complex problems that are on the agenda of public nutrition.

Public action for public nutrition may originate from both state and local government as well as from civil society. The forms that public action can take in each situation will likely depend on the objectives pursued and the existing social balances of power. It also evolves over time, as clearly shown in the experience of Thailand [9]. What is clear is that "the public" represents an extremely heterogeneous compound of institutions and very diverse and often conflicting interests. Facilitating successful collaboration is therefore essential for successful public action for nutrition.

The conditions of successful collaboration

A recent synthesis of relevant literature on inter-organizational collaboration for the nutrition field [12], though largely inspired from experience in North America, raises several issues of apparent relevance to establishing successful collaboration for global nutrition. It provides a conceptual framework for viewing collaborations, suggests approaches to evaluating them, and explores key issues, including collaboration typologies and factors associated with success, to finally make recommendations for practice, research, and evaluation. Our attention here will be limited to a key factor of success identified, which is more directly relevant

to a community of "public nutritionists": the need for a shared vision. This factor also relates to the author's first recommendation for practice "shift the lens/increase the scope," which implies the need to recognize the demonstrated influence of what they call "environmental and systemic factors on individual and community health" and to shift the focus from individual behaviour to community and systemic change. Similar findings emerge from a recent analysis of intersectoral health-related action [13]. Defining it as a "process through which actors belonging to different sectors unite to address a given health-related issue," the authors found a clear consensus in the literature about the necessity of intersectoral action to promote the health of populations as well as about the key elements of a definition. However, although concrete and specific suggestions are occasionally made on how to work intersectorally, they found very little consensus, except for the fact that this work fails more often than it succeeds. As a contribution to fill this gap, they first examined research on collaboration and cooperation as well as on interorganizational relationships, and chose the notion of coalition as the most useful to conceptualize intersectoral health-related action. Using parameters of coalition theory heuristically, they then assessed three case studies from which to formulate recommendations for practitioners. In summary they suggest that since an intersectoral group is made up of members who have cooperative and conflictual interests at the same time, cooperative interests would have to dominate conflictual ones for the group to succeed (i.e., to emerge, to maintain itself over time, and to realize activities related to its goals). They formulate their main findings from this perspective and identify a key role for convergence within the group and commonality of purpose among the different actors to assure continued collaboration. This also suggests the need for members to share (or be able to arrive at sharing) a similar or compatible understanding or worldview of the problem of concern. Similar findings also emerged from the overall analysis of the experience of Thailand by Tontisirin et al.[9].

The need for a shared understanding of the problem

In the case of the nutrition problems on our agenda, this understanding must consider both their social causes and the biological ones. It is the recognition of the complexity and multisectoral nature of nutrition problems that led us earlier to suggest the need for public action or for broad intersectoral collaboration to be able to confront them successfully. The above suggests that for this collaboration to not only work, but to be effective in improving nutrition, contributors must arrive at a shared and somewhat common and evidence-based understanding of what is meant by this multisectoral nature, of how different sectors are in fact organized to lead to malnutrition, and of how they can organize to confront it. In other words, it is not enough to either agree with a broad conceptual framework of the causes of malnutrition (such as the one promoted by UNICEF [14]), or to adopt it. It has to be used to guide assessment and analysis of a situation and therefore decisions on actions. Frequently, a broad conceptual framework is adopted in principle but then is not used, and each actor, or group of actors, reverts to their pet area of analysis or action: convergence can no longer dominate over divergence. To avoid this, it seems necessary to include members who see the need for such a broad understanding of the problem of concern and who can help to articulate it. They will frequently be among the initiators of public action for nutrition.

Nutrition specialists, or nutritionists, do generally see themselves as the leaders responsible for directing progress in nutrition or at least as having a key role to play in such intersectoral action, given their specialized knowledge and skills. To that effect, they need to be able to contribute to the articulation of the broad understanding of the problem. This suggests a particular and critical role for academic and research institutions: to advance this broad understanding of the problem both on the research front and through their training activities. How can academic and research institutions advance or facilitate such development?

The influence of academic and research institutions

In recent years several analyses have discussed the influence of academic and research institutions for more effective nutrition action. Three will be addressed, from the perspective of advancing such a broad understanding of the nutrition problems under consideration, then attempting to situate the practice of current research and training in light of their conclusions. They are the recent United Nations University/International Union of Nutrition Sciences (UNU/IUNS) workshop on Institution-Building for Research and Advanced Training in Food and Nutrition in Developing Countries [15], the report of the Committee on Opportunities in the Nutrition and Food Sciences of the Food and Nutrition Board of the Institute of Medicine of the National Academy of Sciences (United States) [16], and the report of the Bellagio Conference "Addressing the 'How' Questions in Nutrition: Unmet Training and Research Needs" [17].

The UNU/IUNS report [15] reiterated the frequently recognized need for more applied research and interdisciplinary training [18] but also discussed proposals for more cross-disciplinary training [19] for more profound changes towards a more problem-oriented ap-

proach [20] accompanied by a development-based approach [21]. They will not be addressed here. The Committee on Opportunities in the Nutrition and Food Sciences of the Food and Nutrition Board of the Institute of Medicine of the National Academy of Sciences (United States) [16] did not specifically address the question of the role of other disciplines and sectors concerned with global nutrition problems; it appeared more concerned with research needs and with what was needed to promote their own disciplines. The underlying assumption seems to have been that implementing its recommendations was necessary to enhance individual and public health substantially. Briefly, the Committee noted that the disciplines of nutrition and food science were underfunded in relation to their potential contributions to the health of individuals and populations, and that they faced an identity crisis because of their interdisciplinary nature and the diversity of institutional settings in which research and training occur. It considered that to enable the nutrition and food sciences to prosper in today's political and economic climates (at least in the United States), it was critical that its researchers and practitioners become more politically active through their professional societies and as individuals to advocate for more government and private support for these fields. It also recommended a presidential initiative in the nutrition and food sciences to bring greater attention to these disciplines and to engage public debate on the support society could appropriately provide to them. Although it recognized that investigators doing nutrition and food-related research include molecular biologists, anthropologists, and engineers, and it acknowledged that nutrition and food scientists should be trained in a variety of ways, the Committee considered that for the nutrition and food sciences to maintain their identity and to be more effective in generating new knowledge, it was important that a substantial number of individuals be trained specifically as nutrition and food scientists.

In a different direction, Berg [22, 23] suggested that our approaches to research and training in nutrition were a more important constraint to effective action for nutrition than were other reasons more frequently mentioned. Berg tried to demonstrate that academics did not work well with those involved in policies and programmes, that they emphasized the wrong research issues, and that their training of nutritionists to work operationally in this field was inadequate. He proposed a chain of research questions that needed to be addressed to bring about large-scale improvements in nutrition, ranging from "why" a nutrition problem occurs (understood mainly as the "biological" why), to "who" has the problem or is vulnerable, to "where" those people are, to "what" to do about the problem, and finally "how" to do it (which includes dealing with constraints to action). He then tried to demonstrate that most efforts in research and training had been concentrated towards the "why" end of the chain, although more progress would be expected from concentrating on the "how" end.

The many reactions to Berg's proposals led to the Bellagio Conference "Addressing the 'How' Questions in Nutrition: Unmet Training and Research Needs" [17], where 22 international nutrition specialists from the North and the South and from a mix of experiences in research, training, and operations concluded that the focus of both research and training should not be exclusively on the "how" (or the "nuts and bolts" implementation issues), but rather that they should focus on the spectrum of knowledge and skills needed to address the actual obstacles to programme success in a given situation. This implied that given the current balance among most research and academic institutions, many more training and research programmes needed to concentrate on questions to specifically address the processes associated with or leading to the "how" question, or to encourage programme-driven training and research. This is what the Networks for Research and Training to Improve Nutrition Programs were intended to foster [24].

This approach contrasts with that of the Committee of the National Academy of Sciences [16] referred to above. It goes beyond the more traditional approach to nutrition problems viewed mainly as a function of their biological complexity, suggesting paths to broaden the understanding of nutrition and to influence its leadership for more effective nutrition practice. Although most nutrition scientists do not seriously disagree with such conclusions and see merit in a complementarity of approaches, many seem to consider that this is what is currently being done, as evidenced by the reactions to Berg's proposals [25] and by the limited follow-up to the Bellagio Conference.

Current focus of research and training

We recently reported on a picture of the current nutrition focus in major academic and research institutions from non-industrialized countries [26]. In summary, we analysed the content of abstracts submitted by graduate students in application for a "young investigator travel bursary" to the International Congress of Nutrition (Montreal, July 1997). A committee of nutrition specialists with experience in international nutrition to recommend candidates for these bursaries was formed by Dr. Hélène Delisle (Université de Montréal); Dr. Réjeanne Gougeon (McGill University) and the author participated; content analysis was then carried out by the latter and discussed with the Chair for the purposes described here. Given the presumed leadership role of academic institutions in society, especially those involved in research, and the importance of research in the training of graduate students, such

an analysis could be a fairly good reflection of the major emphasis of activity related to nutrition. True, much training and activity does take place outside of such institutions. However, since one is greatly influenced by the models received, this can give a picture of major circulating influences.

To identify the type of understanding of nutrition problems conveyed by related research activity, the abstracts were analysed for the diversity and scope of nutrition interests, including the breadth of biological and social causes being addressed and the balance in the chain of research questions proposed by Berg (table 1). A total of 178 applications were received. Abstracts submitted by students from industrialized countries or those doing research in an industrialized country were not included in the analysis, since they had been discouraged from applying, and those who still did would probably not be representative of that group. Thirty-five abstracts were thus discarded, and what follows refers to the 143 remaining. They were divided by region, as would be expected from the population distribution, with nearly half coming from Asia.

Over half of the abstract topics addressed nutrition issues in populations (52%), and the majority of projects were carried out with humans (68%) (part of which could be said to reflect an interest in "public nutrition"). Ten percent focused on problems generally associated with young children other than those related to micronutrients, 23% focused on micronutrients, and 21% focused on chronic diseases. Globally, around 27% could be considered among those mainly prevalent in developing countries and associated with young child malnutrition (39% if one includes those related to food security and to general malnutrition in adults) [26]. This is somewhat less than might be expected from their relative prevalence or their consequences for development.

The 97 projects carried out on humans were further examined in light of the chain of questions proposed by Berg [22, 23], the stages of the "triple-A" process [14], and the levels of the conceptual framework of the causes of malnutrition [14]. If these instruments indeed reflect the different focus of interests that need to be addressed to foster increased effectiveness of programmes, and if there was indeed a balance in the questions being addressed to help develop a full understanding to influence programme effectiveness, it might be expected that projects would be roughly evenly divided among the different levels of each of these instruments.

Over a third of the abstracts (38%) addressed whether or not there was a problem and what that problem was; 22% addressed the "why," 3% the "who," 37% the "what" to do to solve the problem, and none addressed the "how" [26]. Table 2 shows the distribution of abstracts dealing with projects on humans according to the stage of the triple-A process and the level of the conceptual framework of the causes of malnutrition being addressed. As we have previously reported [26], 29% of the abstracts focused on an "assessment" of the situation (i.e., described a situation without analysing relationships), whether of manifestations, consequences, or causes of a problem; over one-half (58%) referred

TABLE 1. Variables used to assess abstracts submitted by graduate students in application for a "young investigator travel bursary" to the International Congress of Nutrition (Montreal, July 1997)

Region of study and region of host academic institution
Area of nutrition concentration (intracellular nutritional processes; nutrition of organs and organisms; nutrition in populations; foods, food science, and food systems) [27]
Species on which research was carried out (plants/foods, animals, humans)
Focus on the chain of research questions from "why" to "how" [22, 23]
If in humans, stage of the triple-A process being addressed (assessment, analysis, action) [14]
Level of the conceptual framework of the causes of malnutrition being addressed (manifestations/consequences, immediate causes, underlying causes, basic causes) [14]
Age group being targeted: (i) children or infants, pre-schoolers or adolescents; (ii) adults or mixed; (iii) elderly; (iv) pregnant or lactating women
Problem being addressed: (i) related to children: protein–energy malnutrition, breastfeeding and lactation, diarrhoea; (ii) micronutrients: iron, vitamin A, zinc, iodine, and others; (iii) chronic diseases, including cancer, cardiovascular diseases, diabetes, and obesity; (iv) miscellaneous: food security, including food safety, street foods and non-traditional foods; protein–energy malnutrition in adults; energy metabolism; lipid metabolism; others, including dietary intake, fibre, alcohol, renal dialysis, etc.
Involvement of a partner outside of the academic institution, and who

TABLE 2. Distribution of abstracts dealing with projects on humans according to the stage of the triple-A process and the level of the conceptual framework of the causes of malnutrition being addressed[a]

Conceptual framework	Triple-A stage[b]				
	Assessment (%)	Analysis (%)	Action (%)	Total	
				N	%
Manifestations or consequences	50	18	0	24	25
Immediate causes	46	52	77	52	54
Diet intake	(13)	(26)	(9)		
Disease	(0)	(3)	(1)		
Underlying causes	0	14	23	11	11
Food			(1)		
Health					
Care			(1)		
Unspecified			(1)		
Basic causes	4	16	0	10	10
Total	29	58	13	97	100

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b. The numbers of cases are given in parentheses.

to an "analysis" of relationships between either causes or associated factors and manifestations or consequences of a problem; only 13% focused on "actions"; most of those focused on immediate causes, and none addressed the process itself, or the "how" question. Regarding the levels of the conceptual framework, overall, 25% of abstracts (whether assessment, analysis, or action) focused on manifestations or consequences of a problem and 54% on immediate causes; a minority focused on underlying and basic causes (11% and 10% each). Nearly all the projects classified as "assessment" focused either on the manifestations or on the immediate causes of a problem, and so did nearly 70% of those classified as "analysis."

If we are indeed to improve our understanding of the biological and social causes of nutrition problems in order to share it and eventually contribute to increased effectiveness of nutrition action, it would seem desirable for academic and research institutions to consciously foster analysis not only of immediate causes, but especially of underlying and basic causes and of the constraints to their removal. If these are not assessed or analysed, it may be difficult to improve our breadth of understanding or our ability to share it and influence public action.

Because public action requires collaboration with actors from diverse sectors and interests, and because related skills are also an asset, we also tried to assess the partnerships identified in the projects submitted. None of the abstracts reflected any participation other than that of academic institutions and the subjects, or rather the "objects," of the research. Admittedly, reviewing abstracts may not have been the most appropriate way to find out about partners, although there are certainly "what" and "how" research issues that would refer to partners in the field.

Although this is definitely a self-selected sample and is limited to what goes on in institutions from non-industrialized countries, if indeed the most promising students—by today's mainstream criteria–would submit an abstract to such a congress and an application for a bursary, and if these abstracts are fairly representative of priorities at least in non-industrialized countries, one might conclude that the balance of research and training currently fostered is still too tilted towards the "why" end of the chain and towards assessment and analysis of immediate causes of malnutrition. It may thus not be conducive to the development and sharing of the broad understanding of the biological and social causes of nutrition problems proposed as necessary to effectively mobilize public action for nutrition. If academic and research institutions wish to contribute to this understanding, would they not benefit from making changes in the directions suggested? And if programming is to become more effective on a wider scale, many academic institutions may need to institute such changes because of the considerable influence they do exert in this area, even when it is not their expressed intention. This was also suggested in the recent UNU/IUNS report where the executive summary starts as follows: "The success of applied science is determined by the short and medium term relevance of knowledge developed by researchers and the effectiveness of the implementation of accumulated knowledge. Both of these determinants of success, in turn, depend significantly on the quality and quantity of trained personnel."[18]

Depending on how nutrition specialists view the problem, they either advocate for more resources for themselves (or for more "nutritionists") or they advocate for a greater involvement of other sectors, either under their own leadership (remember the era of food and nutrition planning and all those central coordinating offices; no one wanted to be under the coordination of others) or in partnerships. Clearly the latter (partnerships) is what is desired for successful public action for nutrition. Perhaps one of the key roles of a community of "public nutritionists" is to foster the development and sharing of such a broader understanding of nutrition problems so as to facilitate effective intersectoral collaboration or "public action" for nutrition.

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Success factors in community-based nutrition programmes

David Sanders

Abstract

Community-based nutrition programmes (CBNPs) generally include such activities as growth monitoring, breastfeeding promotion, nutrition education, promotion of better weaning practices, and sometimes micronutrient programmes and deworming. Defining success in these programmes involves the attainment of objectives related to process, outcome, and sustainability (financial and functional), all of which are influenced by sociopolitical, technical, and financial factors. Four well-known programmes generally acknowledged as successful are used to illustrate the combination of contextual (sociopolitical), programmatic (technical), and financial factors that ensure success in CBNPs. The more technical programmes are more instructive and replicable, given the difficulty in creating conducive sociopolitical factors. However, the evidence demonstrates that with careful design and phased implementation of different components, nutrition activities can enhance positive sociopolitical factors, thereby creating a positive context for nutrition programmes and for capacity building for the broader challenge of social development.

Introduction

Nutrition programmes generally include such activities as growth monitoring, breastfeeding promotion, nutrition education, promotion of better weaning practices, and sometimes micronutrient programmes and deworming. In addition, supplementary feeding of malnourished children may be included. Supporting activities often comprise health activities such as immunization, improved diarrhoea case management and family planning, nutritional surveillance, and links to local food production.

The author is the Director of the Public Health Programme in the University of the Western Cape in Bellville, South Africa.

Defining success in nutritional programmes

Before considering the range, combination, and relative weighting of factors contributing to successful community-based nutrition programmes (CBNPs), it seems pertinent to question the term "success." What is a successful programme? The simple, almost facetious answer is "A successful programme is one that achieves its objectives!"

There are three issues here concerning attainment of objectives:

» Objectives (when they are stated) for CBNPs almost always include "outcome" objectives ranging from narrow nutritional outcomes, e.g., the eradication of grade III malnutrition (Costa Rica), to broader contributions, e.g., the reduction of malnutrition and high mortality rates of children under three (Tamil Nadu) [1].

» Objectives sometimes include "process" objectives ranging from narrow nutrition-related processes, e.g., to enhance mothers' capability for nutrition surveillance (ICDS India), to broader social objectives such as increasing community participation and expanding coverage (UPGK, Indonesia) [1].

» Stated objectives frequently do not explicitly include process objectives, yet certain processes may be facilitated or even initiated, either as a result of the programme design, or, in some cases, as an unexpected by-product of the programme, e.g., Zimbabwe child supplementary feeding programmes (CSFP) (strengthened self-organization of village people). In addition to certain processes being facilitated by the development of programmes (e.g., community participation), intended or sometimes unforeseen effects may occur, such as the influencing of policy by successful nutrition programmes, e.g., Zimbabwe's CSFP/SFPP (supplementary food production programme) influenced agricultural policy).

Another important, yet often neglected, measure of success is sustainability [1]. The sustainability of a programme without significant external funding should be one ultimate goal of any community-based pro-

gramme. But financial sustainability is only one, albeit crucial, aspect of sustainability. The other critical aspect is functional sustainability.

Factors influencing success

Success in CBNPs is a function of sociopolitical, technical, and financial factors. Although each of these factors—or rather group of factors—is essential, the strength and relative weight of each differs from programme to programme.

Sociopolitical factors are those which describe power arrangements and social relations affecting nutrition programmes and which influence the decision taken in a society to initiate or support such programmes.

Technical factors include two broad components, which may be termed programme hardware, which includes the buildings, equipment, transport, and other materials necessary for implementation; and programme software, which has to do with the technical capacity of programme personnel to design, initiate, manage, and evaluate nutrition programmes [1].

Financial factors are both external and internal. Although nutrition programmes are often initially funded externally, their sustainability is significantly dependent on internal financial capacity and its reliability.

The above groups of factors are explored in more depth below and are illustrated by reference to four well-known and successful large-scale nutrition programmes.

Sociopolitical factors

Community participation

In their review of successful nutrition programmes, Gillespie et al. [2] identify "genuine community involvement [as] a key feature of those programmes that work." Kavishe, invoking UNICEF's "triple-A" programming cycle, insists that community participation includes a full role in assessment, analysis, and action. Shrimpton [3] has detailed further numerous components of programme development in which communities can successfully engage. Jennings et al. [1] have summarized the pros and cons of community participation in nutrition programmes. According to Jennings et al., the perceived benefits of community participation in nutrition programmes include the following:

> i)It increases a sense of ownership of the project by the community, thus leading to sustainability of the project; ii) it decreases resistance to project innovations, assists the dissemination of nutrition education messages, and promotes regular and ongoing attendance at programme activities; iii) it decreases dependence on external assistance and promotes self-help in tackling community problems through the strengthening of community structures and leadership; and iv) projects which stress community participation tend to be interventions which are more appropriate for the community, in the goals and objectives defined and in the technology employed.
>
> One limiting factor of community participation in a project is an increased administrative complexity…. Logistical constraints are also increased due to the frequent location of needy communities in isolated areas with weak infrastructure. The benefits would appear to outweigh these negative aspects. It should be recognized, however, that there always is the potential for local elite groups to use 'community participation' in a project as a means of extending their own patronage network within the community…. Yet if targets are well defined and the programme is closely monitored to determine coverage and beneficiaries, this should be detected early in the implementation phase.
>
> When community participation is promoted in the planning phase, there can be conflicts between programme goals and community goals. Based on a review of community participation in the health planning process in several health programmes in Southeast Asia, it was considered that in some cases 'community members did not see health as a priority'…. In recalling the historical developments of nutrition programmes in Tanzania… it is shown that poorly considered attempts to involve community participation in the planning process can possibly hinder efforts to reach programme goals.

"Community participation" is a central principle of the Primary Health Care Approach (PHCA) and a feature distinguishing it from previous approaches to health care. Genuine community participation in programme development implies participatory democracy and a measure of popular democratic control more generally in a society.

Political will

In a situation where participatory democracy operates—even if only temporarily—governments are more likely to be responsive to their social base and sensitive to popular demand. In short, it is in such situations that governments demonstrate "political will."

Werner and Sanders [4] put it thus:

> To achieve and sustain the political will to meet all people's basic needs, a process of participatory democracy—or at least a well informed grassroots movement—is essential. And because the opposition to equity-oriented social development has be-

come so pervasive, a coordinated global effort is urgently needed.

Recognizing the importance of such popular participation is a key to successful health care initiatives. This is illustrated by the impressive achievements of China's mass public health campaigns in the 1950s, as it is by Nicaragua's mass immunization campaigns in the 1980s. Even at the provincial or district level the health benefits of popular involvement are excellent. The state of Kerala in India and the San Ramon district of Costa Rica are good examples. This latter initiative involved strong community participation in service provision as well as in planning. Guided not by health professionals but through large community gatherings, San Ramon District achieved the best health and child mortality statistics in all of Latin America, with the exception of Cuba.

Gillespie et al. [2] suggest:

> Successful community-based nutrition programmes have tended to have had combinations of political will at central level, middle-level districts (and more decentralized) administrative support, in addition to community-level organizational capacity. This reinforces the potentially 'synergistic' relationship between the community and government.

The experiences of Zimbabwe and Tanzania illustrate in different ways the relationship between democratization and community participation in the development of nutrition programmes. These two cases also display the relative weight and importance of sociopolitical (or contextual) and technical (or programme) factors in determining success.

In the case of Zimbabwe, the unfolding relationship before and after political independence between the state and institutions of popular organization is central to understanding the process of popular involvement ("community participation") in all areas of social development, including health. It is in situations where the old order and power structures are being contested or have recently been overthrown by a unified popular struggle that comprehensive primary health care often has the best chance of succeeding. This was the case in Zimbabwe in 1980, as it was in revolutionary China, Cuba, and Sandinista Nicaragua. It is under such conditions that popular participation in decision making and collective—rather than individual—self-reliance grow and flourish.

In Zimbabwe this situation was most evident in the semi-liberated communal areas, where ZANU, the leading party in the national liberation movement, had long been active. In these areas the party had created popular organizations, initially responsible for supporting the liberation effort but later structured to perform essential social and economic tasks, as an alternative to the Rhodesian state's rudimentary district administration. Grass-roots village committees dealt with the day-to-day problem of feeding and clothing the ZANU guerrillas and of providing basic services to the community. Matters involving larger outlays of money were passed to higher-level committees.

The existing community-based administrative infrastructure that had developed during the war permitted a more rapid and better-organized implementation of the nutrition programme than would otherwise have been possible. Mothers evaluated the children's nutritional status by measuring and recording upper-arm circumferences. Those with mid-upper-arm circumference less than 13 cm were included in the programme. The reasons for this cut-off point were explained to all parents, both those of children admitted to the programme and those of children considered not at risk. Then they established locations for supplementary feedings (which the mothers preferred to be located close to their homes and fields), and themselves cooked the food and fed the underweight children [4].

The deliberate choice of nutritious, commonly used and cultivable foods for the Children's Supplementary Feeding Programme (CSFP) allowed the programme's steering committee, together with a conscious and self-organized community-based infrastructure, later to launch a Supplementary Food Production Programme (SFPP). The land selected for the cultivation of (primarily) groundnuts was taken from communal grazing land and allocated by recently established local government authorities, responsive, at that time, to the popular demand of their constituents.

In attributing success in Tanzania's Iringa Nutrition Project (INP), certain observers have given prominence to the sociopolitical environment, whereas others, including the programme's initiators, suggest that programme factors were more important. Pelletier [5] identifies five characteristics of success, three sociopolitical and two "technical": Tanzania's strong ideological and political support, its sturdy village-level administrative system, and the Iringa region's surplus food production, as well as efforts to strengthen regional programme management and the close involvement, through operations research, of the Tanzania Food and Nutrition Center. Jonsson et al.[6] identify participatory programming, through engaging affected communities in the triple-A process (assessment, analysis, and action), as central to the INP's success. They point to the fact that significant community participation was achieved in eight programme elements through the involvement of communities in all of the components and subcomponents of the triple-A strategy.

Jonsson et al. acknowledge, however, that Tanzania's national political environment in the early 1980s was conducive to the programme's success. Thus, they state, "No doubt Tanzania, and particularly the Iringa region,

were well suited and prepared for a participatory project such as INP"[6].

Although Tanzania in 1983 differed from Zimbabwe in the early 1980s in that in the latter society popular self-organization was still at a high pitch following the recent liberation effort and constituted the human infrastructure for the CSFP, in Tanzania "self-reliance" and collective action remained the ideological legacy of that country's independence struggle, even though the level of social mobilization had waned since the achievement of independence in the late 1960s. This ideology expressed itself first in the establishment of Ujamaa villages and later in the encouragement of villagization and 10 house cells, each with an elected cell leader. This "strong village organization facilitated social mobilization and community participation"[6], and "communities with weak leadership lagged behind"[7].

Advocacy through a Prime Ministerial speech inaugurating the INP and the reinforcing of its message by leaders at community meetings, the involvement of media professionals, and the making of a film on Iringa all contributed to creating a context facilitatory of this programme's success.

In Indonesia's National Family Nutrition Improvement Programme (UPGK), extensive grass-roots community participation has been identified as an important success factor. This phenomenon, while not associated with any political movement, has been identified as a natural outgrowth from a tradition of mutual help in the community. In the early 1980s this tradition was translated into rapid development of a village women's organization, known as PKK, whose members established

> village nutrition centers called taman gizi, where growth monitoring, nutrition education and supplementary feeding activities were undertaken by village nutrition cadres, trained under the auspices of government nutrition programmes. Since 1984, the village nutrition centers have been gradually integrated with other primary health care services, and known as posyandu. The posyandus are designed to be managed by the community and supported by sector workers. Interest is first aroused through the process of a baseline survey, before training and support from the health services is then used as means of enabling full participation. By 1994, there were expected to be two posyandus per village in Indonesia. This rapid development was primarily due to the active participation of PKK and other women's organizations at village level [2].

Summary

These brief descriptions have illustrated the importance of community participation and its sociopolitical context in the initiation and development of large-scale nutrition programmes. In the Zimbabwe case, the immediately preceding political situation had created a context for widespread popular participation in social provisioning. Technical design factors were also important, particularly in facilitating the transition to a food production scheme (see below). In the Tanzania programme, the legacy of the independence struggle more than a decade earlier ensured ideological commitment and political support and a village-level infrastructure through which the Iringa programme was implemented. The programme design was informed by a conceptual framework outlining the multiple causes of the nutrition situation, leading to community action. This triple-A process built upon and reinvigorated the preexisting social movement, directing it towards recognizing and addressing the major community problem of child undernutrition. In the Indonesian case, the tradition of mutual help has been harnessed and built upon by women's organizations. Significant technical input has strengthened and directed the activity towards addressing child undernutrition by using the mechanism of a baseline nutrition survey followed by training and support. Table 1 summarizes the level of community participation in the four programmes discussed.

Technical factors

Technical inputs comprise hardware and the capacity of programme personnel to implement programmes. Implementation can usefully be separated into a number of linked phases, of which the most important are prob-

TABLE 1. Level of community participation in four major nutrition programmes [3]

Component	Level of community participation[a]			
	Tamil Nadu (TINP)	Thailand	Indonesia (UPGK)	Tanzania (Iringa)
Needs assessment	1	1	1	3
Organization	2	1	2	4
Leadership	2	1	2	5
Training	5	1	1	4
Resource mobilization	1	1	2	5
Management	1	1	2	5
Orientation of activities	5	3	5	5
Monitoring and evaluation	4	2	5	5
Total score	21	11	20	36

a. 1 signifies minimum and 5 signifies maximum community participation.

lem definition and design, initiation, and management. The importance of involving recipient committees in these phases has already been discussed; clearly the ability of technical personnel (health staff, nutrition workers, etc.) to guide, support, and supervise programme development is equally important.

Problem definition, programme design, and initiation

A prerequisite for rational and comprehensive programme design is the conducting of a situation analysis. This should identify the prevalence and distribution of the nutrition problem, its causes, and potential resources that can be marshaled and actions that can be undertaken to address the problem. According to Gillespie et al.[2], the more effective programmes have taken the above approach, involving as key actors the target community in the three phases of programme development, namely, assessment, analysis, and action. This approach should ideally involve community-based assessment of the problem, coupled with an understanding of the multiple factors contributing to undernutrition. This is more likely to result in the design of appropriate interventions and their successful implementation.

In analysing success factors in Tanzania's INP, Jonsson et al. [6] point out that

> the center-piece of the programme was community-based growth monitoring in which each village would conduct a quarterly Nutrition Assessment Day. Political support ensured large levels of participation in the measurement of children's nutritional status.

After the completion of this assessment, participatory analysis followed.

> The introduction of the conceptual framework which explicitly identified the immediate, underlying and basic causes of malnutrition and the interaction between them increased the analytical capability of those involved in the INP. After training, the people from all sectors and levels of society involved in the programme were able to use the framework as an analytical tool. The framework facilitated multisectoral cooperation. It showed that everybody was important in attacking the problem. It also helped in understanding the different roles of the various levels of society. Its lack of detail allowed for gradual development. It became an important empowering instrument. People and their representatives could articulate their situation better and identify which particular constraints were to be attacked in order to improve their situation.

Other programmes appear to have been less explicitly structured around a triple-A process, although several were clearly informed in their design by an assessment of the problem and some analysis—although not necessarily guided by UNICEF's conceptual framework—of the causal factors needing to be addressed. The Zimbabwe programme, for example, was preceded by a number of nutrition surveys that revealed the presence of a problem of national significance. At the launch of the CSFP, the identification of the target group (assessment) was performed by community members—mainly women—who had been trained in the use of the Shakir Strip and instructed as to the significance of a reduced mid-upper-arm circumference. The design of the programme was informed on the one hand by an understanding of the most important factors underlying rural child undernutrition in Zimbabwe, and on the other by knowledge of rational dietary measures and identification of locally used and cultivable food sources (analysis). By deliberately selecting for use in the programme foods that were highly nutritious, traditionally used in weaning, and commonly cultivated, and by reinforcing their value with a very specific message in the form of a widely distributed poster asserting the importance of groundnuts and beans in addition to the staple, it was possible to shift the focus of the intervention from supplementary feeding towards small-scale agricultural production. This was aimed at resuscitating the cultivation of groundnuts—culturally a "women's crop"—which had been largely displaced as a food crop in Zimbabwe by the commercialization of maize. The provision by local and national government of communal land, agricultural inputs, and extension assistance, together with the policy of collective production on these groundnut plots, contributed to improving the food security of poor households. An additional element was the compulsory siting of communal food production plots adjacent to pre-school centres, thus creating facilities for young child care and feeding as well as focal points for immunization programmes and health (supplementary feeding) to preventive and promotive interventions (nutrition education and food production), thereby displaying the features of a comprehensive primary health-care programme. This comprehensive approach to child undernutrition, widely displayed through the CSFP's operation, greatly influenced the management of this problem within the health sector. It resulted in a changed approach within health facilities to the dietary management of the sick child and to nutritional rehabilitation. It also created a community-level infrastructure of feeding points and (later) food production plots/child-care centres to which recuperating undernourished children could be discharged. Thus the sequenced addressing of immediate (dietary) and underlying (household food insecurity, inadequate young child care, and inaccessible health services) causes by the feeding and the communal plots and pre-school centres, respectively, was made possible both by careful design

based on a prior analysis and by the presence of a well-organized and motivated population.

Indonesia's UPGK is premised on the concept that a healthy child gains weight every month. This places growth monitoring at the centre of this programme in which community-based monthly weighing is accompanied by intensive nutrition and health education, administration of a "nutritional first-aid package," supplementary feeding of the undernourished, food demonstration, and advice on home gardening. The design features of this programme were based on substantial research data describing the pattern of young child undernutrition and an understanding of the imperative to improve young child-feeding practices, especially during the weaning period [8]. Linkages to possible underlying causal factors do not seem to have been explicit in this programme's design. However, the strategy of inducing behavioural change (in respect of feeding practices) and local self-reliance (in respect of food production) reveals an implicit linkage between improving diets and attempts to increase household food security as well as child-care practices.

India's Tamil Nadu Integrated Nutrition Programme is fundamentally based on the delivery of nutrition services consisting of monthly growth monitoring, short-term supplementary feeding for malnourished children and for pregnant and lactating women, deworming and micronutrient supplementation, and education on diarrhoea management and feeding. Improved coordination with health services for children and mothers is also a feature. Although the programme design does not reveal an explicit linkage to household food insecurity as an underlying determinant of malnutrition, about one-quarter of the project's food requirements were provided by village women's groups in a neighbouring state: this contributed to the incomes of local women and educated them in the production of a low-cost weaning food [9].

By strengthening maternal and child health services and providing education about improved child-care practices, this programme appears to have focused on health and care as the underlying factors to be tackled in improving young child nutrition.

All of the above programmes were targeted to some degree. Initially in Zimbabwe and Tamil Nadu, poorer districts were targeted, whereas in Indonesia and Iringa, almost universal geographic coverage was attempted. In all of these areas, children under five years of age (under three years in Tamil Nadu) were targeted, with only thin children being registered in Zimbabwe for supplementary feeding, although in the later phase all children under five years old benefited from supplementary food production in the districts where this was operating. In Tamil Nadu and Indonesia, pregnant and lactating women were also included.

Programme management

Central to successful implementation and proper management of nutrition programmes are personnel. Factors governing their functioning include selection, training, support (including resourcing), and supervision.

In all four programmes described above, community-level workers were primarily responsible for on-the-ground implementation. In all cases, the workers were selected from the local community. In the case of Tanzania's INP, Indonesia's UPGK, and Zimbabwe's CSFP (in its early phase), the workers were selected by community structures. In Tamil Nadu criteria for selection included residence in the village as well as age and educational qualifications; however, the role of the community in such selection is not clear and appears to have been variable.

Similarly, in all four programmes training has been a very important success factor, with Tamil Nadu and Tanzania having the most elaborate and longest training components. The TINP community nutrition workers received three months of initial training from a community nutrition instructress, with annual refresher training. The last 10 days of training were conducted jointly with the multipurpose health worker, thereby strengthening links to the health sector. In Iringa, following an initial village orientation, volunteers were trained as temporary village health workers (VHWs). Later their training was expanded to six months, including three months of field experience. Attendants at village day-care centres were given a two-day orientation on child care. In Indonesia's UPGK programme, community volunteers were initially trained for five days by health centre staff. Later, as the programme expanded, the duration of training was reduced to three days, resulting in reduced capacity to give appropriate nutrition advice and interact sympathetically with caregivers [8]. In the early days of Zimbabwe's CSFP, training was brief and limited to the use of the Shakir Strip, maintaining a register for children enrolled for feeding, and accounting for and preparing distributed food. Feeding point coordinators—who were mostly women selected by their village structures—received this short training at the district level from staff of the Ministry of Health or personnel working for various health-related non-governmental organizations. Later, during the expansion of the SFPP, intersectoral training was conducted at all levels, and a training handbook was developed with each sector defining its own training needs [1].

Support, supervision, and provision of resources—including transport for supervisors and scales and other equipment for village-level workers—have clearly been important in ensuring programme success. Support and supervision appear to have been best planned and conducted in the Tamil Nadu and Iringa projects. In the former, the community nutrition worker is supervised

by a community nutrition supervisor, who is usually a college graduate, and trained by a community nutrition instructress. A Subdistrict (Taluk) and District Nutrition Officer assist with and monitor administration, and at the state level a Project Coordination office oversees training, communication, information processing, and evaluation. In Iringa there is support for the VHW from other members of the village health committee and other village members as well as from the ward (subdistrict) level. The project provided a motorcycle to the Ward Secretary and vehicles to the divisional and district levels. Their activities ensured good supervision and regular communication as well as the participation of other development sectors. In Indonesia, as the goal of Universal Child Immunization by 1990 was embraced, the Department of Health allocated to each village post (now called *posyandus*) a health worker who assumed responsibility for supervision of all activities, including those related to nutrition. Although this resulted in improved credibility, for these village-level activities it also, according to Rohde [8], led to the "medicalization of the programme, due to the presence of a health worker at each monthly weighing session." In Zimbabwe's CSFP and later in the SFPP, support and supervision came initially predominantly from the health sector, with the Department of Agriculture becoming active in the programme's second phase. In an evaluation conducted relatively early in the programme's life, it was concluded that management structures and supervision needed to be strengthened [1].

Mirroring the training efforts and the support and supervision, monitoring appears to have been best developed in the Tamil Nadu and Iringa projects. In these two initiatives, management information systems based ultimately on growth monitoring data were used to monitor project progress and, particularly in the case of Iringa's INP, used to inform and stimulate village-level discussion and dialogue with government departments about progress. Tamil Nadu's system is evidently detailed and finely developed through training at all levels and development of feedback loops. Although it did allow for the monitoring of several facets of this programme, its organizers acknowledge that it sometimes proved duplicative and too cumbersome, resulting in a decline in monthly feedback to the field [9]. In Indonesia and Zimbabwe, it seems that management systems were simpler and developed more slowly and organically, without the degree of forward planning of Iringa and certainly of Tamil Nadu. Indonesia's UPGK developed a simple and standardized village-level monitoring system that documented activities and progress on a monthly basis and was used in a graphic display to stimulate inter-village competition. Zimbabwe's CSFP initially relied upon district coordinators—who traveled on local public transport—to supervise and monitor feeding-point activities. Later, as the SFPP evolved, intersectoral management was conducted by provincial and district-level Supplementary Food and Nutrition Management Teams [10]. Monitoring was performed through the maintenance of local-level registers recording children's growth, food production, and other data.

Summary

The above discussion on technical factors contributing to the success of CBNPs has focused on programme design and management and subcomponents thereof. It seems apparent that the designs of the programmes in Iringa and Zimbabwe were based on an analysis of the multilevel causation of the nutrition problem, deliberately fashioning a sequenced intervention comprising activities addressing the proximal causes and having characteristics that spawned activities to address underlying and more basic causes. In Iringa's case, this process studiously involved the recipient communities at all stages. The UPGK and TINP initiatives, although multifaceted, appear to have been designed both with less community involvement and with less apparent intent to promote an integrated and multisectoral approach to undernutrition. That "small credit (schemes) for agriculture and women's development have proliferated through the posyandu system" [8] seems to be more a reflection of the development and maturation of the posyandu structures than a design feature of the UPGK.

As far as programme management is concerned, the TINP appears to have been very well planned and implemented from the outset in terms of management systems and physical and human resources, with many of the latter having been specifically created for and employed in this programme. The Iringa project is similar, albeit less elaborate. The Indonesia and Zimbabwe examples appear to have relied much more on community volunteers, supported and supervised by already existing governmental (and non-governmental in the case of Zimbabwe) staff.

Financial factors

Gillespie et al. [2] state that "there seems to be some convergence on around $5–10 per head per year being a workable, common level of expenditure in nutrition programmes, though generally not including supplementary food costs." The calculated costs per capita for the Tamil Nadu, Iringa, and Indonesia programmes in the late 1980s were of this order, with the UPGK being the least costly. Financial data are unavailable for the Zimbabwe programmes. Descriptions of the Iringa programme indicate that staff costs were the largest expenditure category: this makes it somewhat surprising that the Tamil Nadu programme costs are so low, given its formidable array and number of staff. It presum-

ably also explains the very low cost of the Indonesia programme, which relied heavily on volunteers, supervision being rendered largely by staff already employed in the health services.

Three of the four programmes described were initially funded externally: Iringa by a range of external donors, unilateral and bilateral, Tamil Nadu by the World Bank, and Zimbabwe at first by a number of national and international non-governmental organizations and later by the Swedish Government. All of these programmes have enjoyed substantial financing from their governments; funding continues to be provided even as donor contributions have diminished. Ongoing financial commitment will ultimately depend on governments' "political will," which, it has been argued, is significantly shaped by their responsiveness to community demand.

Conclusions

Success in community-based nutrition programmes has in the past proved elusive. The four programmes discussed above are generally acknowledged to be successful. Each displays its own unique combination of contextual (sociopolitical), programme (technical), and financial factors. If they were to be placed along a spectrum with "sociopolitical" at one end and "technical" on the other, it is this author's estimation that Zimbabwe's CSFP/SFPP would lie towards the sociopolitical end and Tamil Nadu's TINP towards the technical, with Iringa's INP closer to Zimbabwe and Indonesia's UPGK closer to the technical end. Some might argue that the more technical programmes are more instructive and more replicable, given that conducive sociopolitical factors are difficult to create or reproduce. Although this is partially true, both the Iringa and Zimbabwe programmes seem to demonstrate that with careful design and phased implementation of different components, nutrition activities can serve to enhance positive sociopolitical factors, thereby creating a context not only for the initiation and sustaining of nutrition programmes, but also for the building of capacity for the broader challenge of social development.

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Community-based programmes: Success factors for public nutrition derived from the experience of Thailand

Kraisid Tontisirin and Pattanee Winichagoon

Abstract

Thailand has faced the major nutritional problems of protein–energy malnutrition and micronutrient deficiencies, notably iron, iodine, and vitamin A deficiencies. For decades, the problem was addressed through the national health planning system. Its alleviation was embedded in a service-driven approach, which not only consumed a disproportionate share of the government budget, but also restricted participation by the people and depended heavily on centralized planning. This approach failed, resulting in a paradigm shift to community-driven programmes, which were seen as investments for the health of the Thai population. Nutrition was framed as part of the National Economic and Social Development Plan. A comprehensive situation analysis was undertaken and the results were used for community mobilizing, organizing, and financing, using basic minimum needs indicators to guide the process. Critical to the success of the community-based approach was the village-level volunteer system, which featured manageable ratios of mobilizers, facilitators, and households, interacting to define the needs of the communities and propose solutions.

Introduction

Like other developing countries, Thailand has faced the major nutritional problems of protein–energy malnutrition and micronutrient deficiencies, notably iron, iodine, and vitamin A deficiencies. For decades, Thailand addressed malnutrition as a small part of national health planning. Its alleviation was embedded in a service-driven approach, in the same way other health issues were addressed. It was a long battle, as it is in other developing countries, underscored by the struggle to get a comprehensive system in place. The struggle was often worsened by the fact that the government did not have a large allocation for health. The service-driven approach relied on and consumed a disproportionate share of the government budget, and was often offered as welfare service. There was very limited or no participation by the people, and resource allocation depended heavily on centralized planning. Not until the latter half of the 1970s, when examples of community-based operational research on malnutrition alleviation and the primary health care approach were successfully implemented, did the need for change become evident.

New thinking on how health care should be implemented in rural areas and a paradigm shift to community-driven programming were perceived to be innovative approaches to investment in improving the health of the Thai population. In this development paradigm, the principal emphasis was put on maximizing community participation and keeping service delivery to a minimum. Social mobilization has become the key element in successful programme implementation.

Effective communication of "what" and "why"

Recognizing the dearth of knowledge, and concerned that the scope of malnutrition and its consequences was beyond the reach of the responsible agency and academia, a comprehensive situation analysis was undertaken to shed light on the problem. The information thus obtained was disseminated to increase public awareness about "what" malnutrition is and "why" it is important, and to stimulate the understanding that the well-being of the nation depended on individual and public action. This generated the initial momentum for addressing malnutrition as a national, community, and family concern, a necessary prerequisite for any programme to be implemented successfully.

Nutrition as a development agenda

Despite the efforts, implementation of malnutrition

The authors are affiliated with the Institute of Nutrition at Mahidol University (INMU) in Salaya, Thailand.

alleviation was not a one-shot matter. First, nutrition was framed as part of the national development agenda. For the first time, explicit strategies for nutritional goal attainment were established as part of the National Economic and Social Development Plan (NESDP). An action plan at the national level was instituted as an integral part of sectoral planning aimed at unifying the goal of alleviating malnutrition among specific, priority target populations.

At the community level, intersectoral implementation was originated in the conventional manner, i.e., sectors designated their allocations for specific nutrition activities. The weaknesses of the approach were not recognized until the first five-year efforts were evaluated, and the accomplishments were far from the anticipated goals. It was realized then that merely putting malnutrition on the national agenda was inadequate for effective implementation of a successful programme. The evolution of primary health care, along with the implementation of a community-based approach to malnutrition alleviation, was timely. Over time, the basic minimum needs approach was integrated, and it has significantly strengthened community-based, intersectoral implementation of nutrition programmes.

At the national level, rural development was also redefined. Priority areas were defined under the Poverty Alleviation Plan. Meanwhile, the national mechanism was re-engineered to be more effectively supportive of rural development. Nutrition was considered an important element of human development for the country.

Community mobilization

Prior to primary health care implementation, the health-care system in rural areas could cover at most about 30% of the population. This may have been due to the fact that the majority of health-care needs were curative, not preventive and promotive. Moreover, limited access due to geographical barriers, transportation access, and poverty all added to the list of barriers to successful health services. From the pilot project of primary health care, it was learned that three pillars, namely community manpower, organization, and financing, are essential for community-based programming.

Community manpower development

The first element, manpower development, involved the adoption of a community health volunteering system. From the early stages until recently (about 20 years in all), two types of community health volunteers were trained: village health communicators (VHCs) and village health volunteers (VHVs). The volunteers were selected from villagers living in a particular community, using a sociogram or some other mechanism agreed upon by the community. All identified volunteers were trained to become "communicators," i.e., liaisons between local health personnel and villagers, to communicate the community's health problems or provide services from the health post. After a period of time, the best one or two performers among the VHVs were selected and given additional training on simple medical care. They were also equipped with the ability to dispense limited medications (from the essential drug list). All volunteers were expected to carry out any necessary elements of primary health care as identified in their own community. The ratio of the number of VHCs to the number of households was 1:10-20; the ratio of the number of VHVs to the number of households was 1:100-200; and the ratio of the number of VHVs to the number of VHCs was 1:10.

Essentially, the VHCs and VHVs are community people who serve as "mobilizers." These volunteers communicate and facilitate preventive and promotive health care through activities such as organizing weighing sessions in the community at an appropriate place identified by the community people, and informing and gathering mothers and infants for vaccination sessions. The advantage of the approach is that the volunteers live in the community, with each volunteer assigned his or her area of coverage (10–20 households). They know the people, having direct lines of relatives in their areas of responsibility. This made it possible for all villagers to be covered for any organized health services. Moreover, the communities' perception of health service delivery was made favourable by ensuring an effective referral system facilitated by the volunteers.

The first training received by the VHCs consisted of a broad range of health-care needs. About 50 lessons were taught in a one-week training programme. In the event of dropouts, new volunteers were selected and trained in the same manner. Dropout rates were high in the early stages of implementation but declined after the first few years, occurring only among those who absolutely could not carry on the commitment. At present, the government allocates an annual budget for refresher courses, generally organized to add new, specific skills training for the volunteers. All volunteers are now given additional training to become VHVs. Being a VHV has become a source of prestige in the communities.

Concerns and doubts have been raised as to how to keep these villagers serving on a voluntary basis. Volunteers are not paid workers and are not auxiliary health personnel. Recognition, peer acceptance, and respect are among the rewards received from their own community. To this, the government added free medical services for members of their families, along with recognition and periodic contests to determine the best performers (with district, provincial, and national winners).

Interface between facilitators, community leaders, and mobilizers

To initiate community-based activities requiring strong

community participation, "facilitators," defined as local workers (usually from line agencies or non-governmental organizations) from varying backgrounds, such as health and agriculture, can play very crucial roles. There are two interfaces of particular import: the one between facilitator and community leaders and the one between facilitator and mobilizer.

Facilitators and community leaders

Through dialogues, facilitators can help the community recognize and distinguish between "felt" needs (e.g., roads and electricity) and "real" needs (good health and nutrition). These dialogues may need several repetitions before the issues and concerns are made clear and are well received by the villagers. The basic minimum needs approach introduced in the Thai primary health care and rural development programmes contributed significantly to the implementation of this step by serving as a guide for people in identifying the problems they were facing.

The basic minimum needs approach is innovative in that it evolved from the basic teaching in Thailand that one needs to have food, medicine, clothing, and shelter to live. This concept laid the groundwork for developing the indicators that address minimum needs for a good quality of life. The set of indicators was tested and refined, and the first set implemented consisted of 32 indicators belonging to 7 categories (table 1). By setting the criteria of achievement for each indicator at the community level (i.e., percentage of households reaching the set criteria), the basic minimum needs indicators could be used as problem identification tools, as goal-setting tools, and as criteria for monitoring the progress of the implemented activities.

Planning, implementing, monitoring, and evaluating

At the national level, setting a clear and explicit impact goal is important for planning. However, the set goal must be realistic, i.e., it must have a good chance of being achieved. At the community level, nutrition indicators are included in the basic minimum needs. What is important is that the measurement of all indicators must be simple and that it be done by the community people, preferably with the assistance of the facilitator, especially at the beginning of implementation.

Once the problem is identified, a solution is more likely to be accepted if the people participate in the decision making and planning. This might not seem feasible at first, but by working and understanding how people cope with their own problems, one gains the ability to recognize people's ability. External inputs, technical or managerial, are in fact information to be processed, modified, and integrated by the people who participate in the process. Efforts were made to use a menu of possible solutions to issues of community concern. The menu of activities, with regard to nutrition, will be elaborated on further.

Using basic minimum needs as a guide makes monitoring and evaluation easier, in that the same set of indicators can be collected and compared for assessment of programme effects. Basic minimum needs indicators are compiled yearly for each community, so that they may be used as a basis for planning the next cycle of activities. The same indicators can be similarly used by local authorities at different administrative levels to plan and make requests for allocation. Thus, in its most efficient use, the basic minimum needs approach serves as a tool for surveillance and action at the community level. Problems regarding the precision of measurement of the indicators may be expected. However, it should be recognized that some of the indicators are crude measures. More precise statistics on such measures can be obtained through other mechanisms, which may need to be set up systematically. Nevertheless, the basic minimum needs approach set the stage for getting people—community leaders, facilitators, and mobilizers—to work together.

Facilitators and mobilizers

The interface that occurs with facilitators differs qualitatively from that with mobilizers. With community leaders, the focus of this interface is to help the community define the problems and plan for solutions. However, in implementing the activities, the people of the community may need specific or additional skills to accomplish the various tasks. Thus, the interaction between facilitator and mobilizer focuses on specific skills, including training, supervision, and quality assurance.

Training

The training of mobilizers has been done on a yearly basis. Refresher courses have also been provided periodically, or as the need arises. All training sessions have been given by local government personnel (i.e., at the Tambol, District, or Provincial level). Training curricula are centrally produced, and additional materials relevant to a locality can be added. Moreover, in the Thai situation, the exchange of short visits to different communities has been another effective means of training, as villagers share their experiences with each other. Often, what is done in one community gets spread more quickly when it is seen that the activities implemented are applicable in other settings.

Supervision

The success of the volunteer system depends a great deal on supervision, particularly at the level of mobilizers. The function of supervision is not only for

TABLE 1. Thailand basic minimum needs indicators (1998)

Indicator	%
Adequate food and nutrition	
LBW prevalence	<7
PEM in children under 5	<10
PEM in schoolchildren	<10
Exclusive breastfeeding for 4 mo	~30
Households that do not eat raw fish	~90
Proper housing and environment	
Houses last at least 5 yr	~100
Houses have basic sanitation index	~60
Households possess and use hygienic latrines	~100
Households with adequate clean drinking water all year round (5 L/person/day)	~95
Households free from environmental pollution (noise, dust, chemical)	~95
Adequate basic health and education services	
Adequate antenatal services	~95
Adequate delivery and postpartum services	~95
Full vaccination for infants under 1 yr	~95
Immunization with BCG, DTP, OPV, and MMR for primary schoolchildren	~95
Households have knowledge of and exercise prevention against HIV/AIDS	~80
Primary education for all children	~100
First-year enrolment in secondary education	~95
Literacy among citizens 14–50 yr old	~99
Households receive at least 3 pieces of useful information per week	~95
Security and safety of life and properties	
Households with safety of life and properties	~100
Households protected against accidents	~95
Family planning	
Couples with wife aged 15–44 yr use family planning services	~90
Couple with not more than 2 children	~75
Participation in community development	
Households belonging to at least one development group	~90
People are active in voting	~90
Households involved in caring for public properties and in self-development activities	~90
Households involved in conservation of natural resources and environment	~90
Spiritual and ethical development	
Households involved in religious activities at least once a week	~90
Family members not addicted to alcohol	~90
Family members not addicted to tobacco	~95
Households involved in traditional or cultural activities	~90
Elderly receive needed care	~100

Abbreviations: LBW, low birthweight; PEM, protein–energy malnutrition; BCG, bacillus calmette-guérin; DTP, diphtheria, pertussis, and tetanus; OPV, oral polio vaccine; MMR, measles, mumps, and rubella; HIV/AIDS, human immunodeficiency virus/acquired immunodeficiency syndrome.

monitoring progress, but also for on-the-spot training in additional specific skills, assistance with trouble-shooting related to implementation, and motivation. Thus, it is a sharing and exchanging of ideas for specific, concrete, technical and managerial matters. Regular interpersonal communication was shown to be most effective. However, it should be complemented with other methods (e.g., organized meetings, social events, and distant supervision via print and electronic media). In practice, monthly or bimonthly meetings between facilitators and mobilizers/volunteers and community leaders/groups have proven essential for effective supervision. Additionally, periodic supervision by higher-level personnel should be encouraged, and possibly new and updated information brought into the discussion.

Community nutrition actions

Since the foremost nutritional problem in Thailand is protein–energy malnutrition among children under five years of age and pregnant and lactating women, examples of community nutrition will be discussed in some detail in this section. In implementing these ac-

tivities in rural Thailand, it became obvious that although the health sector might play a leading role in some respects, isolated vertical programmes could not bring about the sort of success achieved through the implementation of an integrated, holistic nutrition programme with strong community participation, as described above.

Growth monitoring and promotion

The target population of this activity is children under five years of age. Weighing sessions were scheduled quarterly and run by VHCs and VHVs and the mothers of the children or women's groups, as it suited each community. In the early stages, the health personnel had to be supervised more closely, but as things became routine for the village volunteers, the sessions were conducted with less supervision. Once weighing was done, the children were classified as normal or as having first, second, or third degree malnutrition. Children in the second and third degrees of malnutrition were monitored closely or referred to the appropriate health service, as deemed necessary. They also received nutrition supplements free of charge (see below). This had in fact an educational purpose; however, it also served the immediate needs of the malnourished children, who often came from rather poor families. These children were then weighed at closer intervals on a monthly schedule. Other children got the food at some cost and continued to be weighed quarterly. Further investigation and appropriate actions are given as guidelines for children who did not improve.

Breastfeeding and complementary feeding

Although breastfeeding is traditionally practiced, at times for as long as two years, semi-solid foods are also given quite early in life (e.g., three to seven days or one month). This has remained the main difficulty in the promotion of exclusive breastfeeding in rural Thailand and has yet to be adequately resolved. The introduction of solid foods is becoming more delayed (for two or three months), but more updated information is needed. In addition, the false perceptions of mothers about breastfeeding (e.g., colostrum must be discarded, breastfeeding is old-fashioned, it distorts the figure) had to be addressed. These issues have been addressed in the national breastfeeding campaign. More recently, increasing numbers of mothers working outside the home have been faced with more difficulties in breastfeeding.

With regard to complementary foods, infants are traditionally given only rice or banana as their first solid foods. The timing of the introduction of complementary foods has been considered inappropriate, since they replace what the infants should be receiving from breastmilk. The improvement of complementary food was done, however, on a commercial scale by a governmental agency. Although the product was good, the logistics of production and distribution prevented the foods from reaching the needy, particularly in rural areas. Moreover, the food was promoted as a supplement rather than as a complement to breastmilk.

These problems were recognized and resolved by the introduction of a newly formulated rice-legume-oilseed combination of complementary food. These ingredients could be made available in local areas by the promotion and production of the crops or their purchase at low cost. Additionally, a procedure for processing the food using raw ingredients from household production was developed and promoted. The processing steps were simple, and all equipment was locally available. Just as important, the production of the food could be done in such a way that community participation, especially that of mothers of malnourished children, was feasible. Thus, the process was also educational to mothers and the community as a whole, and the formula was applicable for household-level preparation of the complementary food.

In addition to the production of the complementary food, feeding sessions were organized, and all mothers were invited to participate and learn. It was the decision of the community in most instances to give food free of charge to the more severely malnourished children to ensure that the appropriate food was available for urgent needs. The food package could be kept for at least one month without contamination or change of taste.

Basic health service package

A minimum level of basic health services must be ensured, as infections contribute significantly to malnutrition. Moreover, preventive and promotive measures should receive at least the same level of attention as curative measures. Immunization coverage for infants, children, and mothers must be made accessible to prevent illnesses, particularly the potentially fatal ones, such as tetanus, polio, and diphtheria. Treatment of diarrhoea with oral rehydration salts and treatment of acute respiratory tract infection should be made available at the community level. Community people may be trained to dispense these remedies. In Thailand the essential drug system was covered by village volunteers who had received training. These volunteers also helped to gather mothers and infants for immunization sessions.

Antenatal care

Aside from the care for children, care for pregnant and lactating mothers is also necessary to improve maternal and child nutrition. Traditionally, antenatal care was not perceived as necessary, and birth delivery was taken care of by traditional birth attendants. Several factors occurring during pregnancy are important risk factors

for maternal morbidity and mortality. Thus, the provision and use of antenatal care services should be expected to prevent the potential complications. As a start, a target of at least four antenatal visits was set, with the additional goal of increasing coverage and compliance over time. Women were encouraged to attend antenatal care services at early gestational age, and urged to keep attendance through each trimester.

Home and community food production

Several activities were supported, including home gardening, pond fishing, chicken raising, and growing fruits and other nutritious foods. The activities could be undertaken by individual families or by a community group. Emphasis was given to promoting the production of ingredients that were needed for the complementary feeding of young children, along with other nutritious crops for the other members of the family.

Other supportive activities: Technical and managerial support

Community organization and financing

In addition to community manpower development, community organization and financing were also needed for a good community-based programme. Village committees were encouraged to oversee the planning, implementation, and monitoring progress made on basic minimum needs indicators (table 1). The village committees consist of 15 to 20 people. Chaired by the headman, the committees include respected and educated individuals in the community, along with volunteers from various backgrounds (e.g., health, agriculture). The financing of community initiatives depended on partial funding from outside the community. A cooperative agreement where the government or other external source provided startup funds proved successful. The people contributed as shareholders. Only when participation had reached a sizable level were the funds for specific activities established. Especially in the very poor communities, government investment may be needed to improve the situation before the people are able to participate.

Operational research

In the implementation of community nutrition actions, barriers to implementation may be due to technical, logistical, or managerial constraints. Operational research on these barriers is useful to elicit information and action to improve the system. Appropriate methods, such as qualitative research to identify and understand barriers to proper behaviours and practices, participatory research, etc., was found to be quite effective in programme improvement. Other applied nutrition research, such as development of complementary food, required the application of knowledge in nutrition and food science.

Training of facilitators

A hierarchical training scheme was developed by training personnel in a specific field of expertise at the central level, who then become level 1 trainers. These level 1 trainers then formed teams to be trainers for the lower administrative level, and so on. Periodic short-course training was also organized by ministries and universities as needed.

Management information system

A proper information system is needed for monitoring and evaluating the progress and achievements of programmes for resource allocation and logistical support for programme implementation. A management information system at different levels (and different forms of presentation) for different objectives has to be established. In Thailand the anthropometric data collected at the village level were used for individual surveillance, family, and community action and sent up the line of command. The data were then aggregated for purposes of presenting the national situation and trends. In addition, nutrition indicators were included in the basic minimum needs package of indicators, at these aggregation levels:

» basic minimum needs individual indicators at the village level (village aggregates of household data) for action at the individual, family level;
» basic minimum needs individual indicators at the level of facilitators (Tambol: aggregates of groups of villages; Districts: aggregates of groups of Tambol) for resource allocation and facilitation of action at the village organizational level;
» basic minimum needs aggregates at the provincial level for resource allocation (linkage between the central and the grass-roots level in terms of mobilizing national resources for allocation to priority areas).

National policy direction and programme guidelines favouring implementation of community-based programmes

For a community-based programme to be successful, the people must actively work to resolve the problems. Improving the nutritional status of the population required a national agenda and commitment. Policy makers and planners agreed that good nutrition is fundamental for the country's development, and that investment in nutrition should not be framed as a welfare programme. This garnered the necessary support

for nationwide programme implementation. Moreover, efforts were made in formulating the national food and nutrition plan to be holistic and to involve key sectors of the government to take active participation in this intersectoral effort.

In addition, previous government bureaucracies, such as the superfluous non-functioning committees, were abolished and reorganized to make the national mechanism effective. "Decentralization" (in the practical if not the ideal sense) of planning was also noted as a sound principle in the planning of activities, although the allocation of resources remains centralized. However, some leverage was given for authorities at the provincial and district levels to modify their use of the allocation to best suit the needs of each locale. Provincial committees chaired by governors and consisting of sectoral representatives convened meetings for the annual planning of each province. Several provinces showed a strong commitment to nutrition improvement and served to others as examples for successful implementation.

Success factors in community-based nutrition programmes

Factors contributing to the successful implementation of community-based programmes addressing health and nutrition in Thailand can be presented as follows:

Nutrition as a development agenda: micro and macro level

Gaining momentum: effective communication of the "what" and "why" of nutritional concerns

Effective community-based, social mobilization in nutrition programmes
» community manpower
» ratio of mobilizers to households
» interface between facilitator and communicator leaders
» planning and implementing community-based programmes
» setting impact goals: basic minimum needs indicators
» implementing concrete community menu of activities with community participation
» integrated, holistic approach
» monitoring and evaluating: basic minimum needs indicators
» interface between facilitator and mobilizer
» training
» supervision

Community nutrition action

Other supportive activities
» community organization and financing
» operational research addressing
  – nutrition intervention strategy
  – implementation/managerial/logistical issues
» training of facilitators
» MIS at different levels (for different purposes and uses)
  – basic minimum needs indicators at the village level (village aggregates of household data) for action at the individual and family level
  – basic minimum needs indicators at the level of facilitators for resource allocation for action at the village organizational level
  – basic minimum needs aggregates of provincial level for resource allocation
» policy and planning at the national level well in place
» effective national mechanisms
  – decentralization of planning
  – intra- and intersectoral coordinated efforts

Summary

For decades Thailand faced major nutritional problems that were addressed through the national health-planning system. Their alleviation was embedded in a service-driven approach, which operated as a form of social welfare and was characterized by a constant struggle just to get a system in place. Participation by the people was almost nil, and resource allocation depended heavily on centralized planning. Careful reconsideration of the methods of implementing health care in rural areas, along with a paradigm shift to community-driven programmes, took root as an investment strategy for the health of the Thai population. The principal emphasis was on maximizing community participation, while making service delivery available everywhere at affordable prices. The key success factors that contributed to the successful implementation of community-based programmes to address health and nutrition in Thailand are presented.

Nutrition was made a development agenda at both the micro and macro levels of policy and planning. Effective communication of the "what" and "why" of nutrition concerns was targeted to the public, policy makers, planners, academicians, and other important figures in the country as a means to gain momentum. Subsequently, from around 1982, effective community-based nutrition programmes, with strong components of social mobilization, were launched. Extensive efforts were made to develop community manpower. Village-level volunteers were active and played crucial roles in community mobilization. The ratio of mobilizers to households has been 1:10-20. This ratio made possible the expansion of outreach for preventive and promotive health care, as well as a substantive increase in curative-care coverage, from its initial 35% coverage.

Additionally, various schemes for strengthening community organization and for financing were initiated.

Interactions between facilitators (local officers of health, agriculture, etc.) and community leaders and between facilitators and mobilizers were essential for the community-based programmes addressing community problems. The facilitators interacted with the community leaders to define the problems (real needs) of the community and to facilitate decision making and action plans. The use of basic minimum needs indicators served as a framework for holistic, integrated implementation of activities. The interaction between facilitators and mobilizers centres around the training in specific skills necessary to carry out the action plans. The lists of activities that lead to nutrition improvement, such as growth monitoring and promotion (weighing, breastfeeding, complementary feeding, etc.), antenatal services, and household and community food production, were provided as options for solution. This helped to strengthen the ability of the people in the community to conduct self-help activities. Active supervision was made an integral part of the process. Finally, monitoring and evaluation were done by evaluating the improvement in the basic minimum needs indicators.

In the Thai experience, academicians have played catalytic roles in the application of technical knowledge in various ways, including doing operational research on nutrition intervention. Implementation, managerial, and logistical issues can be studied and the improvements tried out in various research and pilot programmes. In addition, what is learned through these exercises has contributed significantly to formulating training curricula and refresher courses for the various people who participated in the process, from personnel to community people.

Management information systems were set up at different levels and presentations were done in different forms, so as to accommodate different uses of data (different purposes) at each level and by the people of the community. Basic minimum needs indicators at the village level (village aggregates of household data) were used for action at the individual and family levels. The same indicators were used by facilitators (Tambon level: village aggregates; District level: Tambon aggregates) for resource allocation and for facilitation of action at the village organizational level. Basic minimum needs aggregates at the provincial level were used by provincial and central planners for national resource allocation.

At the macro level, it is critical that policy and planning be well in place. Further, an effective national mechanism must be established so that decentralization of planning and intra- and intersectoral coordination can be facilitated.

Public policy in nutrition: US nutrition safety net past, present, and future

Eileen Kennedy

Abstract

The paper reviews the history leading to the creation of the US Safety Net as well as synthesis and critique of evaluation research for the three major programmes: Food Stamps, School Feeding, and WIC. The effects of the cadre of safety net programmes on household income are examined. The recent Welfare Reform Legislation changed the nature and scope of the nutrition safety net. The implications of these changes for income, diet, and nutritional status are discussed as well as critical issues for maintaining the effectiveness of the nutrition safety net in the future.

Introduction

Today we are at a historic crossroads. Some of the changes enacted by the 104th Congress in late 1996 changed the structure of our nutrition safety net and the country's social safety net. I will focus on three issues:

» What is the US nutrition safety net and what can we conclude about the effectiveness of the constituent components?
» How does the nutrition safety net complement the overall social safety net?
» What are some of the anticipated effects of recent welfare reform legislation and other emerging pieces of legislation?

Recent events

Two recent events served as the focus for rearticulating the government position on food security/nutrition security and hunger in the United States. The first was the report entitled "Nutrition Action Themes for the United States." This report describes the US Government's priorities for improvement of nutrition both domestically and internationally [1]. Our USDA (United States Department of Agriculture) Center for Nutrition Policy and Promotion facilitated the development of the report by an interagency working group with representatives from USDA, HHS (Health and Human Services), and AID (Agency for International Development). There were, initially, seven priority areas for the domestic plan, the second of which is nutrition security. The United States adopts the goal of continued improvement of national nutrition security to achieve a healthier and more productive society.

The concept of nutrition security builds on food security but takes us beyond this. Nutrition security is defined as "access by all people at all times to enough food for an active, healthy life," in addition to the provision of an environment that encourages and motivates society to make food choices consistent with short- and long-term good health. Implied in this is the assurance that individuals have the ability to acquire foods in socially acceptable ways, i.e., without resorting to emergency food supplies, stealing, or other negative coping strategies.

The nutrition security priority was reinforced by the United States in the position paper prepared for the World Food Summit held in Rome in November 1996 [2]. The USDA's Secretary Glickman headed the US delegation to the World Food Summit. Of the eight action steps identified by the United States to improve food security worldwide, there is a specific mention of continuing to work towards food security for all Americans. The idea was expressed thus:

> Recognizing that there exist food insecure populations in the United States, the government continues its pledge to maintain a nutrition safety net that provides access to food and promotes healthy eating.

What is the US nutrition safety net?

In both the US Nutrition Plan of Action and the US approach in the World Food Summit, the nutrition safety

The author is the Deputy Under Secretary of the US Department of Agriculture in Washington, DC.

net is emphasized as the mainstay for improving nutrition security. The US Government has a long, rich history of involvement in interventions that promote nutrition security. The US safety net has evolved over the past 30 to 40 years in response to documented problems of hunger and malnutrition in the United States. Here are some of the key results.

The Ten State Nutrition survey in the later 1960s [3], the Preschool Nutrition Survey [4], and the First Health and Nutrition Examination Survey [5], both in the early 1970s, provided evidence that:

» Low-income households in the United States were more "at risk" for inadequate diets (low calories and insufficiency of a range of nutrients).
» Low-income women were more likely to have poor neonatal outcomes: higher rates of low-birthweight babies and higher neonatal and infant mortality; African-Americans were more at risk than other racial or ethnic groups.
» Stunting and low weight-for-age were more prevalent in low-income children than in children from other income groups.

The survey data were used effectively to put forth the message that even in a country as wealthy as the United States, hunger and malnutrition were apparent. The link between the survey data and very specific actions is an ideal example of how science can be linked to public policy. The survey data were used by key influential policy makers—people such as the late Senators Robert Kennedy and Hubert Humphrey and Senator Bob Dole—to promote nutrition as an important part of the policy agenda. A number of specific actions emerged out of the late 1960s and early 1970s:

» In the early 1970s under President Nixon, the Food Stamp Program became a nationwide programme.
» In 1972 Senators Hubert Humphrey and Margaret Chase Smith sponsored a bill that created a two-year pilot project called the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).
» The School Breakfast Program was created.
» Nutrition Education for low-income households was emphasized by the legislation creating the Expanded Food and Nutrition Education Program.
» The School Lunch Program for low-income children was expanded.

Today, the nutrition safety net consists of 14 distinct programmes addressing various target audiences, as shown in table 1. Of these, the anchor programmes in the nutrition safety net are the Food Stamp Program, WIC, the National School Lunch Program, and the School Breakfast Program.

TABLE 1. Domestic food assistance programmes

Food Stamp Program
Nutrition Assistance Program
National School Lunch Program
School Breakfast Program
Child and Adult Care Food Program
Summer Food Service Program
Special Milk Program
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
Commodity Supplemental Food Program (CSFP)
Food Distribution Program on Indian Reservations
Nutrition Program for the Elderly
Disaster Feeding Program
Emergency Food Assistance Program (TEFAP)
Food Distribution Programs for Charitable Institutions and Summer Camps

Food Stamp Program

The Food Stamp Program is the main food security programme for low-income households. The Food Stamp Program was established in the mid-1960s to provide adequate purchasing power for low-income households. The basic premise underlying the program is that use of the food stamps will increase family food expenditures, which will, in turn, improve food consumption and nutrient intake and ultimately improve health. Table 2 shows some of the early studies that have documented that food expenditures increase with participation in the Food Stamp Program [6–10].

In addition, data from the USDA show that the diets of the poor improved markedly between the period 1965/1966 and 1977/1978, a period that marked the nationwide expansion of the Food Stamp Program. Work by Fran Cronin [11] at the USDA documented

TABLE 2. Effect of the US Food Stamp Program on food expenditures and food consumption

Study	Impact on food expenditures
Basiotis et al. 1987 [6]	+
Salathe 1980 [7]	+
	Total food expenditures up 9.5%
	At-home food expenditures up 19.0%
West and Price 1976 [8]	+
Blanciforti 1983 [9]	+
	7.0% increase in food purchases
Senauer and Young 1982 [10]	+

that the lower intake of nutrients in low-income households shown in 1965/1966 was not apparent in the 1977/1978 survey. Between 1965 and 1977, the average nutrient intake levels for households in the lowest-income group improved more than those in other income groups. The Food Stamp Program has been successful in increasing food expenditures and nutrient intakes.

Using the most recent 1994 Continuing Survey of Food Intake by Individuals—a USDA survey based on a nationally representative sample—we find that food stamp participation is significantly associated with both increased food expenditures and, more importantly, improved diet quality [12].

Women, Infants, and Children Program

The 1969 White House Conference on Food, Nutrition and Health recommended that pre-school children and pregnant women be given top priority for nutrition programmes. Thus the Women, Infants, and Children (WIC) Program was authorized as a two-year pilot project. The numbers are impressive: as of September 1996, WIC was serving 7.4 million participants operating through 85 state agencies and 8000 local agencies. What made WIC go from a small, pilot project to a programme serving 40% of all infants born in the United States and one out of four pregnant women in the United States? Why is WIC so popular? There are many reasons, but one of the key reasons is that evaluation research was built into the programme from its inception.

Table 3 shows the chronology of evaluations from 1974 to the mid-1980s. As we explore each of these studies, we find that a variety of research designs were used to evaluate the effectiveness of WIC [13–18]. A consistent pattern of positive health and nutrition benefits associated with WIC emerged.

This has given policy makers confidence that the health and nutrition benefits are real. An analogy I like to use is the FDA (Food and Drug Administration) decision-making process for allowing health claims to be made on the food label. The term "significant scientific agreement" is used to indicate that a series of clinical, epidemiological, and other studies are available with the results pointing in one direction.

I highlight this because in WIC the results are not based on simply one study. Thus in WIC an accumulating body of evidence has emerged over the years that links participation in WIC to significant health and nutrition outcomes.

In addition to the research related to the nutrition impact of WIC, a number of studies have been done to analyse its cost-effectiveness. Participation in WIC prenatally results in Medicaid savings of US$1.77 to $3.90. A May 1993 report by Barbara Devaney and Allen Schrim using extant data from five states (Florida, North Carolina, South Carolina, Minnesota, and Texas) found that infant mortality decreased with WIC participation [19]; this decrease was statistically significant in all but Minnesota. Most of the decline in infant mortality is due to decreases in neonatal mortality. The effect associated with WIC is independent of the receipt of prenatal health care, which is also associated with large and statistically significant reductions in infant mortality.

It is interesting to note that for both the WIC and the Food Stamps Programs, it is almost impossible in the late 1990s to do these types of studies. It is extraordinarily difficult to find high-risk, income-eligible people not on WIC. For example, very few low-income pregnant teenagers are not on WIC. Similarly, using the most recent survey data out of USDA [20], we find that food stamp-eligible but non-participating households have a higher income than households that are eligible and do participate. Appropriate comparison groups for both WIC and Food Stamps are difficult to find, attesting to the good coverage of the programmes.

School Lunch and School Breakfast Programs

Nationally representative studies of school meal participants were conducted in the early 1980s [21] and the early 1990s [22]. Each of these studies showed that school lunch and school breakfast contributed to the intake of certain nutrients.

Viewed together, the nutrition safety net has been effective in improving the health and nutritional status of the target population. The programmes have also used the monitoring and evaluation results to change the programmes to be more responsive to the intended clientele. A few examples of note are in order. The Food Stamp Program originally had a purchase requirement; households had to spend a certain amount of money in order to get a substantially larger amount of money in free food stamps. Survey data indicated that this purchase requirement was a significant barrier to the very-low-income households in the United States. Thus in the late 1970s the purchase requirement was eliminated from the Food Stamp Program.

When the WIC Program was originally established, nutrition education was not a required part of the programme. Over time, nutrition education has been mandated as an essential service. In addition, specific funding was established exclusively for breastfeeding promotion; this is in addition to the basic nutrition education services in WIC.

Since 1996, the school meals programmes, which were initially designed with a nutrition standard based on a specified level of calories and nutrients, have had the nutrition standard also based on the Dietary Guidelines for Americans [23]; school meals must meet specified requirements for total fat and saturated fat.

Thus the ability to change in response to the changing needs of participants is viewed as a strength of the

TABLE 3. Evaluation designs and highlights of results from WIC evaluation studies

Research institution	Study design	Highlights of results
University of North Carolina [13]	Prospective study; cohort design; pregnant women entering WIC compared with women already on WIC to assess programme effect. 9,867 pregnant women included initially, 5,417 revisited; 41,330 infants and children	WIC women had significant increase in weight gain Birthweight of newborns significantly increased for mothers participating more than 6 mo Gestation 5–6 d longer Increased weight and height for WIC infants and children Increased intake of all target nutrients except energy for 1- to 3-yr-olds in WIC
Harvard School of Public Health [14]	Retrospective study; non-equivalent group design; 1,328 women from 4 geographical areas and 9 WIC and non-WIC sites included	Increased birthweight and decreased rates of low birthweight for infants born to WIC mothers Haematological status of WIC women significantly better than that of non-WIC women For each $1 spent on WIC prenatally, $3 in medical savings
Massachusetts Department of Public Health 1980 [15]	Retrospective study; matched control design; all WIC women who gave birth in 1978 were matched to non-WIC control based on race, age, parity, maternal education, and marital status; 4,126 pairs included in study	Significant increase in mean birthweight, decrease in low birthweight, and decrease in prematurity in infants born to mothers participating in WIC Significant decrease in neonatal deaths associated with WIC
Massachusetts Department of Public Health 1982 [16]	Retrospective study; follow-up to 1980 study; all WIC women who gave birth in 1978 and for whom the 1978 birth was parity 2 or greater were included; 1978 birth outcomes were compared with earlier non-WIC birth outcomes; 1,306 pairs included in study	WIC participation associated with increased birthweight in subsequent pregnancies
University of Oklahoma Medical Center [17]	Prospective study; experimental design; 900 women included in study, 450 high-risk (300 WIC and 150 non-WIC) and 450 low-risk (mainly non-WIC) followed throughout pregnancy	Increased birthweight and decreased low birthweight associated with WIC WIC cost-effective
Nationwide Evaluation [18]	Prospective study: 5,205 WIC prenatal participants compared with 1,358 non-WIC women. Historical study: 1974-80; 1,392 counties in 19 states and the District of Columbia; 11 million births	Historical study data find that WIC participation prenatally was associated with significant increase in birthweight, decrease in low birthweight, and decrease in late foetal death rate No significant effect of WIC found in longitudinal study Infants and children – improved haematological status associated with WIC – improved intake of selected nutrients – increased head circumference

nutrition safety net; however, the proposed block granting of the nutrition programmes was opposed by the Clinton Administration in the last Congress.

Block grants

In the last Congress, block granting of child nutrition programmes and the Food Stamp Program were proposed as part of a broader package of welfare reform. The USDA opposed the block grant approach, for the following reasons.

National nutrition standards would no longer be mandatory; each state could decide the level of benefits provided in the various programmes. Thus the benefits could vary dramatically from state to state. History gives us some indication that this would happen. Prior to the establishment of the Food Stamp Program as a national programme with a federal benefit structure, benefits in the programme varied markedly from state to state. In general, poorer states had lower levels of benefits than wealthier states.

Economic responsiveness of the nutrition programmes would be jeopardized. Historically, the Food Stamp Program has automatically expanded to meet the increased need when the economy is in recession and contracted when the economy improves. Between 1990 and 1994, the number of people in the Food Stamp Program increased by one-third, and the programme funding expanded to meet this increased need. Under a Food Stamp Block Grant, the increase in funding to meet increased need would not happen. The importance of the loss of an automatic adjustment in the Food Stamp Program can be assessed by considering the period 1989 to 1994, when the economy fell into a recession and subsequently recovered. Over this five-year period, benefits would have fallen and the cumulative shortfall would have exceeded $43 billion. Funding reduction of this magnitude would have resulted in 16.8 million fewer recipients, including 8.3 million fewer children, reached by the Food Stamp Program.

Block grants eliminate national eligibility standards; national standards protect low-income families and their children, no matter where they live. Block grants would permit the 50 states to establish their own eligibility; here again, where states have flexibility, there is enormous variability in benefits. In the old AFDC (Aid to Families with Dependent Children) Program, a single parent with two children qualified for US$120 in Mississippi but $680 in Connecticut. All of the block grant proposals suggested lower levels of funding for WIC, the Food Stamp Program, and the School Feeding Program.

Social safety net

Clearly the effectiveness of the nutrition safety net programmes is influenced in large part by the overall income of the household, which, in turn, is influenced by the larger US safety net. Many Americans are confused about the effectiveness of the US social safety net programmes that have emerged since the time of Franklin Roosevelt.

Using US Census data, the Center on Budget and Policy Priorities [24] recently evaluated the effectiveness of government programmes in reducing poverty. This was done by assessing the number of people who would have been poor before and after a range of government programmes.

Income was divided into three categories. The first was cash income, consisting of Social Security, Unemployment Compensation, Supplemental Security Income (SSI), and AFDC (commonly referred to as Welfare). The second was means-tested income, consisting of Food Stamps, the School Lunch and School Breakfast Programs, and Housing Assistance. The third category of income was the Earned Income Tax Credit (EITC). Some of the main findings were the following:

» In 1995, 57.6 million people would have been poor had no government programme been part of income.
» After counting both cash and non-cash government benefits, 30.3 million people stayed in poverty, and 27.3 million people were removed from poverty.

Thus, about half of those who would have been in poverty were lifted above the poverty line by a combination of government-provided benefits. The authors pointed out that this is not the same as saying that 27.3 million more people would have been in poverty without these benefits. We cannot document the counterfactual situation. If the range of these programmes had not existed, one could not predict the behavioural response of the individual or the institutional response of organizations.

» The combination of programmes had more of an effect on the elderly than on children.

In 1995, of the 27.3 million people who were moved out of poverty, 18.2 were removed from poverty by the social insurance programmes (Social Security, SSI), 7.7 were moved out of poverty by the means-tested programmes (Food Stamps, Housing Assistance), and 1.4 were moved out of poverty by the EITC.

Different programmes were effective with different groups. The social insurance programmes were most effective with the elderly; among children, the means-tested programmes had the most effect on poverty reduction. This is not surprising, given that most means-tested programmes serve families with children. The cadre of programmes reduced poverty among the elderly by about 50% to a final level of 9%. Child poverty was reduced only from 24% to 16% by the combination of programmes. This differential effect on elderly versus children is due in large part to the difference in the level of benefits. In January 1995, the average monthly benefit under Social Security was $697, about twice the AFDC payment of $377 for a family of three.

One potentially important part of the government

social safety net is to better the negative effects of economic recession. The researchers compared the effects of the government safety net in two periods of recession: the early 1980s and the early 1990s [24]. In both periods, the number of people who slipped into poverty increased by about 10 million. However, the government response was different in the 1980s than in the 1990s. In the 1979 to 1983 period, the number of people in poverty after government benefits actually increased; this happened because between 1979 and 1983, a number of government benefits were constricted. Fewer people were lifted out of poverty in the 1979 to 1983 period compared to what we see for 1989 to 1993. The number of people living in poverty was cut in half due to the benefits of the government social safety net in the period 1989 to 1993.

Income–nutrition relationships

Clearly reductions in income are of concern for a number of reasons, one of which is diet and nutrition. Although income is not the only determinant of dietary intake, it is a significant one. The Healthy Eating Index (HEI) is a single summary measure of diet quality [25], which incorporates the Dietary Guidelines and the five major food groups of the USDA Food Guide Pyramid. There are two findings to highlight:

» The HEI ranges from 0 to 100; the probability of scoring below 50—an indication of poor diet quality—is significantly higher for people of low income.
» Conversely, the probability of scoring above 80—an indication of a good diet—increases significantly with increased income.

Any policy change that decreases household income is likely to have negative effects on diet and nutritional status.

Welfare reform

The new welfare law, the Personal Responsibility and Work Opportunities Act of 1996, has dramatically changed our welfare system [26]. There are a number of key features of the new law. The mainstay of the old welfare was AFDC—Aid to Families with Dependent Children—which provided direct cash assistance to low-income households. AFDC has historically attended to different types of households. About 25% of families on AFDC had been on the programme continuously for two years or more. The remaining majority of households participated for a shorter period of time. About 60% of women on AFDC left for work within a year of joining the programme. Approximately 75% of women had returned to AFDC within a five-year period.

The new law converts AFDC, Emergency Assistance, and the JOBS Program to a block grant called Temporary Assistance for Needy Families (TANF), with basically fixed funding. States will now receive a level of funding for income and job programmes based on what they spent in 1994 without respect to the change in level of need in a state. (States can choose 1994, 1995, or an average of 1992 to 1994 for their base level of funding.)

Prior welfare had no time limit; TANF participation has a lifetime limit of five years. States are allowed to set a shorter time limit. Under the new law, legal immigrants were not allowed to receive benefits. About 40% of the net savings in the new law were projected to come from eliminating benefits for legal immigrants. However, the 23 June 1998 enactment of P.L. 105-492 changed the legal immigrant restriction; provisions in this bill reinstated food stamp benefits to approximately 250,000 of the 800,000 legal immigrants who had lost food stamp benefits. The individuals with restored benefits include primarily children, the elderly, and certain Hmong and Highland Laotian immigrants.

The prior welfare law had a federal–state partnership in financing AFDC benefits. This type of structure provided an incentive for states not to reduce funds. A reduction in state funds for AFDC would result in a concurrent decrease in the federal funds for the programme. Under the new law, this funding structure is changed. To receive the full amount of the federal block grant, a state need only maintain what is called "maintenance of effort." This level of effort is equivalent to 75% of what the state spent on these programmes in 1994.

Under the old law, federal welfare funds were mandated to be spent on the AFDC and JOBS Programs. This is no longer true; up to 30% of the TANF block grant funds can be transferred to child care and the social service block grant. Finally, under the old law, there was open-ended funding for child care. Under the new law child-care funds are capped.

Food assistance

Half of the cost savings in the new welfare legislation come from cuts in food stamp funding; this amounts to $22 billion over a six-year period. The bill could reduce the average food stamp benefit by about 20%. There is no hard funding cap on the Food Stamp Program, that is to say, the level of funding was not limited to a specific base year.

Adults 18 to 50 years of age without children are limited to 3 months of food stamps in any 36-month period (in a limited number of cases, this can be 6 out of 36 months). Here again, some categories of legal immigrants are denied food stamps benefits.

Effects of welfare reform

From the above analyses, we have seen that the nutrition safety net programmes have been effective in meeting their stated goals. The evaluation research reviewed

here indicates significant improvement in diet and/or nutritional status. Similarly, the social safety net has been effective in lifting some types of households out of poverty.

If the programmes we have reviewed have been effective, why did the phrase "We must end welfare as we know it" crop up in a number of the debates surrounding welfare reform? The answer is that although some types of individuals and households have been helped by the cadre of safety net programmes, long-term recipients of AFDC alone were not lifted out of poverty. The problem of persistent poverty was not dealt with effectively under the old welfare system. There was a strong bipartisan consensus during the debate on welfare reform that for the 25% of recipients on long-term (greater than two years) public assistance, the welfare system trapped people into intergenerational poverty. The very volatile debate that has ensued revolves around how to modify the social safety net in the United States to make it effective as a policy instrument for poverty alleviation. The major premise of positive impact of the new welfare reform lies in being able to move individuals from welfare to work. The focus of this new policy is to concentrate on more effective alleviation of persistent poverty.

States are already aggressively moving ahead with a variety of employment training and jobs programmes. The major group targeted for job creation consists of single women with children. Although the new Personal Responsibility and Work Opportunities Act ends the long-standing federal entitlement to cash assistance, it does give states more flexibility in creating their own particular approach to promote economic security for low-income households.

The 60% of AFDC recipients (of whom 75% return to welfare within five years) contribute a lot to our understanding of what is needed to facilitate long-term employment. Women who moved from work back to welfare consistently state three major reasons for failure to stay in the job market.

First is lack of health care. The majority of low-wage jobs in the United States do not provide health care as part of the employee benefits; it is estimated that only 9% of workers hired at $5 per hour or less received immediate health-care coverage from their employers. Of those working at the same place one year later, about 33% remained uninsured. In the minority of cases where health-care benefits are provided, they are for the individual only, not the entire family.

The second reason for women returning to welfare is lack of adequate child care. Working poor families—below the poverty line—who pay for child care spend 33% of their income for child care, as compared with 7% of income on a national basis.

The third problem is low wages; most long-term welfare recipients have limited formal education and thus qualify only for entry-level jobs. If the government is serious about making welfare recipients self-sufficient, there needs to be a heavy investment in child care, health services, and job training.

The choices made by states in the design of their welfare reform plans will greatly influence the probability of successfully moving individuals from welfare to work. States that are implementing transitional child-care assistance and continuing the provision of health-care benefits are more likely to ensure the successful long-term entry of welfare recipients into the job market.

Some recent federal legislation will also help provide some of this buffering. A very recent piece of legislation sponsored by Senators Hatch and Kennedy proposed health-care coverage for the approximately one in three poor children in the United States who do not have health-care coverage.

The benefits in the nutrition safety net will become more important as they may come to represent an increasing share of overall household income. Any movement in the direction of block granting for the child nutrition and family nutrition programmes will weaken their ability to ensure nutrition security for low-income households. If the overall effect of welfare reform is to decrease household income, negative dietary and nutrition impacts are likely. If, on the other hand, the reforms encourage long-term participation in the job market, with higher overall income, health and welfare should improve.

As with many types of macro economic reforms, there are often "winners" and "losers." Effective policy strives to enhance the positive benefits that have been achieved, and where negative effects occur, provide buffering mechanisms. One key to be able to adequately document the range of effects on subgroups is to have an effective monitoring system in place. The USDA is involved in monitoring the dietary and nutritional effects of welfare reform as implemented. What we are seeing already is great diversity in the states' approach to operationalizing the new law. A key first step in monitoring the range of effects of welfare reform is to categorize states on the basis of prototypical plans that will then allow policy makers to identify key elements of successful welfare to work plans.

Conclusions

There continues to be a tension between policy makers advocating broad-based economic reforms as a means to achieve nutrition objectives and those advocating more targeted types of nutrition interventions. The data from the 30- to 40-year experience with the US nutrition safety net indicate that both macro and micro level approaches will continue to be needed to ensure nutrition security in vulnerable populations.

Fogel's Nobel Prize–winning research provided solid evidence that investment in public health, including

nutrition, was a key factor in successful development in Europe [27]. The complement of nutrition benefits provided under the US nutrition safety net has led to significant improvements in dietary intake and nutritional status in programme participants. The working poor (those who despite full-time employment still fall below the poverty line) rely on programmes such as food stamps and WIC to ensure access to an adequate diet. The long-term solution to persistent poverty and its resultant negative nutritional consequences will undoubtedly involve a combination of macroeconomic policies with investments that benefit vulnerable populations as well as targeted public health interventions.

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Public nutrition: Research and training needs to advance the field

Beatrice L. Rogers

Abstract

The idea that nutrition as a field of study encompasses more than the laboratory and the clinic is by now widely accepted, as evidenced by recent visible and prestigious showcases for the broadest possible definition of nutrition. This paper goes beyond arguing for the validity of the concept of public nutrition, to identify the role of university-based research and training in advancing the field and professionalizing it. As a start, the false dichotomy of "basic" and "applied" research must be avoided. Public nutrition is inherently interdisciplinary and thus provides a dynamic merging of both. The more critical question is whether public nutrition is a discipline in its own right or a specialization within another discipline. A recent study suggests the possibility of distinct and complementary career paths for public nutrition professionals, each requiring different kinds and levels of training that transcend what any traditional discipline can offer.

Introduction

The idea that nutrition as a field of study encompasses more than the laboratory and the clinic is by now widely accepted. The Institute of Medicine of the National Academy of Sciences, an institution not known for wild-eyed radicalism, asserted in its 1994 report *Opportunities in the Nutrition and Food Sciences* (note the plural on "sciences") that "a new kind of nutrition investigator is needed who researches issues at the interface between the nutrition of populations and the behavioral and social sciences" [1]. This report emphasized the role of nutrition science in health promotion and disease and deficiency prevention, and the importance of understanding sociocultural and economic as well as biologic determinants of nutrition in individuals and populations.

The author is affiliated with the School of Nutrition Science and Policy in Tufts University, Medford, Massachusetts, USA.

As another example, the 14th Annual Nutrition Research Symposium sponsored by Bristol Myers Squibb/Mead Johnson in 1995 was subtitled "Implementing Science for Healthier Populations." The presentations in that symposium spanned the disciplines from basic biology through epidemiology to psychology, anthropology, and economics [2].

The curriculum and education content for public nutrition training was proposed in an earlier article [3], and a number of the ideas here are based on this proposal and associated discussions.

Several colleagues have proposed to define the field of public nutrition as that part of the study of nutrition that deals with the "nature, causes, and consequences of nutrition problems in society," and with approaches to resolving these problems in the arena of public policies, programmes, and interventions [4]. These recent visible and prestigious showcases for the broadest possible definition of nutrition demonstrate that the battle for recognition of the field of public nutrition is surely being won, even before the name "public nutrition" has achieved full acceptance and general understanding.

The goal of this paper, therefore, is to go beyond arguing for the validity and usefulness of the concept of public nutrition, and to identify the kinds of research and training needed to advance the field further and to professionalize it. Specifically, I want to address the question, what is the role of university-based research and training in achieving these goals?

Research in public nutrition

Nutrition as a field of study is inherently problem-focused; the measure of its success, ultimately, is whether things get better. As an economist, I developed an interest in nutrition because nutritional status seemed to me to be a universally meaningful, context-free measure of human well-being, more directly interpretable than leisure or labour, income, possessions, or wealth. Nutritional well-being is not merely a proxy for some

different concept but is itself a key component of welfare, a goal in its own right.

If the goal of research in nutrition is to improve the nutritional situation of individuals and populations, this implies that nutrition research is necessarily "applied," a term often used to contrast with "pure" or "basic" research. The distinction between basic and applied research is far from clear. All research is guided by a question that arises, directly or indirectly, from observation; and the results of even the most basic research are sure to contribute to real-world applications by elucidating cause-and-effect relationships that underlie the application of science to problem-solving.

It is important to avoid the trap of thinking that research in the biological sciences is somehow "basic," whereas research in the arena of public nutrition, that is, research in the social sciences related to nutrition, is somehow "applied." It is an attractive formulation to think of white-coated nutrition scientists in their laboratories, advancing our basic understanding of nutritional biochemistry and metabolism, while the social scientists, public nutrition professionals, forge into the field, developing approaches to translate scientific findings into policy and programme applications. Attractive, but wrong. In fact, both the biological sciences (laboratory-based nutrition research) and the social sciences (public nutrition research) cover the range from very basic, pure research to highly applied research designed to answer specific, operational, programme- or policy-related questions.

The reason for stressing this point is that I believe there is a critical role for research on public nutrition questions that is based in universities and research institutes, and the spurious identification of laboratory science with basic research and public nutrition with applied research contributes to the misperception that universities are not the place where public nutrition research should appropriately take place. Still, we need to recognize that empirical research in public nutrition depends critically on interaction with actual programmes and policies in real-world settings; we seldom have the luxury of creating our own controlled conditions, but rather must seek out opportunities where they occur and adapt ourselves to those conditions we are unable to manage.

Some key research in the human biological sciences has contributed enormously to the design of programmes. For example, understanding the complex biology of vitamin A and its precursors and the roles they play in human biology has contributed not only to a recognition of the importance of these chemicals to human health, but also to the fine-tuning of recommendations regarding the level and timing of dosage [5]. The research was basic; the application to programme design was direct. Now, evidence from the field has pointed laboratory scientists towards the question of whether there are differences in the conversion of β-carotene to retinol depending on whether the source is green leaves or yellow or orange fruits and vegetables [6]. This field observation has led to some highly applied research, designed to answer a programme-based question, yet firmly grounded in the biological sciences, on the absorption of vitamin A from different sources and on the dietary and other factors affecting absorption [7].

Another example: basic research on iron metabolism, currently being conducted at the Human Nutrition Research Center on Aging at Tufts University for the purpose of understanding how iron is used in the body, may result in new, more accurate tests of iron nutriture that can be applied in field settings [D. Fleming, Tufts University School of Nutrition Science and Policy, personal communication, 1995]. Again, basic research provides a result directly applicable to programmes. But there are also examples of iron research that, while laboratory based, are highly applied, in the sense that the research is conducted to answer a very specific operational question. For example, current research is addressing the question whether weekly doses of iron are as effective as daily doses in the treatment of iron-deficiency anaemia. This is a question that applies to the realm of public nutrition, that is, to the design of programmes, but the research itself is clearly in the realm of clinical nutrition, that is, in the biological, not the social, sciences.

These are examples of research dealing with the nutritional status of individuals. Public nutrition, in contrast, is specifically intended to address nutritional issues of populations. In the arena of public nutrition, it is easy to identify research that is "basic," intended to map out fundamental mechanisms of the determination of nutritional well-being or malnutrition; research that is specifically applied, focused on resolving a specific operational or programmatic problem; and research that is primarily methodological. There are clear parallels to all three kinds of research between the biological sciences and the social sciences; between laboratory or clinical nutrition and public nutrition.

Implementing science

One key goal of research in public nutrition is to contribute to the design of interventions that apply scientific findings in programmatic settings—to "translate science into policy." The case of vitamin A again provides well-known examples. Laboratory and clinical research has demonstrated the importance of assuring adequate vitamin A intake [2] and can specify appropriate target groups, amounts, and timing—information critical to designing appropriate interventions. But the process of identifying the programme best suited to achieving the desired outcome falls outside the realm of the laboratory, squarely in the realm of public nutrition.

Laboratory scientists and clinicians are seldom equipped to make decisions as to which approach is best suited to what circumstances. This would require knowing first, what is the range of programmatic options available, and what is the record of their success; second, what are the relevant characteristics of the local environment—political, economic, cultural; and third, what is the nature of the nutritional problem, its causes, extent, and severity? It is the role of public nutrition researchers to provide the context for deciding what overall approach (or approaches) to take, based on feasibility, political support, available resources (human, financial, and infrastructural), and the specifics of a programme design or policy recommendation.

In the case of vitamin A, alternative strategies would include: a market-dependent, food-based approach such as universal fortification of a staple food (examples include sugar in Central America and margarine in the Philippines); a medical model approach, such as the periodic distribution of capsules through institutional settings such as clinics or schools; a behaviour-change model, such as the promotion of home gardens or the alteration of dietary practices. In some settings, pricing policies, market development, or income interventions could have significant impact on the vitamin A status of the population as well.

For vitamin A interventions, the task has been addressed through programme evaluations and cost-effectiveness analyses [8] that incorporated the use of financial, economic, and operational assessment techniques.

Evaluation research is a key element of research in public nutrition. Evaluation is simply the application of social science research techniques to one particular kind of question: whether a particular intervention does or does not work, and why. The "why" question in evaluation research relates to the "how" question that Alan Berg [9], in his influential and controversial Forman Lecture, held to be grossly underemphasized in nutrition research. Answers to the question why a programme works or fails to work should lead directly to an understanding of how the programme could work better.

Evaluation research is conceptually no different from any other kind of research, except that evaluations typically face problems that other kinds of research may be less prone to: issues of random assignment, appropriate control groups, and selection bias. And in any evaluation, there may be more emphasis on the monitoring of implementation (this is often called "process evaluation") to be sure the evaluation assesses the intervention that was intended.

This last concern is not unique to programme evaluation. In clinical studies, monitoring of "process" is critical to reliable evaluation of, for example, a dietary intervention. If subjects in a dietary study do not comply with instructions, or if the feeding formula is handled incorrectly so its nutrient profile changes, then the clinical study will lose its validity, just as a field study would if, for example, educational materials were not comprehensible or sugar fortification was inadequately performed in the processing plant. The difference, perhaps, is that in public nutrition, such failures of process are examined to see if they communicate important information about the feasibility of an intervention, rather than being treated as mistakes. If an intervention that ought to work repeatedly fails to be implemented correctly, it raises questions about feasibility that would form part of the evaluation outcome.

Implementing science requires more than the development of appropriate policy and programmatic responses to nutritional problems based on advances in scientific understanding. Policy analysis and programme design are in part technical exercises, involving the application of expertise in situation assessment, programme design, implementation, monitoring, and evaluation. But there is an important advocacy component that draws on a different set of skills on the part of the public nutrition professional. Obviously, politics is an important dimension of nutrition policy, but skills of persuasion and consensus building are relevant in the technical as well as the political arena. There is little research, and even less that is specific to nutrition, on the process of advocating for a particular intervention, or for intervening in the nutrition situation at all [2]. Such research lies in the domain of political science and sociology. It may just happen to be focused on a nutrition or food policy question; it is rare for nutrition to be the driving force behind research on the process of policy formation.

Finally, applied research in public nutrition includes operational research on specific interventions and their implementation. There is a tremendous need for information on what makes a programme work. This kind of operational focus should not be seen as entirely distinct from more theoretical formulations of, say, organizational theory or behavioural change, but as mutually reinforcing. A specific operational analysis can function as a "laboratory" for testing assessment tools and for expanding understanding of determinants of programme effectiveness, as well as providing guidance to programme implementors. In this sense, the development of assessment tools is one domain of public nutrition research. Models for identifying programme constraints, such as the "programme constraints assessment" model developed for use in South Africa [10], represent an important contribution to the field, providing a mechanism for integrating information about logistical, economic, political, and other barriers to programme effectiveness in a unified framework, going beyond evaluation to improving implementation. Similarly, the assessment tool for identifying food-insecure households that was recently developed at the National Academy of Sciences [11] is a significant methodological contribution to the conduct of public nutrition research.

Basic research in public nutrition

People from any academic discipline understandably see other disciplines in relation to their own. It is easy for laboratory and clinical scientists to see the role of social science research as supporting the application of their own research, as the foregoing examples demonstrate. But a major reason for promoting the concept of public nutrition as an academic discipline in its own right is that basic research needs to be done to understand the determinants of nutrition in populations and societies that has nothing to do with metabolism, nothing to do with genetic endowment, but that deals with determinants of the behaviour of individuals, households, and groups.

The relationship between household income and individual nutrition is one example of a basic question with strong policy and programme relevance. It is axiomatic that low income is a constraint to nutritional adequacy; a logical corollary is that therefore, improvements in income (typically measured as household income) are key to improving nutrition. This belief was enshrined in the 1980 World Bank Development report [12] that argued, "The most efficient long term policies [to alleviate malnutrition] are those that raise the income of the poor."

A great deal of fundamental research has contributed to a refinement of our understanding of the relationship between household incomes and nutritional outcomes. The link has certainly not been discredited, but research has demonstrated that its strength is critically affected by a wide variety of other factors: who earns the income, and at what cost to other household productive activities; the form, timing, reliability, and source of the income; the possible interactions between changes in the level of income and the prices of basic goods, including food; health conditions, which may be a constraint to achieving good nutritional status, despite the ability to purchase adequate food and even curative care; infrastructure in the health system or in the food-marketing system, which may be a barrier to translating increased purchasing power into improved health [13].

Beyond these questions, basic research on the internal economy of households has demonstrated that the "household" is in fact a collection of individuals who conduct exchanges among themselves [14]. At a given level of household resources, nutritional outcomes are determined by the allocation of goods (including food), and tasks (which affect physical activity) among members. Control over separate streams of household income is one important variable affecting the process by which income is used to produce the well-being of household members, but factors other than control over purchasing decisions also affect this outcome—factors including the present and future productive capacity of members, for example [15].

One critical outcome of the stream of research on the internal economy of households is the recognition that time is a household resource comparable to real income, and that time costs are as important as monetary prices in determining consumption choices, choices that ultimately affect food consumption and nutrition. Time costs are at the root of many programme failures: cases in which the time required to take advantage of a "free" service (health care, child feeding) resulted in underuse of the service. The time required to make use of oral rehydration therapy is one factor discouraging its use, despite its clinically proven effectiveness [16]. The time burden of food preparation explains why price changes do not always result in the predicted inverse changes in consumption, an important result for anticipating the consequences of policies such as the elimination of consumer subsidies or producer price supports [17, 18].

This field of research has also contributed to the recognition that interventions outside the realm of nutrition, even outside of health, can have important nutritional consequences. Any intervention that reduces the time burden on caregivers, for example, may permit better feeding practices (more frequent feeding of small children, for example; greater use of oral rehydration in case of illness).

Research on the internal economy of households is clearly basic, in the sense that much of the research has attempted to develop generally applicable models of the behaviour of individuals within households comparable to the neoclassical models of the behaviour of households in response to changing external variables such as prices and wage rates. Like all research, this area has demonstrated interaction between theory building and empirical observation. Many of the observations on which the theory and its modifications have been based come from programme evaluations [19], but the research on models of household and intrahousehold behaviour is not "applied" in the sense I have been using it: that is, it is not directed at answering a specific policy- or programme-related question, but rather at generating an understanding of behaviour and developing universally applicable rules. As with basic research in the laboratory, however, this stream of research has obvious and important application to the design of programmes and to the prediction of policy consequences for nutrition.

If a goal of the study of household economics is to develop universal rules that can be applied in designing programmes or recommending policies, it has surely failed. Researchers hoping to find universal truths regarding the effect of agricultural commercialization on dietary adequacy, for example, or regarding women's income control and children's nutritional status, would have been disappointed by the fact that the one universal truth is that context matters for every one of these outcomes. But this does not mean the research

is less "basic" or less valuable. In the laboratory, researchers are finding complex interactions between genetic profile and the effects of certain nutrients on health outcomes; this is an analogy in the laboratory to the importance of context in determining the effect of an income change on food consumption, for example. What is basic is the knowledge not that women are always more likely to spend their money on food, but that paying attention to gender-disaggregated effects is critical, and that income control is important; not that higher food prices always result in reduced dietary adequacy, but that the price and cross-price effects, as well as non-monetary costs, must always be taken into account.

The economics of households is just one example of a field of "basic" research directly related to public nutrition. There are many others, such as the area of political science that studies determinants of policy change; the area of psychology that studies the determinants of individual behaviour, including the factors influencing adoption of new practices, whether in food consumption, child care, or other areas related to nutrition; and the area of anthropology that looks at cultural determinants of food and health practices.

Public nutrition spans the same range of research questions from basic to applied as do the laboratory sciences. Advances in the field of public nutrition will depend on the availability of rigorously trained researchers and on funding for basic research in the social sciences, comparable to that in the laboratory sciences. Further, the distinction between "applied" and "basic" research is of limited usefulness in either domain. Basic research is applied in the field; field evaluations raise new questions for basic research to resolve; in no sense is applied research "softer" or less demanding of rigorous study design and measurement technique than is basic research. The two simply represent ends of a range of kinds of research questions that can be answered by carefully applied investigative methods.

Training for careers in public nutrition

All of the examples given above and many more that we could all generate demonstrate the application of some discipline other than nutrition to nutritional questions. It is this characteristic of public nutrition, that it necessarily goes outside of the boundaries of "nutrition" as a science, that makes it interesting, useful, and extremely difficult to define. Micheline Beaudry [20] observed that "nutrition is not a sector in the way that health and agriculture are; nutrition is an outcome." Similarly, Jean Mayer frequently noted that "nutrition is not a discipline to be studied; it is a problem to be solved." But in fact, this again is not unique to public nutrition.

The Institute of Medicine report referred to earlier [1] calls nutrition "the most interdisciplinary of all sciences" and stresses the importance of cross-disciplinary training in the laboratory as well as in the social sciences, suggesting that students of nutrition need to integrate this study with another discipline, whether it be molecular biology on the one hand or political science on the other [1]. In the realm of public nutrition (which they do not name as such), they argue that "research skills necessary to confront problems of hunger and food security…go beyond those traditionally found among public health nutritionists," and specify statistics, anthropology, sociology, and (later on) economics as complementary disciplines to nutrition.

This raises a critical question for the training of professionals in public nutrition: is this a discipline in its own right, or a specialization within one of the social science disciplines? Should we, can we train people for public nutrition careers, or should our goal be simply to encourage social scientists to direct their attention to nutritional problems? I think there are two questions here. One is, what is the training needed to perform well in the various jobs related to the solution of "nutritional problems in society"? A second is, what is the academic training needed to achieve professional recognition? Let me start with the first question, and then address the second.

Public nutrition career paths and skills

A recent study conducted at Tufts with funding from the Pew Charitable Trusts allowed me to interview practitioners, potential employers, and advanced students and faculty at universities teaching nutrition, including those with a public nutrition focus [21]. What emerged from that study is that there are distinct and complementary career paths for the applied nutrition professional: distinct, in the sense that each requires a different set of skills and kind of training; complementary, in the sense that each career path reinforces the other.

One career track is that of programme manager (not the person operating the clinic, child-care programme, etc., but the person one level up, who may supervise a number of these, and who may have the authority to make appropriate modifications in the programmes or the job responsibilities of the staff). This is the person who can improve a programme by better implementation in areas such as outreach, operations, and other aspects of management. Existing programmes, if they are offering needed resources and services, will be more effective if they are implemented in a manner that meets the needs and constraints of the target population, addresses the immediate and underlying causes of the nutrition problem in the area, and achieves coverage of those who need the programme most.

This person is probably closest to that intended by

the term "nutrition engineer" coined by Berg [9]: "a person who carries through an enterprise and brings about a result." The most effective of these people can, beyond improving programme implementation, become advocates for programme expansion and change, and for community development and empowerment as well.

A second track is that of the professional working in policy making. In our study, many respondents agreed that a few individuals can make a big difference if they understand the nutritional implications of policy decisions *and* are in a position to alter them. But the ability to influence policy is a function not only (some said not at all) of knowledge and skill, but also of position, prestige, and access to high levels of government. High-quality professional education is critical to these professionals, both to give them access to these positions and to enhance their effectiveness once they are there.

The third arena in which public nutrition training and education are critical is the area of knowledge building or research. As I have argued above, there is a continuing need for research in public nutrition as in other areas of nutrition; the preparation of well-trained researchers is essential to meet this need.

Training and education for public nutrition

These career paths require different kinds and levels of education and different patterns of recruitment, but there are common elements. One is that the training crosses disciplines; no matter what level one works at, an understanding of the multicausal nature of nutrition problems is critical to working effectively, in part in order to know when there are factors outside one's own control that must be addressed in order to achieve nutritional improvement. Another is that the core set of skills for all levels includes the ability to assess the nutritional situation; to conduct process and outcome evaluations of programmes and analyses of policy impact; to identify and use existing information, and to know how to collect new information for these purposes; and to know how to interpret data in a meaningful way and use it to make or modify policy. Despite the political riskiness of saying it, these are the skills of social science research. I would argue that these social science research skills (assessment, analysis, and the application of results, to adapt the triple-A formulation) are the core tools of the public nutrition field, just as laboratory skills are core tools for nutrition science.

Elsewhere, I have spelled out what I believe to be the essential elements of training in public nutrition [3]. These include, besides the research skills of statistics, data collection, analysis, and interpretation mentioned above, the following areas: communications and advocacy; programme management and administration (especially for those planning to work in management and implementation); basic nutrition science; a knowledge of food and nutrition policies and programmes and the conditions of their success or failure; and an understanding of social science concepts, especially in economics and the behavioural sciences. An essential element of such training is fieldwork through an internship or practicum, especially for those who have not already had relevant work experience.

No one can master advanced professional skills in every one of the areas that fall under the rubric of public nutrition. For this reason, I agree with the conclusion of the Institute of Medicine report [1], among others, that training in public nutrition, especially at professional levels, must necessarily include in-depth specialization in a relevant discipline. Again, I would argue that this is not unique to public nutrition. In most fields, students specialize as they advance. In the laboratory sciences of nutrition, students may concentrate in immunology, molecular biology, and other specialties. The key is to master the discipline by concentrating in those areas that are relevant to the practice of public nutrition.

This is an important qualification. The International Nutrition Planning (INP) programme at the Massachusetts Institute of Technology (a programme now no longer in existence) intended to prepare people for careers in what we are now calling public nutrition, through the collaboration of the departments of Nutrition, Political Science, and Economics. But the INP programme could not grant degrees, and each department held onto every last one of its departmental requirements. Two courses in pre-Lockeian political theory and two in post-Lockeian theory were required to complete the Political Science concentration at MIT; despite the burden of extra courses in nutrition, economics, policy, statistics, and others, students in the political science concentration of INP could not waive any of those four course requirements. It is a question of judgement whether all these requirements were necessary to a career in public nutrition.

This exemplifies at least one reason for seeking professional recognition for public nutrition. We need the flexibility to define the educational requirements of the field, even while recognizing the need for genuine expertise in a complementary disciplinary specialization. Within the academic community, departments, divisions, and schools that have the authority to define their own requirements, seeking the collaboration of other departments as needed, have greater probability of success in developing public nutrition programmes than those that must try to bend the structure of existing departments.

Many whom we would define as public nutrition professionals today came to their interest in nutrition over a lifetime career, after professional training in a different discipline (whether economics, anthropology, or nutritional biochemistry). Many of these have made enormous contributions to the field. But the fact that such a career path is possible does not make it ideal. I would mention Julia Tagwiyere, who stated in a semi-

nar at the World Bank [22] that surely there must be a more efficient way to prepare people to be effective in the public nutrition arena than to spend 20 years in on-the-job training. One approach to addressing the needs of such people is to develop educational programmes (such as the one-year midcareer Professional Masters Degree, or targeted shorter, certificate courses) specifically designed to fill in the "public nutrition" gaps in the professional training and experience of those who have chosen to direct their efforts towards solving nutritional problems. But for those who embark on their careers knowing that they wish to address nutritional problems, an explicit professional focus on public nutrition within a graduate degree programme may be more appropriate.

Several models are possible for public nutrition training at the professional level. As suggested in the Institute of Medicine report, the field can try to recruit people who already have professional degree training or experience; or those graduating in public nutrition can seek out an experience like a postdoctoral fellowship or its professional equivalent to round out their education. It would be interesting to explore the possibility of structuring something analogous to the postdoctoral laboratory experience, a mentored but independent transitional professional experience, for people entering the field of public nutrition.

Academic and professional recognition

Many in the academic world have intimated that multidisciplinary programmes are inherently suspect. Some refer to this as the "funny degree" problem. "Traditional" academic disciplines are labels that inform the world what a person knows and is capable of doing; new, multidisciplinary programmes are less easy to define, and the people with such training need to explain themselves and their abilities. (Yet we should recall, as the president of the American Agricultural Economics Association did in a recent newsletter, that the field of biochemistry, when it started, was seen by many as irresponsibly multidisciplinary and undefined.) Some respondents even expressed the concern that only "second-rate" people would choose to go into such unrecognized fields, while first-rate people would naturally gravitate towards fields where the career path and its rewards were well specified.

This reflects a rather narrow perception of what an acceptable career path is. An interest in engaging the real world is not evidence of a second-rate mind (in my opinion), nor is the ability to recognize that the straight academic path is not the only possible one for a person with professional training. Certainly, an economist (for example) who publishes primarily in nutrition and public health journals may not achieve recognition in mainstream economics, but for the committed public nutrition professional, that may not be the field in which recognition is sought. Yet if we wish to promote academic training programmes in public nutrition, we need to confront these biases directly. Public nutrition is an applied discipline; as an area of study, it has more in common with public health or business administration than it does with the liberal arts (not to diminish the liberal arts in any way).

Elsewhere, I have suggested that academic institutions are hampered in their ability to recruit faculty to educational programmes in highly applied fields if they place undue emphasis on publication in juried journals, while ignoring achievements in policy making, programme implementation, and publications in the ephemeral literature of reports and programme evaluations [21]. I stand by that position, and I do think that practical experience should be a key qualification for faculty in such programmes. But the ephemeral literature is just that: ephemeral. Advances in the field of public nutrition depend on having better-established means of communication and more widely disseminated and lasting fora for our own professional communications. This would be especially useful to promote the dissemination of research and experience in operational and managerial aspects of nutrition, which now have few venues for publication. It seems to me that a benefit of institutionalizing public nutrition is that it opens the possibility for developing mechanisms of communication for the practical and operational as well as the theoretical work that is done in our field: sections of existing journals, or even a new journal, and meetings such as this one.

Conclusions

I welcome the opportunity to contribute to defining and building the field of public nutrition. It is a field that has existed and made considerable accomplishments for many years; its importance and validity are increasingly recognized; and the time has come to take some of the steps that are needed to establish it as an accepted and understood professional discipline.

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Report of an International Union of Nutrition Sciences (IUNS) Satellite Meeting on Public Nutrition at the 16th International Congress of Nutrition held in Montreal, 24–26 July 1997

Edited by John B. Mason, Beatrice L. Rogers, and Yaw Agyeman

Abstract

This report summarizes the scope of ideas introduced and debated at the first meeting on public nutrition, convened in Montreal as a Satellite Meeting of the 16th International Congress of Nutrition in the summer of 1997. Consensus was reached, in principle, on the issue of definition and why defining the field was necessary. From this emerged strategic themes related to advocacy, capacity building, training, and research, along with future collaboration for generating momentum for the field. Proposed follow-up strategies include explorations of national and regional networks and meetings, systematic advocacy to raise the profile and clarify issues in public nutrition, and curriculum development to provide adequate training for professionals in the field.

Introduction

On 24 July 1997, a group of professionals from a variety of disciplines, united by a common concern for the problem of nutrition in populations, convened at the University of Montreal, Canada, for a dialogue on public nutrition. Issues of definition, principles, and purpose, in conjunction with strategic themes and proposals for follow-up, were addressed over three days of presentations, plenaries, and small-group discussions. Public nutrition was defined, in broad terms, as concerned with the nutritional status of populations, and therefore with the conditions that lead to or determine this status. The implications of this definition for advocacy, capacity building, training, research agenda, and future collaboration were debated, leading to proposals for short-term and long-term follow-up to establish public nutrition as an emerging field of study, research, and action. This paper is based on the report of the meeting [1].

John Mason and Yaw Agyemen are affiliated with the Department of International Health and Development in the School of Public Health and Tropical Medicine at Tulane University in New Orleans, Louisiana, USA. Beatrice Rogers is affiliated with the School of Nutrition Science and Policy in Tufts University in Medford, Massachusetts, USA.

Principles and purpose

Public nutrition is concerned with the nutritional status of populations. The implication of "public" is twofold. At one level, public simply means concern for nutritional well-being at the population level. Public can also be taken to refer to actions in the public interest, by people's representatives, and with a specific responsibility of the state. The view that good nutrition is a human right is gaining ground and reinforces the concept that public nutrition is a responsibility of society. Any actions that affect public nutrition—public or private, regarding broad policies or specific programmes, whether intentionally nutrition-focused or not—can be seen as part of the purview of the field of public nutrition.

The subject itself is viewed in two compatible but slightly different ways. First, public nutrition is an emerging field of study, research, and action. It is centred on the nutrition of populations, and addresses factors that affect this. Thus, public nutrition encompasses epidemiology, public policy, and programme analysis, along the lines put forward recently in the literature [2]. In this sense, public nutrition is a field of study that can lead to professional qualification, in a manner similar to public health. This means, for example, that degree training, such as a Masters in Public Nutrition (M.P.N.), is a reasonable goal.

At the same time, the field of public nutrition can provide a focus for other disciplines to contribute to improving nutrition. For example, professionals from economics or other social sciences may define their interests in terms of a public nutrition focus. This is an equally important benefit of defining the field. This would be analogous to having economists working in public health: health economics is a recognized subdiscipline

within economics; and people whose primary training is outside nutrition could gain certification, including specific degrees (e.g., M.P.N.), to continue the analogy.

The scope of public nutrition is broad, encompassing but not supplanting more focused topics. Figure 1 shows in schematic form the aspects of nutrition that would be included in a definition of public nutrition. Public health nutrition is shown as a subset of public nutrition; but some concerns of public nutrition (agriculture and food price policies, or politically or ecologically driven food crises, for instance) would fall outside public health nutrition.

On this point, there was broad agreement that public nutrition is compatible with "public health nutrition," but that public nutrition is broader in scope. It was agreed that time should not be wasted in trying to fine-tune distinctions.

Several purposes of defining a field of public nutrition at this stage were seen. One was to give legitimacy to a field of academic study and professional qualification, as well as to actions, promotion, and advocacy, that are underrecognized because they do not fit neatly into established disciplines or professional definitions (or budgets, departments, and so on). In line with this, recognition and endorsement of the concept of public nutrition would give a strong basis for engaging systematically with specialists working in related fields. A wider acceptance of the concept of public nutrition would lead to a stronger sense of identity for those already working *de facto* in the field, fostering coherence and mutual support of their work.

Strategic themes

Many lines or themes were discussed for the development of public nutrition. These are organized under some general headings here, synthesizing the structures adopted by different discussion groups at the meeting. They are distinct from the points for follow-up in that they provide for broader discussion and longer-term strategic aims, whereas the next section gives ideas for what might be done in the relatively near future, in part to begin to adopt this strategy. The overall approach was summarized as advocacy and capacity building to seize opportunities that arise from this; the latter is where much of the detail comes in.

Advocacy

Advocacy for public nutrition should aim at influencing key decision makers. It should also raise the consciousness of the public in order to fuel a demand for nutrition-enhancing policies and actions. Advocacy for public nutrition should be based on clear, empirically based understanding of the factors that affect the nutrition of populations in various contexts. Two streams of reasoning underlie advocacy: first, action should be urged on the basis of obligations related to nutrition rights; second, nutrition-promoting actions should be encouraged by showing their economic benefits and the economic cost of their non-implementation.

A need was seen for a nutrition "champion," "conductor," or "coordinator" at different levels, one responsibility being for advocacy within and between different disciplines and interests. This includes advocacy for action, as well as advocacy for empirical investigation of the justification for action. Various materials, including a flyer describing the field and focus of public nutrition, should be developed and made available. Advocacy about the social, ethical, and economic significance of nutrition could be better orchestrated, and a systematic effort to do so is one possible follow-up.

Capacity building

Capacity building requires education, networking, and research. For individuals, education and training, com-

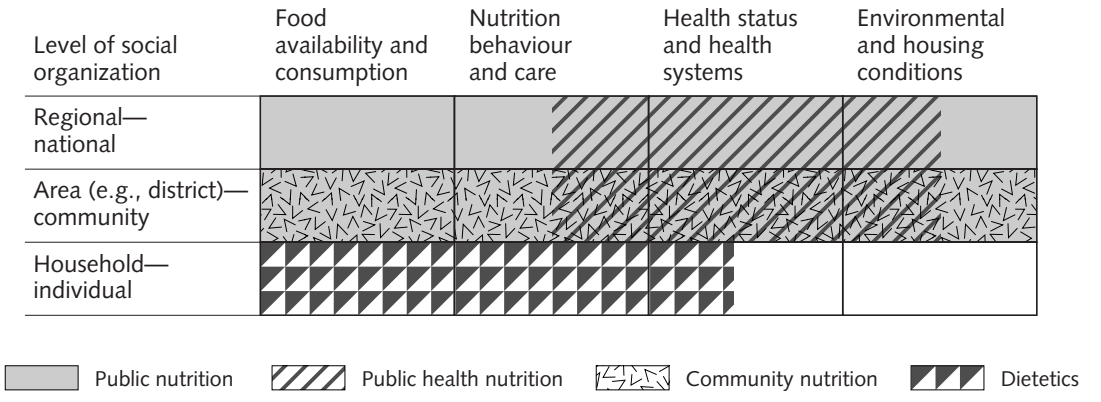

FIG. 1. Areas of concern for public health nutrition and community nutrition organized according to the determinants of nutritional status and different levels of social structure. Source: R. Gross, personal communication, 1997

munication, information generation and dissemination, etc., are dealt with in later points. For the group interested in public nutrition and its evolution, strategies discussed included fostering a critical mass of professionals. For this, the following set of activities was proposed:

» exploring employment opportunities and skills required and desired by potential employers;
» defining the content of graduate programmes and courses;
» sharing course contents on computer disks, CD-ROMs, etc.;
» promoting field experiences early in graduate students' programmes;
» establishing internships that provide graduate students with field experience and programmatic skills;
» establishing exchange programmes between individuals with policy analysis and programme delivery expertise and academic institutions;
» strengthening research and educational programmes in public nutrition;
» establishing a professional identity; this could include possibly establishing a Society for Public Nutrition.

In principle there was agreement that any group or network formation should be broad and inclusive.

It was agreed that communication regarding a society and its activities should be primarily by e-mail. One of the first steps should be to set up temporary interest groups to deal with topics such as training, communications, society structure, future meetings, etc. These groups will interact by e-mail. Information of general interest to the group can also be shared in this way, including work that is not yet published in journals or presented at relevant meetings.

There was strong support for the idea that the initial focus should be on national and regional activities and networks, which would include non-governmental organizations, public sector agencies, and academic and research institutions. Additionally, it was agreed that multilateral and bilateral support is required for these activities—both technical, including that from "northern" academic institutions, and financial.

TABLE 1. Curriculum and educational content for public nutrition training

Applied research skills Statistics; epidemiology; survey and field study design; data handling, analysis, and interpretation; application to community needs assessment; programme monitoring and evaluation; qualitative and quantitative methods
Communications and advocacy skills Ability to write and speak persuasively; identify an audience and communicate ideas at the appropriate level; advocate for a point of view; train and work effectively with staff
Programme management and administration Management and administrative skills as relevant to service delivery, non-governmental organization, government, and international agency settings; personnel management; new management techniques. Techniques for conducting situation analyses; programme design processes, including planning, budgeting, implementation, operations, monitoring, and evaluation
Nutrition science Basic concepts of nutrition science: human nutrition, physiology, and diseases of nutrition and malnutrition; food and dietary composition; assessment of nutritional status in community settings
Nutrition policies and programmes Case study of successful and failed experience of policy and programme interventions, with a study of their rationale and context; how to select policy interventions from a range of possible options
Social science concepts An understanding of the underlying economic and social conditions as related to nutrition and food security; an understanding of behaviour and its social, cultural, and psychological determinants
Fieldwork, internship, and practica The application of training to nutrition problems in field settings

Training and education

Universities should be encouraged to develop and offer courses on public nutrition. Curricula should be developed for public nutrition; the scope proposed earlier provides a useful point of departure [3]. A summary of a proposed curriculum and educational content for public nutrition is given in table 1.

Training should be broad and should be pursued at all levels. A core training package for the field should be developed. The meeting on research and training held in Bellagio, Italy, in 1994 should be followed up in all regions. As part of this effort, one specific and urgent need is to improve opportunities for internship-style field opportunities for young professionals. Ensuring that the perspective of nutrition and human rights is prominent in future training was stressed.

Research agenda

Research should be closely linked to the need for better programme design and implementation and for better understanding of the nutritional implications of policy decisions. The following are examples of possible actions:

» appoint people with field experience in programmes and at the policy level (as appropriate) to research review boards;
» foster joint training for researchers and programme people; try to interest, for example, the Fulbright and Humphrey programmes;
» disseminate research results ("market" them) to programme people, for example, by newsletter;

» try to get more support for "what works" and "how to" research, for example, within donor-supported country projects;
» improve the rate of publication of research results in such topics, especially from developing countries, in established journals. (There was some consensus that it makes more sense to encourage submission of public nutrition articles to existing journals with sympathetic editors rather than start a new journal. The suggestion was made that a mechanism should be found for assisting in the writing and editing of articles so that interesting and relevant articles could be made suitable for publication.)

In general, it was felt that one purpose of networking and communication is to foster cooperation in developing a mutually supportive and practically oriented research agenda.

Materials on public nutrition

More suitable materials for learning and for technical guidance are needed in this area. The proceedings of the meeting (i.e., this issue of the *Food and Nutrition Bulletin*) itself would be one start, and it was agreed that these should be published. A text on public nutrition, including experiences from all regions and available in several languages, should be produced. Material development should include print, multimedia on disk, etc.

Different collaborators in public nutrition

Discussion groups stressed the need to engage a wide range of actors in efforts to improve public nutrition, with special emphasis on the private sector and civil society in general. Collaborators suggested fell into four different categories: public institutions, civil organizations, private entities, and corporate enterprises. Monitoring and evaluation, research, education, and social mobilization were roles identified for the public sector.

Additional points

Additional actions and themes that were discussed included the following:

» working with existing journals to define and promote recognition of the field by changing sections that currently go under the name of "international nutrition" and related areas to "public nutrition";
» including public nutrition sections in other meetings;
» broadening participation by bringing in other nongovermental organizations, public sector agencies, and academic and research institutions;
» providing writing assistance for practitioners to enable them to publish reports on their work in peer-reviewed journals;
» accelerating the transfer of knowledge; this was seen as a critical issue;
» publication in journals to influence colleagues and decision makers "upstream"; however, there also needs to be emphasis on "downstream" influence, through the media, etc.;
» the need for all to contribute to demand as well as supply, that is, asking the right questions to set agendas for research and policy makers;
» avoiding the attempt to formalize an agenda;
» the public nutrition movement needs to be ethical and responsible. Part of this is being rigorous in analysis before statements are made and not being influenced by pressures that come from vested interests in the area.

Proposals for follow-up

Follow-up by participants

It was agreed, in principle, that "follow-up" meant what participants could do next, and how they could collaborate in this. This part of the report thus aims to summarize some of the ideas discussed to facilitate follow-up by participants.

Professional association

Agreement was clear on networking, less so on any formalization of a professional association. Points made were as follows:

» One discussion group believed that a Society for Public Nutrition should be established. There should be no exclusion criteria for membership. It is unclear when the Society should develop by-laws, hold elections, etc., but the by-laws of the Society for International Nutrition Research could serve as a model. The Society should meet every four years at the IUNS International Congress of Nutrition, and perhaps once or twice in between, at appropriate professional meetings.
» Another suggestion was to develop a forum for further discussion and dissemination of information to people interested in public nutrition. A *society* would be useful in this context, specifically for people in the field. It was considered very important to involve the public in further development of public nutrition strategies.
» Two key activities that need to take place before forming any association would be development of a clear definition of the field of interest and a mission statement. The following definitions of public nutrition were put forward as a starting point for discussion: (a) serving the public interest through nutritional means; (b) activities to increase understanding and raise awareness of the nature, causes, and consequences of nutrition problems in populations, and to address them. This needs to be further debated.

A mission statement would provide a mandate for an association and anchor its activities.

» The definition should include both the concept of a population perspective and working for the public interest. With regard to the mission, the need for ethical behaviour and a code of conduct was emphasized.

A recommendation from the organizing group was that the wider group should network on some specific issues, such as curriculum development and training materials and opportunities. An issue that will arise is financial, but first steps can be taken using the funds from registration.

National and regional networks, meetings, etc.

One strategy put forward was to organize meetings around themes, at national, local, and international levels, where a range of groups can be invited to participate. Similarly, sections on public nutrition can be proposed for inclusion in preestablished meetings: regional nutrition meetings, future IUNS meetings, national nutrition society meetings, etc.

Networking needs issues to work on. Procedures for networking will need to evolve; not all communications within one group, country, or region should be copied to everyone else. On the other hand, an important aim of networking is to make sure everyone knows what is going on (at least in broad terms), and that ideas are exchanged efficiently, but without information overload. The principle was that those things that were done best in person at a meeting should be done there; those that can be done in cyberspace should be done that way. Through discussion it should be possible to agree (or equally importantly, to define disagreements) on topics such as the following:

» important constructs;
» what works and what does not;
» research needs and priorities;
» communications/linkages between research/academia and programmes.

Systematic advocacy

A proposal was discussed briefly for systematic (orchestrated) advocacy, to raise the profile and clarify the issues in public nutrition, drawing on the resources and contacts of the participants. For example, the academics involved could ensure a phased and consistent set of statements and publications that would use the scientific literature and related routes to establish the current state of the art. This could contribute to public understanding and high-level attention.

Curriculum development

The universities that are currently offering course work in public nutrition could consult together to identify how resources may be shared, what gaps need to be filled, and so on. Possibilities include putting together interinstitutional courses, exchanging credits, developing materials, coordinating research, etc. The framework already discussed, as given in table 1, provides a start.

Internship opportunities

Graduate schools could develop procedures together for offering field opportunities to young professionals. Such cooperation might be more effective than having each institution pursue this goal individually.

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Patterns of change in food consumption and dietary fat intake in Chinese adults, 1989–1993

Xuguang Guo, Barry M. Popkin, and Fengying Zhai

Abstract

Dietary and socio-economic data were collected from over 5,600 Chinese adults aged 20 to 45 in 1989, 1991, and 1993. Adults were categorized by income and other socio-economic variables, and dietary changes between 1989 and the subsequent two periods were studied. The quantities and proportions of animal foods and edible oils consumed increased dramatically, while daily consumption of grains and potatoes decreased by about 41 to 77 g. This decrease was greatest among coarse grains (corn, millet, and sorghum). The largest contributors to increased fat intake were edible oils, high-fat red meat, and lard and butter. Those eating more grain consumed less fat. Among high-income persons in 1993, 58% had a higher fat intake than recommended (> 30% of calories from fat), 31% had a high intake of saturated fat (> 10% of calories from saturated fat), and 40% had a cholesterol intake exceeding 300 mg/day. The corresponding figures were 27%, 15%, and 21% among low-income persons. This study raises important concerns about some long-term adverse consequences of economic change in China.

Introduction

In recent years, China has been recognized as an economic superpower in the world. China's economic performance has brought about one of the most rapid improvements in human welfare anywhere in the past two decades. Real gross national product has grown by an average of almost 9% a year [1]. By 2002, China's economy is predicted to be eight times larger than it was in 1978. At that point, China would expect to match the performance of its neighbours, Japan, South Korea, Singapore, and Thailand, during their fastest quarter-century of economic growth.

This rapid change has resulted in important health risks that accompany the benefits. In urban areas and increasingly among higher-income groups in rural areas, dietary excess and obesity are emerging [2]. Although there has been a large decrease in the proportion of stunted children, growth failure remains widespread among Chinese pre-school children in many poor rural areas [3]. Although the overall trends indicate an improvement in growth, the average rates of growth in childhood diverge between the urban and rural areas [4].

In China there have been few studies on socio-economic differences in food consumption and nutrient intake; the most recent are the China Health and Nutrition Survey (CHNS), covering the years from 1989 to 1993, and the 1992 China National Nutrition Survey. According to these studies, the intake of fat was lower among rural than urban populations [2, 5, 6].

Dietary change in China has been extremely rapid. Over the last decade, China has attained a high measure of food security and has seen marked changes in diet adequacy and structure [2, 5]. Several cross-sectional analyses have studied the patterns and trends of food consumption by comparing dietary patterns at different time points. There are some deficiencies in this literature. First, earlier methods of allocating household fat intake to individuals have needed improvement. Second, available official reports about the dietary and nutritional status of the Chinese population have been dependent on a household dietary inventory survey or estimation from national food consumption data collected by the State Statistical Bureau of China [5, 7, 8]. Few studies have looked at changes at the individual level.

To obtain a clearer picture of food consumption patterns and dietary fat intake in China, we selected a study sample from the CHNS in 1989, 1991, and 1993. The purposes of this study were to examine in more detail how food consumption and fat intake changed during 1989–1993, and what changes in food consumption and fat intake occurred across different socio-economic

Xuguang Guo and Barry Popkin are affiliated with the Department of Nutrition in the University of North Carolina in Chapel Hill, North Carolina, USA. Fengying Zhai is affiliated with the Institute of Food and Nutrition and Food Hygiene in the Chinese Academy of Preventive Medicine in Beijing.

groups. Special emphasis was put on food groups and sources of dietary fat to allow us to highlight one of the more important trends emerging not only in China but throughout Asia. The study examined dietary fat and cholesterol intake levels in 1989 according to income level and then focused on dietary changes over time among those in the three income tertiles. The information gained from this study is expected to help Chinese policy makers to recognize issues in current dietary practices related to nationwide health strategies.

Methods

Survey design and sample

This study includes three panels of data. The CHNS adopted a longitudinal study design in 1989 that was followed up in 1991 and 1993. It covered eight provinces, which varied substantially in geography, economic development, public resources, and health indicators. A multistage, random-cluster process was used to draw the survey sample in each of the provinces. Each panel of the CHNS collected detailed household food consumption data by household food inventory and 24-hour dietary recall for all household members for three consecutive days. All methods were highly standardized, using a detailed manual of operations and central training of fieldworkers and coordinators. The design and selection of the original sample are described in detail elsewhere [2].

We included a sample of individuals aged 20 to 45 years from the 1989 CHNS survey and examined it in 1991 and 1993. Only individuals with multiple-day dietary records were retained in this analysis. Although it was recognized that this might result in an unknown selectivity bias, this selection was desirable for two reasons. First, to interpret the percentage of the population consuming a given food group longitudinally, it was necessary that a consistent temporal unit be used for three panel data sets. Second, many studies indicated that intraindividual variation was a serious difficulty when assessing usual intake, and the problem could be dealt with partly by use of the average from multiple-day dietary data. Thus, study samples consisted of 5,626 individuals in 1989. There were 1,055 and 644 subjects lost to follow-up due to death, outmigration, and incomplete data. Correspondingly, the follow-up rates of adults with full data sets were 81% in 1991 and 86% in 1993, respectively. Analysis of loss-to-follow-up did not reveal meaningful biases.

Socio-economic data

The most common indicators of socio-economic status include education, income, occupation, employment status, indexes of social class, and measures of living conditions [9, 10]. The strongest and most consistent relationships between socio-economic status and food consumption were found in income, place of residence, region, and educational level [2, 11, 12]. We continued to use these four indicators to assess the patterns of change in food consumption and fat intake in China.

In the CHNS, the household was considered the basic income recipient unit. Incomes earned by all individual members as well as by the enterprises operated by members of a household were pooled to produce an estimation of household income. The values of nonmonetary government subsidies, such as food ration coupons and housing subsidies estimated from private renting, were also included as a part of household income.

In this study, income was expressed as annual per capita income, which was household income divided by household size. Per capita income was deflated according to the consumer price index, which was 100% in 1980 [13]. We categorized all households into low-, medium-, or high-income tertiles on the basis of per capita income. The cut-off points for income tertiles were 290 and 596 yuan in 1989, which at that time equaled US$78 and $160.

The place of residence and region chosen for this study were designed to facilitate economic analysis in light of the interactions among food supply, dietary habits, climate, geography, and agricultural technology. Technology was especially important for shaping economic regions, because it determined the nature of economic activity and the degree to which an area could support its population density. In China the transition from agriculture to industry and the shift from inward-oriented self-sufficiency to international commercial integration have been occurring rapidly [14]. These transitions may influence patterns of residential disparities.

The urban–rural classification was based on Chinese official definitions. Urban residents were not food producers and were registered to receive monthly food subsidies from the local government. The region measure was developed by the World Bank in collaboration with the State Statistical Bureau of China [14] to define the Coast (Liaoning, Shangdong, and Jiangsu Provinces), Central Core (Henan, Hubei, and Hunan Provinces), and South Hinterland (Guangxi and Guezhou Provinces). The regions reflect contiguous groupings with comparable income levels.

For this analysis, we combined several measures of schooling into a composite measure to represent the years of formal education completed. Thus, educational levels were grouped as primary (0–6 years), secondary (7–12 years), and professional (> 12 years) school. Detailed characteristics of the study samples are illustrated in table 1.

Dietary data

Detailed household food consumption data were col-

TABLE 1. Selected characteristics of study sample according to tertile of income in China, 1989[a]

Characteristic	Income tertile			
	Total	Low	Medium	High
N	3,927	1,429	1,299	1,199
Age (yr)	32.7 ± 6.9	32.6 ± 6.7	33.0 ± 6.8	32.4 ± 7.1
Sex (% male)	46.2	46.6	45.6	46.5
Per capita income[b]				
Yuan	496 ± 442	151 ± 80	436 ± 92	971 ± 500
US$[c]	133 ± 119	41 ± 22	117 ± 25	261 ± 134
Place of residence (% urban)	27.6	10.4	31.4	44.0
Educational level (%)				
Primary (≤ 6 yr)	40.5	50.5	41.0	28.0
Secondary (7–12 yr)	55.7	48.6	56.9	62.8
Professional (> 12 yr)	3.8	0.8	2.2	9.2
Region (%)				
Coast	37.8	32.4	34.6	47.4
Central Core	37.5	41.1	36.1	34.8
South Hinterland	24.7	26.5	29.0	17.8

a. Plus–minus values are means ± SD.
b. Per capita income was deflated according to the consumer price index.
c. US$1 = 3.72 yuan.

lected from the changes in household food inventories for three consecutive days, in combination with a weighing technique. The three consecutive days were randomly allocated from Monday to Sunday. Chinese scales with a maximum limit of 15 kg and a minimum of 20 g were used to measure household food consumption by the inventory change from the beginning to the end of each day. All purchases and the collection of home production were recorded each day, as well as all available foods stored in the storage room and refrigerator. Wastage during food preparation (e.g., spoiled rice and dishes, discarded cooked food fed to pets or animals) was estimated when weighing was not possible. At the end of the survey, all remaining foods were weighed again. The number and personal characteristics of all household members and guests were recorded.

Individual dietary data for the same three consecutive days were collected for all household members, regardless of age or relationship to the household head. This was achieved by asking each individual except children under 12 years of age, on a daily basis, to report all food consumed at home and away from home on a 24-hour recall basis. For these younger children, the mother or a mother substitute who handled food preparation and feeding in the household was asked to recall the children's food consumption. Using food models and picture aids, trained field interviewers recorded the types, amounts, type of meal, and place of consumption of all food items during the 24 hours of the previous day. Respondents were prompted about snacks and shared dishes. Food items consumed at restaurants, canteens, and other locations away from home were systematically recorded.

Dietary fat intake was expressed by the consumption per capita per day. The dietary data either from the household inventory or 24-hour individual recalls were linked with an updated nutrient data bank of the Chinese food-composition tables [15]. Use of the nutrient database made it possible to study the trends in consumption of fat components, such as saturated fatty acids and cholesterol, even though they were not available in the original database.

Stir-frying is a major cooking method for Chinese dishes and is the major method of adding oil to the Chinese diet. Rather than using standard recipes for calculating the use of added oil, we allocated oil on the basis of consumption of any combination of vegetables and animal products regarded as a "dish." The amount of edible oils and condiments used with each dish varies considerably among Chinese households. Therefore, a method of allocating edible oils between household members was developed [6]. The method was further modified for this study based on the proportion of animal products and vegetables consumed by each individual in a household. Each individual's proportion of the total household meat and vegetables was used to allocate household edible oils and condiments to each individual. Underlying this is the knowledge that Chinese households use frying predominantly for dishes containing vegetables (including tofu and

beans), beef, pork, chicken, fish, and seafood. These components are combined with one of the edible oils–normally soya bean, peanut, sunflower seed, or vegetable-seed oils–and with condiments to form a dish.

With this approach, the amounts of oils allocated were added to the 24-hour dietary recall to estimate individual daily consumption of edible oils and condiments. These data, based on the food inventory method and partial weighing and measuring of the dishes, provide a more accurate measure of individual consumption of edible oils and dietary fat intake. Because one of our aims was to examine the trends in consumption of fat components over time, various fat components were expressed by absolute and relative intakes. Nutrient densities were calculated using the fat contribution to total energy.

Food groups

A combination of antioxidants and fat with basic food categories was used to create a food-grouping system (table 2). It includes all food groups and representative food items. However, for some food groups, consumption was rare and the percentage of individuals consuming them was small. These groups include commercial wheat flour products, legumes, tofu, organ meats, and dairy products. These groups were omitted from the subsequent analysis.

Statistical analysis

Version 6.12 SAS [16] and 5.0 STATA statistical packages [17] were used for all analyses. Comparisons of group means were made by analysis of covariance (PROC GLM analyses with LSMEAN-option) with SAS. Because the study design and data collection were not equally distributed on some demographic and socioeconomic factors, means of food-group consumption and fat intake were adjusted for these variables. Foods and fat sources were the dependent variables; age, sex, income, education, place of residence, and region were included in the model as independent variables. Similarly, the predicted function of STATE was used to obtain the adjusted probabilities of individuals consuming a given food group. The results reported here were the least-square means (LSMs) and the probabilities for testing the null hypothesis that the two LSMs being compared were equal [H_0:$LSM_{(I)} = LSM_{(j)}$].

Since assumptions were made in the analyses of variance, the normality of the distribution was tested. The distribution was skewed to the right for all food groups, because a portion of the population had zero consumption for a given food group. Thus, three indicators—per capita consumption, percentage of individuals consuming food within a specified food group, and consumption per consumer—were used to describe food consumption patterns and trends.

TABLE 2. Food group system used to classify foods in China

Food group	Representative foods
Rice and rice products	Long rice, sesame rice, sticky rice
Wheat flour and wheat products	Whole wheat flour, refined wheat flour, noodles
Coarse grains	Corn, sorghum, millet
Fried flour products	Bread, cake, biscuits, oil-fried donut, cookies
Potatoes	Sweet potato, potato, lotus
Legumes, beans, and nuts	Soya beans, kidney beans, various nuts
Tofu and tofu products	Semi-solid, oil-fried, and dried tofu
Carotene-poor vegetables (< 500 μg carotene/ 100 g)	Cabbage, Chinese cabbage, turnips, cucumbers, onions, cauliflower, lotus, eggplant, bitter melon
Carotene-rich vegetables (≥ 500 μg carotene/ 100 g)	Carrots, green onions, green peppers, spinach, celery, pumpkin, tomatoes, snow beans, lettuce
Fresh fruits	Apples, pears, bananas, oranges, tangerines
Low-fat red meat (< 20% fat)	Pork, beef, lamb
High-fat red meat (≥ 20% fat)	Pork, beef, lamb, and their products
Organ meat	Animal liver, kidney, digestive tract, brain
Poultry	Chicken, duck, goose, rabbit
Dairy products	Fresh milk, milk powder, cream
Eggs	Fresh and preserved eggs, including lime and salty eggs
Fish and shellfish	Fish, seafood, shrimp, shellfish
Lard and butter	Lard, butter, animal fat
Edible oils	Vegetable seed oil, peanut oil, sunflower oil, soya bean oil

Results

Characteristics of Chinese adults

The distribution of study samples according to age, sex, income, education, place of residence, and region is shown in table 1. The subjects' average age was 32.7 years, with similar age ranges across the income tertiles. Among these subjects, about 46% were male and almost one-third resided in urban areas. The average real income

was 151, 436, and 971 yuan per capita in 1989 for the lowest, middle, and highest income tertiles, respectively. More than half of the sample were classified as having education greater than secondary school (seven or more years). As expected, subjects who had more education and those who lived in urban areas or in the more rapidly developing costal region had higher incomes.

Food consumption

To illustrate the trends and changes in food consumption between 1989 and 1993, 19 food groups were analysed longitudinally. For each food group, three different measures of consumption are presented: the percentage of the population consuming a given food group, the mean weight (grams) of food consumed per capita per day, and the mean weight of each food group consumed per consumer per day. Because each of these indicators illustrates a different measure of trends in food consumption [18], it is meaningful to consider all three to evaluate food consumption patterns over a period of time.

Overall food patterns and sources of fat

The overall consumption patterns and trends at each time point are illustrated in table 3. The changes in food consumption were compared from 1989 to 1991 and from 1989 to 1993. Greater shifts occurred in the weight of various foods consumed than in the proportion of the population consuming them within four years. For example, the average per capita consumption of edible oils more than doubled between 1989 and 1991, with about a 42% increase in the proportion of individuals consuming oils (the percentage point increase was 26) and a 45% increase in the amount consumed per consumer (the absolute amount of the increase was 11 g). These patterns were retained in 1993, with a slight decrease in average per capita and per consumer consumption of edible oils. The quantity of animal foods consumed and the proportion of the population who consumed them increased dramatically during this period. Daily consumption of red meats (low- and high-fat) increased on the average about 8 g every two years. The consumption of poultry, eggs, and dairy products also increased, but by smaller amounts. Very few changes occurred in these three indicators for tofu and legumes from 1989 to 1991, and from 1991 to 1993.

The main food sources of dietary fat at each time point are listed in table 4. Edible oils, high-fat red meat, and lard and butter contributed about 70% to 77% of the total fats consumed. In 1989 edible oils provided an average of only 16 g of fat intake, which doubled to about 32 g in 1991 and 1993. Edible oils, high-fat meat, and lard and butter remained the top three contributors of fat, and the ranking of the other less important sources changed somewhat over the time of the survey. Only coarse grains dropped, from 6th in 1989 to 10th in 1991, and disappeared from the list of the top 10 food sources of fat in 1993. Correspondingly, commercial wheat flour products were added as the 10th highest food source of fat in 1993.

TABLE 3. Patterns and trends in consumption of different food groups in China, 1989–93

	1989			1991			1993		
Food group	% consuming	Mean g/capita/d	Mean g/ consumer/d	% consuming	Mean g/capita/d	Mean g/ consumer/d	% consuming	Mean g/capita/d	Mean g/ consumer/d
Rice & rice products	82.0	320.3	390.5	84.4	329.0	390.0	84.9	298.5	351.7
Wheat flour & wheat products	64.3	174.7	271.9	68.3	180.3	263.9	71.5	165.1	230.9
Coarse grains	27.6	55.3	200.4	20.7	35..0	169.3	21.1	28.8	136.7
Fried flour products	5.9	4.1	69.2	8.8	5.1	57.6	10.6	6.8	64.5
Potatoes	35.6	83.2	233.4	37.0	48.7	131.5	33.7	39.1	116.1
Legumes, beans, & nuts	24.5	13.4	54.5	22.7	11.6	51.2	20.6	11.9	57.9
Tofu & tofu products	43.2	33.4	77.5	45.5	31.9	70.0	46.9	32.3	68.8
Carotene-poor vegetables	96.7	309.0	319.4	97.8	264.6	270.6	97.8	280.6	287.0
Carotene-rich vegetables	52.2	79.0	151.3	55.5	82.3	148.3	59.7	86.1	144.1
Fresh fruits	11.4	15.6	137.0	9.9	10.1	102.1	10.3	12.9	124.5
Low-fat red meat	15.4	8.2	53.6	19.1	11.1	58.0	22.1	14.9	67.5
High-fat red meat	51.8	38.5	74.3	57.2	42.5	74.2	58.0	46.2	79.6
Organ meat	9.4	4.7	50.3	10.3	5.0	48.3	10.1	5.2	51.7
Poultry	9.4	5.9	62.7	10.9	6.6	60.9	13.7	8.4	61.3
Dairy products	1.5	1.8	119.5	2.4	3.4	138.6	2.6	3.4	129.6
Eggs	25.6	10.2	40.0	34.8	14.3	41.0	35.0	15.5	44.3
Fish & shellfish	30.3	23.4	77.2	33.3	21.9	65.8	33.2	21.9	66.1
Lard & butter	31.2	8.0	25.8	30.0	8.7	29.1	27.6	8.4	30.5
Edible oils	62.8	15.8	25.1	88.9	32.4	36.5	88.9	31.6	35.5

TABLE 4. Main food sources of fat in China, 1989–93

Food group	1989		1991		1993	
	% energy from total fat	Mean fat g/capita/d	% energy from total fat	Mean fat g/capita/d	% energy from total fat	Mean fat g/capita/d
Edible oils	28.8	15.8	43.8	32.4	42.7	31.5
High-fat red meat	26.3	14.4	21.4	15.8	23.0	17.0
Lard & butter	14.6	8.0	11.8	8.7	11.3	8.4
Wheat flour & wheat products	4.6	2.5	3.5	2.6	3.2	2.4
Rice & rice products	4.3	2.3	3.1	2.3	2.8	2.0
Coarse grains	3.3	1.8	1.6	1.2	–	–
Legumes, beans, & nuts	3.2	1.7	2.2	1.6	2.0	1.5
Tofu & tofu products	3.1	1.7	2.4	1.8	2.2	1.6
Poultry	2.3	1.3	2.1	1.5	2.8	2.0
Eggs	1.8	1.0	1.8	1.3	2.0	1.5
Fried flour products	–	–	–	–	1.6	1.2

Percentage of individuals consuming specific food groups

Examination of overall food consumption patterns alone does not provide a complete picture for policy makers and nutritional educators. Table 5 shows changes in the proportion of individuals consuming a given food group from 1989 to 1991 and 1993 according to their 1989 per capita income levels. The increasing percentages were mainly in the population consuming edible oils, red meats, eggs, poultry, wheat flour, and carotene-rich vegetables for all income levels. The largest shift was a 30% increase in the proportion of the population consuming edible oils and a 13% decrease in the percentage consuming coarse grains in the lowest tertile of income. In three of the seven food groups of plant origin, there were larger proportions of individuals consuming these food items, despite a decline in average per capita consumption between 1989 and 1993. Examples included rice, wheat flour, and carotene-rich vegetables. However, there was at least a 4% to 30% increase in the percentage of the population consuming high-fat red meat, low-fat red meat, eggs, and oils.

Per capita consumption trends

A number of interesting trends appear in per capita consumption according to place of residence, region, and education levels from 1989 to 1993. As summarized in table 6 and figure 1 according to increasing

TABLE 5. Adjusted percentage of population consuming food groups in 1989 and changes in 1991 and 1993 according to 1989 income tertile[a]

Food group	Low income			Medium income			High income		
	% consuming in 1989	Change in		% consuming in 1989	Change in		% consuming in 1989	Change in	
		1991	1993		1991	1993		1991	1993
Rice & rice products	77.6	+2.0	+2.0	84.2	+0.6	+3.3*	93.2	+2.0	+2.1
Wheat flour & wheat products	55.7	+10.9**	+17.6**	72.5	+0.9	+2.8	74.4	−0.6	+0.5
Coarse grains	32.3	−7.8**	−12.7**	23.6	−4.3**	4.4**	19.4	−8.0**	−2.5
Potatoes	41.6	−3.7*	−3.0	32.3	+1.0	−2.9	30.8	+7.2**	−0.6
Carotene-poor vegetables	97.1	0	+0.7	96.2	+2.1**	+1.9**	97.4	+1.2**	+0.7
Carotene-rich vegetables	49.9	+9.1**	+7.0**	62.5	−3.4	+5.5**	63.7	+1.7	+9.0**
Fresh fruits	9.2	−0.1	−0.7	15.2	−3.2**	−4.0**	24.1	−4.0**	−0.5
Low-fat red meat	18.1	+1.5	+2.2	18.3	+4.1**	+7.5**	27.8	+6.1**	+10.4**
High-fat red meat	52.5	+4.1*	+6.2**	61.5	+3.8*	+3.5	70.6	+5.1**	+5.5**
Poultry	5.4	+0.6	+0.9	13.9	+2.4	+4.1**	16.1	+0.9	+6.6**
Eggs	25.5	+6.1**	+7.8**	31.6	+5.8**	+10.4**	40.2	+13.0**	+7.7**
Lard & butter	27.4	+2.0	−5.4**	32.7	−3.9*	−3.9*	31.1	−2.8	−1.9
Edible oils	63.7	+26.0**	+29.8**	66.1	+26.2**	+23.0**	67.8	+25.4**	+23.0**

a. Proportions are adjusted for age, sex, residence, region, and education level. Changes at same income level are significantly different from zero at the *1% and **5% levels.

tertile of income, diets became more diverse and more people incorporated meat, eggs, and edible oils as well as carotene-rich vegetables and fresh fruits into their diets. The average per capita consumption of animal foods increased as much as 7 to 39 g per day, whereas the consumption of coarse grains and potatoes decreased by 20 to 133 g. Among high-income residents, the increasing per capita consumption of animal foods, such as red meat, poultry, and eggs, and of edible oils was offset by declines in consumption of various grains, potatoes, and low-carotene vegetables. The average amount of grains, potatoes, and low-carotene vegetables consumed decreased by 98 g, but consumption of animal foods and edible oils increased by an average of about 56 g from 1989 to 1993.

As expressed by consumption per consumer, there was less change in portion sizes over time than there was in the proportion of the population consuming food from a food group. However, there were declines in the number of grams of all kinds of animal foods consumed between 1989 and 1993 among consumers for all three income tertiles. In contrast to the grams-per-capita, the changes in the grams-per-consumer were much less dramatic. In other words, most of the shifts in eating patterns were in the initiation of consumption rather than in the amount consumed of a given food group. The results are available from the authors upon request.

Dietary fat intake

In response to the consumption of high-fat foods, total fat intake was expected to increase by a larger amount. The results indicated that fat intake was increasing, and the structure of food consumption evolved differently in populations of different incomes. The population in the lowest-income tertile, for example, had an increase in fat intake from 48 g in 1989 to 68 g in 1993 (table 7). For this group, the adjusted consumption of edible oils nearly doubled, from 15 to 28 g. In contrast, those in the highest-income tertile had a maximum shift from 63 g of fat in 1989 to 91 g of fat in 1993, with a much larger increase in high-fat red meat consumed than did the lowest-income tertile. The percentage of energy from fat increased by about 5, 8, and 9 percentage points from 1989 to 1993 for low-, medium-, and high-income tertiles, respectively. The corresponding values for energy from fat reached 23%, 28%, and 32% in 1993.

As also shown in table 7, respondents in the lowest-income tertile were most likely to consume a diet with

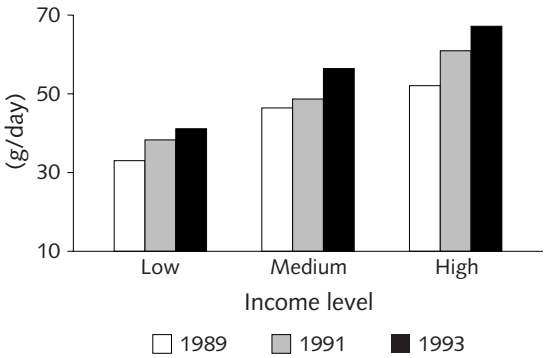

FIG. 1. Average consumption of fatty meat in China according to tertile of income, 1989–93

TABLE 6. Adjusted average consumption of food groups in 1989 and changes in 1991 and 1993 according to 1989 income tertile[a]

	Low income			Medium income			High income		
	1989 consumption	Change in		1989 consumption	Change in		1989 consumption	Change in	
Food group	(g/capita/d)	1991	1993	(g/capita/d)	1991	1993	(g/capita/d)	1991	1993
Rice & rice products	307.7	+10.8	-32.8**	306.1	+3.2	-0.7	320.2	+8.8	-28.2**
Wheat flour & wheat products	169.6	-41.0**	+41.8**	157.5	+10.2	-26.8**	140.5	-25.2**	-40.7**
Coarse grains	70.8	-29.6**	-50.6**	34.7	-11.3**	-13.5**	21.0	-12.6*	-7.8**
Potatoes	113.5	-78.8**	-82.0**	56.8	-18.9**	-27.4**	40.5	-4.8	-11.9**
Carotene-poor vegetables	313.3	-83.4**	-70.5**	279.0	-24.0**	-1.1	254.4	-12.0	-9.0
Carotene-rich vegetables	81.6	+9.5	+4.6	84.8	-4.6	+12.2**	80.3	+2.5	+10.4*
Fresh fruits	11.3	+0.4	+0.2	21.1	-10.1**	-7.6**	31.9	-10.4**	-3.8
Low-fat red meat	14.0	-0.2	+0.6	9.5	+3.3**	+6.7**	14.8	+5.9**	+12.1**
High-fat red meat	41.8	-0.3	+3.8*	48.2	+2.9	+4.0*	51.8	+7.0**	+13.2**
Poultry	4.2	-0.2	-0.1	8.1	+1.0	+2.3*	8.8	+1.3	+5.2**
Eggs	11.2	+0.7	+3.3**	11.5	+3.4**	+6.1**	15.4	+7.4**	+6.5**
Lard & butter	6.8	+1.0	-0.5	8.4	-0.4	0	8.4	+1.6*	+1.8*
Edible oils	14.9	+12.2**	+12.7**	17.0	+15.5**	+15.0**	18.6	+22.3**	+18.7**

a. Proportions are adjusted for age, sex, residence, region, and education level. Changes at same income level are significantly different from zero at the *1% and **5% levels.

less than 10% of energy from fat. Conversely, upper-income respondents were more likely to consume a diet deriving more than 30% of energy from fat. Among the higher-income tertile, the percentage of energy from saturated fat was 8.5 in 1993, and had risen 2.5 percentage points over the past four years. Correspondingly, the average daily cholesterol intake was up to 293 mg, with an additional intake of 72 mg cholesterol from 1989 to 1993. The changes in the proportion of energy from fat, saturated fat, and total cholesterol intake were smaller among the low-income population. The change in fat intake among the poor was mostly through an increase in plant foods.

Among fat components, saturated fat contributed 18 to 24 g of total fat, to provide 6% to 9% of calories in 1993. In addition, the distribution of fat components in table 7 shows the linear association between income level and fat intake. Urbanization had a considerable influence on dietary patterns. Figure 2 shows that in 1993 more than half of urban residents had a higher than recommended intake of total fat (> 30% of calories from fat), one-fourth had a higher than recommended intake of saturated fat (> 10% of calories), and 35% had a cholesterol intake exceeding the 300 mg per day that is the suggested upper acceptable limit.

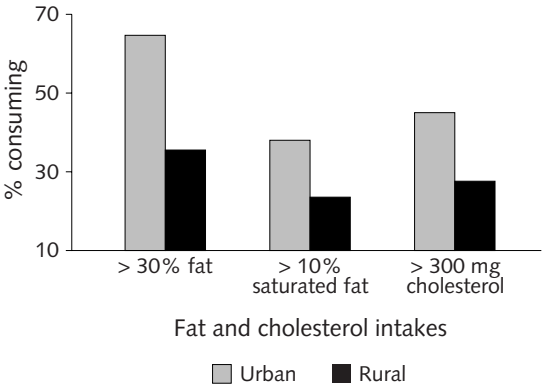

FIG. 2. Distribution of the proportion of the population consuming higher-fat diets in 1993 according to urban or rural residence

Discussion

China has been undergoing industrialization in the past two decades and is experiencing some of the most rapid economic change in the world. Concurrent with this industrialization has been a shift in the structure of the diet. For the high-income population, especially in the urban areas, the Westernization of dietary patterns has occurred at a faster rate than in the rural poor areas. Fat intake has increased rapidly, and for many urban residents, their diet of fat and cholesterol would exceed the dietary guidelines for Americans [19, 20]. The potential health consequences of this shift are significant.

There is substantial evidence that high intakes of saturated fat and cholesterol and low intakes of polyunsaturated fats increase the level of serum cholesterol [21–23]. Saturated fatty acids are the primary deter-

TABLE 7. Adjusted intake of fat and fat components and the proportion of population consuming different fat components 1989–93 according to 1989 income tertile

Year and income tertile	Total fat				Saturated fat		Cholesterol		
	Mean g/d	% energy	% consuming <10%	% consuming ≥ 30%	Mean g/d	% energy	% consuming ≥ 10%	Mean g/d	% consuming ≥ 300 g
1989									
Low	48	17	30	12	13	5	9[a]	129	13
Medium	59	21	16	16	17	6	13	168	17
High	63	22	10	20	18	6	14	221	26
1991									
Low	68	22	12	27	17	6	11	164	19
Medium	80	27	4	38	21	7	17	222	26
High	90	30	1	55	24	8	22	274	35
1993									
Low	68	23	12[a]	27	17	6	15	175	21
Medium	81	28	4	40	22	8	24	246	30
High	91	32	2	58	24	9	31	293	40

Mean fat intakes and proportions are adjusted for age, sex, residence, region, and educational level.
All means are significantly different across income tertiles at same year, $p < .001$.
All proportions except superscript are significantly different across income tertiles at same year, $p < .001$.
a. Proportion in the low-income group is significantly different from those in other income groups at same year, $p < .01$.

minants of serum cholesterol [24]. A low intake of saturated fatty acids is the preferred option for preventing hypercholesterolaemia and is the strategy recommended by numerous international committees [25]. The World Health Organization recommended a maximum intake level of 300 mg cholesterol per day, based on the evidence that serum cholesterol levels independently respond to dietary cholesterol intakes and potentiate the response to dietary fat [24, 26]. Increases in both fat and cholesterol intakes were observed in this study. In 1993 almost 40% of those in the highest-income tertile had a daily cholesterol intake above the World Health Organization recommendation. The results imply that greater nutrition educational and/or public health interventions are necessary to limit the consumption of animal foods and cholesterol intake among the highest-income groups, especially those in the coastal and urban areas. Elsewhere we explore empirically some price options [27].

This study showed a substantial increase in total fat intake for all income groups. The increase in fat was largely due to increased intakes of saturated fat, because it was associated with increases in a number of high-fat animal foods. Per capita increases in consumption of red meat, eggs, and poultry reflected these trends, as described above. The intake of fat components changed substantially, especially among low-income residents. Nevertheless, it is far below that of the typical Western diet. Fat accounted for 33% of calories in the American diet in 1994–1996, representing a continued decrease from 34% percent in 1989–1991 and 40% percent in 1977–1978 [28].

The diet of the poor appears more healthful if one considers the potential healthfulness of a diet with more grains and vegetables, less animal meat, and less fat and saturated fat. Although some observers have noted that foods of plant origin predominate in the Chinese diet [8, 29], it appears that this dietary pattern may reflect economic constraints rather than consumer preferences.

Based on our analyses of the CHNS, it is clear that China is experiencing the nutrition transition at a much lower level of income than might have been expected from the earlier experience of the United States and Western European societies. Therefore, a higher-fat diet and an associated increase in chronic diseases raise important questions about the health consequences of economic reforms for food and nutrition planners in China.

Chinese nutritionists are acutely aware of the coexistence of dietary deficiency and a trend to dietary excess in urban areas, particularly conducive to degenerative disease [7]. A large-scale survey of diet, lifestyle, and chronic diseases in China [8] has provided important descriptive statistics on chronic diseases related to this high-fat diet. Similarly, more sophisticated obesity research has demonstrated that overweight and obesity are now important health problems in China [11, 30]. Together, all of these studies indicate that major problems associated with dietary excess are likely to emerge rapidly in China.

There are several constraints related to studying diet in China. There is one weakness of the current food-composition table and the related dietary intake data from China. The method of measuring and allocating edible fat is based on home consumption of fried foods. Only a small proportion (< 5%) of energy and fat were consumed away from home in this study population [6]. More precise recipes that accurately measure the oil in these dishes consumed away from home is needed. An effort is under way to develop recipe files to ascertain oil levels for commercial foods in China, since it is clear that this will be needed. This study described the effect of income cross-sectionally on food consumption, using 1989 income tertiles, and then examined dietary change for these adults over time. Other research presents a dynamic picture of income and food prices as they affect diet [31, 32].

In summary, this study provided information on the impact of income differentials on diet in China and the way people in different income groups changed their diet over a four-year period. An unexpected finding was that there were no dramatic differences in time trends among different income groups in the consumption of staple foods, such as rice, wheat flour, and edible oils [7]. The central government adopted a series of economic policies to adjust food prices and suspend the use of food subsidies during 1991–1993. The proportion of income expended on food increased considerably.

The present findings have major implications for the design of nutrition education, food-fortification, and intervention programmes in China. They illustrate the need for active public policy to promote a healthful diet. These results can help to develop and target nutrition programmes aimed at reducing risk factors for chronic diseases, provide information for agricultural planners to adjust the relationship between food production and consumption, and predict the trends in food consumption for the next decade.

Acknowledgements

Funding for parts of the project design, data collection, and computerization was provided by the Chinese Academy of Preventive Medicine (CAPM), the Carolina Population Center of the University of North Carolina at Chapel Hill, and the National Institutes of Health (NIH) (P01HD28076 and R01-HD30880). Collaborative training and development work was funded by the National Science Foundation (grant 37486) and the Ford Foundation. Funds for the research reported in this article were provided by NIH. This article is part of a collaborative research project between the CAPM

(directed by Dr. Keyou Ge, Director of the Institute of Nutrition and Food Hygiene, with coprincipal investigators Dr. Fengying Zhai and Dr. Shuigao Jin) and a group from the University of North Carolina at Chapel Hill and the Carolina Population Center (directed by Dr. Barry M. Popkin, with coprincipal investigators Dr. John S. Akin and Dr. Gail E. Henderson). The authors would like to thank Dr. Lenore Kohlmeier, Dr. Pamela S. Haines, Dr. Namvar Zohoori, and Ms. Marie Richards for their advice, support, and manuscript review. We also wish to thank Ms. Frances Dancy for her helpful assistance.

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Protein nutritional quality and consumer acceptability of tropical Ghanaian quality protein maize

Kwaku Ahenkora, Stratford Twumasi-Afriyie, Peter Yao Kanze Sallah, and Kwadwo Obeng-Antwi

Abstract

Quality protein maize (QPM) is a high-lysine, high-tryptophan variety. The essential amino acid profile, the protein efficiency ratio (PER) of mixtures of QPM and normal maize, and the hedonic response to three traditional foods were studied with four QPM varieties. The lysine content of the QPM varieties ranged from 3.7 to 4.2 g/100 g protein and was significantly ($p < .05$*) higher than that for normal maize (2.6 to 3.1 g/100 g protein), but lower than the FAO-recommended human level of 5.0 g/100 g protein, The PER values of normal maize showed significant (*$p < .05$*) improvement at replacement levels of 60% or more with QPM. The overall acceptability scores showed that QPM varieties were equally acceptable as normal maize in* ga kenkey *and were preferred to the local normal maize in* tuo zafi. *The tropical Ghanaian QPM varieties have enhanced amino acid profiles and were acceptable in traditional foods.*

Introduction

Maize is the basic staple cereal grain for inhabitants of Africa, Latin America, and parts of Asia, where it provides more than half of the daily calorie and protein intakes. However, cereal proteins have poor nutritional value for humans and other monogastric animals, because they are low in essential amino acids such as lysine, tryptophan, and threonine [1]. Of these, lysine is the most limiting. One of the most exciting discoveries in the area of cereal improvement was that of Mertz [2] that the *opaque-2* gene in maize plants suppresses the synthesis of the nutritionally inadequate prolamine proteins, resulting in increased lysine and tryptophan.

However, the negative pleiotropic effects associated with the mutation prevented its widespread utilization. The soft, starchy endosperm of *opaque-2* kernels causes them to be less dense, to be more susceptible to insects and mechanical damage, and to have inferior food-making properties [3]. Most importantly, the mutant genotypes were generally less productive than their normal counterparts [4]. Maize breeders at the International Maize and Wheat Improvement Center (CIMMYT), Mexico, the University of Natal, South Africa, and the Crops Research Institute, Ghana, were able to overcome the negative features of the *opaque-2* mutation by developing modified *opaque-2* mutants called quality protein maize (QPM) [5–7]. QPMs are *opaque-2* mutants that have a hard, vitreous endosperm, a high nutritional quality, and a normal yield [5].

Bressani [8] has provided an excellent overview of the potential of high-lysine corn in human nutrition. Nitrogen balance studies with children showed that the amount of nitrogen absorbed from *opaque-2* corn-based diets (75%) approached that of a milk-based diet (81%). The apparent digestibility in adult humans of the *opaque-2* corn is similar to that of egg protein. Other nutritional benefits of the high-lysine maize compared with normal maize are higher food consumption, higher niacin availability, higher calcium utilization in tortillas processed with lime, and nutritional security when corn is the major source of protein. The nutritional superiority of QPM-based diets over normal maize diets is overwhelming [9–11].

QPM provides the means to develop practical high-lysine genotypes, but further improvement of the protein quality is necessary [12]. Friedman [13] reviewed the nutritional value of proteins from different food sources and indicated that it remains to be shown whether high-lysine corn can be incorporated into foods acceptable to humans. Ghana's maize-breeding programme has used the variability in lysine content among maize genotypes to develop high-yielding, open-pollinated and hybrid tropical QPM varieties that have potential for food product development [9, 14].

At the time of the study, all the authors were affiliated with the Crops Research Institute, CSIR, in Kumasi, Ghana; Stratford Twumasi-Afriyie is currently with the International Maize and Wheat Improvement Center in Addis Ababa, Ethiopia.

This article provides information on the essential amino acid composition of tropical Ghanaian QPM varieties, the protein quality of physical mixtures of QPM and normal maize, and the consumer acceptability of QPM and normal maize in the traditional Ghanaian foods *ga kenkey, fante kenkey,* and *tuo zafi*.

Materials and methods

Amino acid analysis

Four QPM varieties (Dadaba, Mamaba, CIDA-ba, and Obatanpa) and two improved normal maize varieties (Okomasa and Abeleehi) were analysed for amino acids. Amino acids were analysed by ion-exchange chromatography with a Beckman 121 M amino acid analyser after acid hydrolysis with 6N HCl and alkaline hydrolysis with 4.2N NaOH [15]. Further determination of lysine and tryptophan contents was performed using methods described by Hernandez and Bates [16].

Rat feeding trial

A rat bioassay study was conducted using mixtures of normal maize (Okomasa) and QPM (Obatanpa) at ratios of normal maize to QPM of 0:100, 20:80, 40:60, 80:20, and 100:0. Maize samples were analysed for proximate composition as recommended by the Association of Official Analytical Chemists [17] and used in the preparation of the diet. Dietary treatments were formulated to contain the same amount of protein (9%), fat (3%), minerals and ash (3.5%), and vitamins (1%), in accordance with methods previously described [9, 18]. A total of 24 male albino weanling rats (*Rattus norvegicus*) were blocked by initial weight and randomly assigned to six blocks of four animals each. They had a three-day cage-adaptation period during which they were fed a laboratory chow diet. The rats were individually housed in cages under controlled environmental conditions (25°C with alternating 12-hour periods of artificial light and darkness). Feed and water were provided *ad libitum* for 28 days. All the rats survived throughout the experiment.

Sensory evaluation

Four QPM and two normal maize varieties were processed into *kenkey* and *tuo zafi* by traditional Ghanaian methods. Maize was washed twice and steeped in water for 24 hours at 25° to 26°C. The steeped maize was wet-milled. The meal was kneaded with water (1:2 meal:water) into smooth dough, which was left to ferment naturally at 25° to 27°C for three days. One part of the fermented dough was made into thick slurry with two parts of water. This was cooked by continuous stirring with a wooden ladle on a gas cooker at medium heat for 40 minutes until it became solid. The remaining two parts of the dough were mixed with the cooked dough. Portions of the *kenkey* mass were moulded into balls and wrapped in either a corn husk or dried plantain leaf. Water was added to the samples and they were boiled for 1 to 2 hours to obtain balls of *fante kenkey* (wrapped in plantain leaves) and *ga kenkey* (wrapped in corn husk). For *tuo zafi*, the maize was dry-milled. One part of the flour was mixed with four parts of water. This was continuously stirred while cooking it on a gas cooker for 50 to 60 minutes to obtain a solid consistency.

The sensory attributes—consistency, taste, appearance, and overall acceptability—of the food products were studied. Flour smoothness was also subjectively determined by squishing a small quantity of flour between the index finger and thumb. A panel of 20 male and 20 female judges, chosen for their ability to detect the lowest threshold values, performed sensory evaluations on the samples. They evaluated the products using a hedonic scale with scores from 1 to 7 (like very much = 7, like moderately = 6, like slightly = 5, neither like nor dislike = 4, dislike slightly = 3, dislike moderately = 2, dislike very much = 1). All the panelists were over 21 years of age and consumed *kenkey* and *tuo zafi* regularly. Each sample was judged on its own merits. After the session, panelists were given food products from the maize variety of their choice for lunch. The lunch was served with soup or stew.

Statistical analysis

The data were analysed using ANOVA, and Duncan's multiple range test was applied to test the significance of the difference between sample means for the sensory evaluation. The standard error of the difference between sample means was also calculated for some of the compositional data.

Results and discussion

Most of the methods for evaluating protein quality, mainly animal assays, may not be useful for quantitatively estimating the effectiveness of foods in meeting human protein needs or for meeting nutritional label requirements. This type of information, however, can be obtained with methods based on measurements of amino acid composition and digestibility [13].

We determined the essential amino acid composition of QPM and normal maize (table 1). The range in amino acid composition (g/100 g protein) for QPM was 3.50 to 3.74 for threonine, 4.21 to 10.90 for cysteine plus methionine, 3.16 to 4.99 for valine, 2.95 to 3.08 for isoleucine, 8.52 to 9.39 for leucine, 6.69 to 7.40 for tyrosine plus phenylalanine, 3.60 to 4.09 for histidine, 3.70 to 4.20 for lysine, 1.01 to 1.21 for tryptophan, and

TABLE 1. Essential amino acid contents (g/100 g protein) of tropical Ghanaian quality protein maize (QPM) and normal maize varieties

Amino acid	QPM[a]				Normal maize		Amino acid requirements	
	Obatanpa	Mamaba	Dadaba	CIDA-ba	Okomasa	Abeleehi	1-yr-old[b]	Pre-school or adult[c]
Threonine	3.50	3.69	3.67	3.74	2.47	2.78	4.3	2.5
Cysteine + methionine	4.21	12.5	10.90	5.54	3.70	5.02	4.2	2.5
Valine	4.93	3.16	3.30	4.99	3.39	5.25	5.5	3.5
Isoleucine	3.08	3.06	2.95	2.95	2.36	3.42	4.6	3.5
Leucine	9.05	9.39	8.52	9.08	7.92	11.43	9.3	6.5
Tyrosine + phenylalanine	7.40	7.06	7.09	6.69	6.59	5.61	7.2	6.5
Histidine	3.60	4.00	4.01	4.09	2.26	3.66	2.6	–
Lysine	3.70	4.00	4.12	4.20	2.36	3.10	6.6	5.0
Tryptophan	1.03	1.01	1.21	1.01	0.62	0.61	1.7	1.0
Leucine/isoleucine ratio	2.93	3.06	2.89	3.07	3.35	3.34		
Protein (%)	9.73	9.48	9.46	9.81	9.86	9.87		

a. Obatanpa is open-pollinated and was released in 1992; Mamaba, Dadaba, and CIDA-ba are hybrids released in 1997.
b. FAO/WHO [19] recommendations.
c. Young and Pellett [20] suggested requirements.

2.89 to 3.07 for leucine/isoleucine ratio. Our mean results for Ghanaian QPM varieties compare favorably with previously reported results for other QPM varieties [21] in threonine (3.65 vs 3.69 g/100 g protein), isoleucine (3.26 vs 3.21 g/100 g protein), leucine (9.01 vs 9.28 g/100 g protein), and lysine (4.00 vs 4.08 g/100 g protein). The mean lysine and tryptophan contents of QPM, 4.00 and 1.07 g/100 g protein, respectively, were higher than the respective mean values of 3.70 and 0.86 g/100 g protein reported for 49 QPM hybrids [22]. Analysis of 93 maize germ plasm samples revealed a broad range of variability for lysine content: 1.6 to 2.6 g/100 g of protein for normal varieties and 2.8 to 4.5 g/100 g of protein for *opaque-2* [12].

However, the lysine contents of our QPM varieties (3.70 to 4.20 g/100 g protein) are below the recommended levels for one-year-old and adult humans (6.6 and 5.0 g/100 g protein, respectively [19, 20, 23]). In Africa maize is used for human food in various kinds of porridges made from flour or meal. In Ghana *koko,* a thin gruel made from maize, is the first major supplementary food fed to weaning children. QPM offers better nutrition if no other protein-containing foods are ingested, because of its superior nutritional value. It is often stated that high-quality cereal grains are really not needed, because the deficiencies in normal grains, in maize in particular, will be made up by other foods consumed along with them [11]. This is not the case for resource-poor households in Ghana, where the only staple most people consume often is maize. The prime motivation, therefore, for converting to QPM is that it represents significant improvements in the nutritional and economic value of a cereal widely used as human and animal food. Moreover, as a dietary staple, maize is the main source of both energy and protein in large parts of the African continent [24]. Among coastal Ghanaians, maize accounts for 90% to 95% of the total calories in the diet [25]. It may lead to nutritional deficiencies if it is relied upon as a major food source. Furthermore, fortification of maize with legumes may alter the rheological and sensory properties of traditional meals [25].

The results showed variation in the sulphur-containing amino acids and indicate the possibility of selecting QPM for improved levels of cysteine and methionine concurrently with lysine, thus improving the amino acid profile and creating further nutritional advantage. Also, there was a lower ratio of leucine to isoleucine in QPM (mean, 2.99) than in normal maize (mean, 3.35). A low leucine-to-isoleucine ratio and higher tryptophan levels in QPM may further increase niacin availability [11].

Although animal assays may not be useful for quantitatively estimating the effectiveness of foods in meeting human protein needs, they can be used to assess damage to proteins during processing and to rank foods according to their protein quality [13]. We assessed the protein efficiency ratio (PER) values for a mixture of QPM and normal maize. The proximate composition of the normal maize and QPM maize used is shown in table 2. QPM does not differ from normal maize in its proximate components. The protein quality of maize samples is shown in table 3. QPM (Obatanpa) contained 57% more lysine and 63% more tryptophan than normal maize (Okomasa). The lysine and tryptophan content and the PER values of normal maize showed significant improvement at replacement levels of 40% or more with QPM. A similar observation of an increase in PER when *opaque–2* corn flour replaced wheat

TABLE 2. Proximate composition (%) of normal maize and quality protein maize (QPM)

Maize variety	Protein (N×6.25)	Fat	Ash	Moisture	Carbo-hydrate
Obatanpa (normal)	9.7	4.2	2.2	11.1	72.8
Okomasa (QPM)	9.9	4.3	2.0	11.4	72.7

TABLE 3. Protein quality of mixtures of normal maize and quality protein maize (QPM) flours

QPM:normal maize ratio	Lysine	Trypto-phan	Methio-nine + cystine	Adjusted PER[a]
	g/100 g protein			
100:00	3.7	1.00	4.2	1.84
80:20	3.4	0.92	4.0	1.82
60:40	3.1	0.84	4.0	1.56
40:60	2.9	0.76	3.8	1.43
20:80	2.6	0.68	3.8	1.34
00:100	2.3	0.61	3.6	1.00
SE[b]	0.21	0.06	0.15	0.05

a. Protein efficiency ratio: g gain/g protein consumed.
b. Within columns, SE differences of two means exceeding twice this value are significant ($p < .05$).

flour in the preparation of cookies was previously reported [26]. The PER of mixtures of 90:0, 72:18, 54:36, 45:45, 18:72, and 0:90% *opaque-2* corn flour:wheat flour, were 1.69, 1.48, 1.41, 1.23, 1.18, and 1.11, respectively. A PER below 1.5 indicates a protein of low or poor quality; between 1.5 and 2.0, a protein of intermediate quality; and above 2.0, a protein of good to high quality [13]. Our results showed that replacement of normal maize with 60% or more QPM changed maize from a poor-quality source into an intermediate-quality source. Significant ($p < .05$) positive correlation coefficients were observed for PER and lysine (0.87), PER and tryptophan (0.87), and PER and methionine + cysteine (0.84). Correlation between the *in vivo* PER and *in vitro* chemical parameters suggests the important contributions of these essential amino acids to growth. A comparison of the nutritive value of mixtures of chickpeas with wheat, triticale, and normal and *opaque-2* maize showed that the calculated scores based on amino acid composition correlated well with PER values based on rat feeding studies ($r = 0.859$) [27]. The results also suggest the equally important role of methionine + cysteine in maize-based diets in promoting growth.

The sensory scores of *tuo zafi* products for flour colour and smoothness, appearance, consistency, taste, and overall acceptability are shown in table 4. Obatanpa (QPM) produced *tuo zafi* flour of better acceptability than the local maize. The QPM hybrids (Mamaba, Dadaba, CIDA-ba) were similar to Obatanpa in flour colour. The colour of Dodzi (improved normal maize) flour was similar to that of the local variety. The mean scores showed that panelists liked the samples. Dodzi, Dadaba, and CIDA-ba produced flours of acceptable smoothness. The results for *tuo zafi* showed that all the maize samples had acceptable attributes for appearance, consistency, and taste. However, there were varietal differences. Dadaba had the highest scores for appearance, smoothness, and taste. The QPM hybrids also produced *tuo zafi* of better taste than the local variety.

The panelists of the *ga kenkey* session rated the maize samples higher for their appearance than the other attributes (table 5). Obatanpa and Dadaba received the highest scores for appearance. The local maize variety produced *ga kenkey* of better consistency than the QPM, Dadaba, and CIDA-ba. Sensory scores for taste and overall acceptability were not significantly different, indicating that all the maize varieties tested produced acceptable *ga kenkey*.

Mamaba had the highest score for appearance of *fante*

TABLE 4. Mean sensory scores for maize varieties in *tuo zafi*

Variety	Colour	Smoothness	Appearance	Consistency	Taste	Overall acceptability
Mamaba[d]	5.33^{bc}	5.86^{b}	5.40^{bc}	5.76^{c}	5.67^{a}	5.87^{ab}
Dadaba[d]	6.07	6.21^{ab}	6.23^{a}	6.47^{a}	6.07^{a}	6.21^{a}
CIDA-ba[d]	6.60^{a}	6.43^{a}	6.00^{ab}	6.27^{ab}	5.93^{a}	6.14^{a}
Obatanpa[e]	6.00^{ab}	5.86^{b}	5.13^{c}	5.13^{c}	5.53^{ab}	5.5^{c}
Dodzi[f]	5.07^{c}	6.07^{ab}	5.53^{abc}	5.33^{c}	5.60^{ab}	5.36^{bc}
Local[g]	5.47^{bc}	5.79^{b}	5.27^{bc}	5.13^{c}	5.07^{b}	4.93^{c}

a-c. Means in the same column with different letters are significantly different ($p < .05$). Like very much = 7, dislike very much = 1.
d. QPM three-way hybrids.
e. Open-pollinated QPM.
f. Normal, improved variety.
g. Normal, unimproved variety.

TABLE 5. Mean sensory scores for maize varieties in *ga kenkey*

Variety	Appearance	Consistency	Taste	Overall acceptability
Mamaba[d]	6.13[b]	6.13[ab]	5.33[a]	5.60[a]
Dadaba[d]	6.53[a]	5.53[b]	5.73[a]	5.47[a]
CIDA-ba[d]	6.47[ab]	5.53[b]	5.20[a]	5.48[a]
Obatanpa[e]	6.53[a]	5.83[ab]	5.23[a]	5.60[a]
Dodzi[f]	6.33[ab]	5.80[ab]	5.23[a]	5.67[a]
Local[g]	6.27[ab]	6.33[a]	5.52[a]	6.07[a]

a-c. Means in the same column with different letters are significantly different ($p < .05$). Like very much = 7, dislike very much = 1.
d. QPM hybrids.
e. Open-pollinated QPM.
f. Normal, improved variety.
g. Normal, unimproved variety.

kenkey, whereas Obatanpa had the highest score for overall acceptability (table 6). The maize varieties Dadaba, Dodzi, and the local variety had similar mean scores, which were lower than that of Obatanpa. The results showed that the QPM varieties were equally acceptable to consumers as the local maize variety in the various foods. However, there were differences in the overall acceptability of the QPM varieties. For *tuo zafi*, Dadaba and CIDA-ba were the most preferred varieties, whereas Mamaba was preferred for *fante kenkey*. For lunch, 100% of panelists for the *tuo zafi* session chose QPM-based foods, whereas 70% and 10% of panelists for the *fante kenkey* session chose QPM and local maize-based foods, respectively (table 7). In one of the first acceptability studies on *opaque-2* maize conducted in 1970 in Colombia using two varieties in different foods, *opaque-2* maize preparations showed good acceptability [28].

In conclusion, our results show that tropical Ghanaian QPM varieties have better protein nutritional quality than their normal maize counterparts. Since the local maize variety is the standard for acceptability in local dishes, our sensory results show that QPM varieties were equally acceptable to consumers and could be incorporated into traditional foods. Improving the nutritional quality of maize varieties by enhancing the amino acid profile through breeding is an example of an important nutrition objective in an agricultural research programme.

TABLE 6. Mean sensory scores for maize varieties in *fante kenkey*

Variety	Appearance	Consistency	Taste	Overall acceptability
Mamaba[d]	6.60[a]	6.27[ab]	6.00[a]	6.20[ab]
Dadaba[d]	5.53[b]	4.47[c]	5.41[b]	4.87[c]
CIDA-ba[d]	6.27[ab]	5.93[bc]	5.19[b]	5.13[c]
Obatanpa[e]	5.80[b]	6.60[a]	6.26[a]	6.47[a]
Dodzi[f]	5.75[b]	6.63[a]	6.5[a]	6.39[a]
Local[g]	6.20[ab]	6.27[ab]	5.73[ab]	5.53[bc]

a-c. Means in the same column with different letters are significantly different ($p < .05$). Like very much = 7, dislike very much = 1.
d. QPM hybrids.
e. Open-pollinated QPM.
f. Normal, improved variety.
g. Normal, unimproved variety.

TABLE 7. Preference of foods made from different varieties of maize for lunch

Food served and maize variety	% of subjects who preferred variety
Tuo zafi	
Mamaba[a]	40
Dadaba[a]	50
CIDA-ba[a]	10
Local[b]	0
Fante kenkey	
Mamaba[a]	20
Dadaba[a]	20
CIDA-ba[a]	10
Obatanpa[c]	20
Local[b]	10
Dodzi[c]	20

a. QPM three-way hybrids.
b. Normal, unimproved variety.
c. Normal, improved varieties.

Acknowledgements

We acknowledge the financial contributions of the Ghana/CIDA Grains Development Project, the Sasakawa Global 2000 Project, the West and Central African Maize Network (WECAMAN), and the National Agriculture Research Project. We also thank the staff of our maize breeding programme for their technical assistance and the staff of Women in Agriculture Development (Ministry of Food and Agriculture) for preparation of the food products.

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Composition and nutritive value of Amazonian palm fruits

I. Escriche, J. Restrepo, J. A. Serra, and L. F. Herrera

Abstract

This paper is a contribution to the study of the use of natural resources from tropical moist forests with a view to avoiding deforestation for farming purposes. This study analysed the moisture, fat, protein, ash, total dietary fibre, nitrogen-free extract, and gross energy content of various parts of the fruits of several Amazonian palms belonging to the Aracaceae (Palmae) family—Attalea racemosa, Euterpe precatoria, Mauritia flexuosa, Oenocarpus bataua, *and* Oenocarpus bacaba—*and also the fatty acid content of the oils extracted from the fractions of the fruit with the highest fat content. The high fat content of the mesocarp makes these foods an excellent source of energy, particularly those from* A. racemosa, M. flexuosa, *and* O. bacaba, *with fat contents of 58.1, 49.1, and 30.2 g/100 g of sample, respectively. The kernels have a high level of nitrogen-free extract, consisting basically of carbohydrates, particularly those of* O. bataua *and* M. flexuosa, *which have 83.9 and 72.5 g/100 g of sample, respectively. Apart from* A. racemosa *mesocarp oil, the fatty acid content of these oils, particularly oleic acid, is quite similar to that of oils with a high market value, such as olive, sunflower, corn, and soya oil. The cultivation of these species in the forest, just as the natives have always done, should be encouraged, since in addition to being potential sources of high-quality vegetable oils, they are alternative foods for the population in that region because of their nutritive value. The sale of these oils could increase the resources of tropical moist forests, which would in turn contribute considerably to the conservation of the forests.*

I. Escriche and J. A. Serra are affiliated with the Universidad Politécnica de Valencia in Valencia, Spain. J. Restrepo is affiliated with the Universidad del Valle, Departamento de Química, in Cali, Colombia. L.F Herrera is affiliated with the Fundación Erigaie in Santafé de Bogotá, Colombia.

Introduction

The final decade of this century is characterized by a greater awareness by both individuals and governments of the importance of natural resources. A great many of the wild plants that form part of the vegetation in jungle areas could be used as sources for a variety of products, such as oils, colourants, alkaloids, and substances with natural fungicide or herbicide properties, which could have immediate uses in the chemical and pharmacological industries. Exploiting these plants could be one way of appreciating the jungle rather than destroying it. Besides serving as foods, they could also be a source of income for the people living in that area, who themselves sometimes destroy forests to create farmland.

Archaeobotanic studies carried out in Río Caquetá [I. Cavelier and C. Rodriguez, personal communication, 1998] confirmed that for more than 9,000 years, groups of hunters-harvesters settled in the Amazon region of Colombia have eaten fruits of palms from the Aracaceae (Palmae) family [1, 2]: *Attalea racemosa, Euterpe precatoria, Mauritia flexuosa* (commonly known as *canangucha amarilla*), *Oenocarpus bataua, Oenocarpus bacaba, Jessenia bataua, Oenocarpus mapora, Astrocaryum aculeatum, Astrocaryum sciophylum, Astrocaryum jauari, Astrocaryum gynacanthum, Maximiliana maripa*, and *Bactris affriparia*. Of these, the first five are the species gathered most by the Huitoto, Andoque, Yukuna, Muinane, and Miraña tribes. They consume the mesocarp cooked or in the form of a drink called *chicha* or *cahuana*, which contributes a substantial amount of fat and carbohydrate to their diet.

The only species studied from a nutritional viewpoint have been *O. bataua* (commonly known as *seje* or *milpesos*) and *J. bataua*. The former has been compared with mother's milk due to its high nutritive value [3], whereas oil from *J. bataua* has been compared with olive oil because of its very similar fatty acid and sterol composition [4].

The aim of this study was to gather information on the chemical composition, nutritive value, and fatty acid

content of the wild-gathered fruits of certain palm species that are frequently eaten in the Amazon region of Colombia.

Materials and methods

Origin and preparation of samples

The palm species used in this study were *Attalea racemosa, Euterpe precatoria, Mauritia flexuosa, Oenocarpus bataua*, and *Oenocarpus bacaba* from the Amazon region of Colombia in the Putumayo and Amazonas Regions (Southwest Colombia) on the Brazilian border, a region of primary jungle with poor lateritic soil including moist forest and rain forest areas with temperatures of 24°C or more and average rainfalls of between 2,000 and 4,000 mm annually.

The fruits were picked when ripe, frozen and packed in isothermic containers, and immediately shipped by air to the University del Valle (Cali, Colombia). In the laboratory, they were thawed to refrigeration temperature, the mesocarp, kernel, and outer shell of the fruit were separated, and each fraction was ground separately in a Willey grinder with a 0.5-mm sieve and assayed. Samples of oil from the mesocarp of *E. precatoria* and *O. bacaba* obtained in the traditional fashion by a native woman in the Peña Roja community were also sent to the laboratory. The latter yielded two types of oil, one from the mesocarp alone and another from the mesocarp mixed previously with *Socratea exhorriza* leaves (commonly known as *zancona*), and known since ancient times as a natural antioxidant. All these samples were stored at 4°C until they were analysed.

Analytical determinations

The moisture content in the samples was determined by drying to a constant weight at 95° to 100°C under pressure (100 mm Hg, 13.3 kPa) [5]. The ash was calculated by ignition in a furnace at about 550°C until constant weight was achieved [6]. Total dietary fibre was determined by the enzymatic-gravimetric method [7]. Fat content was determined by Soxhlet extraction using petroleum ether (b.p. 40°–60°C). Protein was determined by the Kjeldahl method using Buchi (Switzerland) digestion (B-426) and distillation (B-316) units. Total protein was calculated using the conversion factor 6.25 [8]. The nitrogen-free extract given in grams per 100 g of sample was determined by subtracting the sum of the preceding values from 100. This approximately represents the carbohydrates other than cellulose, i.e., starch, hemicellulose, gums, and reducer and non-reducer sugars [9]. The gross energy was assayed using an adiabatic bomb calorimeter (IKA-Calorimeter C4000, Jamke & Kunkel, IKA Analysentecnik, Heitersheim, Germany).

For fatty acid compositional analysis, fats were cold extracted using the Hanson and Olley method [10] and converted to their fatty acid methyl esters using boron trifluoride [11].

The fatty acids in the oils were identified by Gas Chromatography–Mass Spectrometry (GC-MS) Fisons Trio 1000 GC-MS (Manchester, England), with helium as the carrier gas. Fragmentation was performed by EI+ (electronic impact method for ion production) at 70 eV, Scan mode between 50 and 450 mass units. The mass spectra obtained for all compounds were compared with several standard mass spectra provided by the database of the equipment. Quantification was carried out from peak area components and internal standards with an Autosystem Perkin Elmer gas chromatograph (Norwalk, Conn, USA), with a flame ionization detector. Gas chromatographic detector response correction for each component was considered as well. The quantitative results were obtained by averaging three repeat assays. A silica capillary column Chromosorb WHP 80–100 (25 m × 0.25 mm) of diethylene glycol succinate (DEGS) phase was used to analyse the fatty acids. The column temperature was programmed at 80°C for 5 minutes, from 80° to 190°C at 10°C/minute, and 190°C for 15 minutes. The injector and detector temperatures were set at 250° and 280°C, respectively. The carrier gas was nitrogen at 19.6 psi. Injections were made in the split mode with a split ratio 1:16. The injection volume was 1 ml. The chromatograms were recorded and the corresponding peak areas integrated by a Perkin Elmer Model 1020 Personal Integrator.

Results and discussion

Chemical composition

Table 1 shows the chemical composition (determined on a wet basis) of the different fractions analysed in the fruits of the Amazonian palms studied. The highest fat content was found in mesocarps of *A. racemosa* and *M. flexuosa,* with values of 58.1 and 49.1 g/100 g of sample, respectively. Apart from the *O. bataua* mesocarp, the fat yield of the mesocarps was higher than that of traditional oils: 19, 22, and 24 g/100 g in soya (*Soja max*), olive (*Olea europaea*), and sunflower (*Helianthus annus*) oils, respectively [9]. The fractions of fruits with the highest fat content always had the highest gross energy values, as in the case of mesocarp from *A. racemosa,* with 759.2 kcal/100 g, and from *M. flexuosa,* with 637.4 kcal/100 g of sample.

The nitrogen-free extract content of the mesocarps, consisting mainly of carbohydrates, varied between 13.4 g/100 g in *A. racemosa* and 40.6 g/100 g in *E. precatoria.*

All the kernels of the fruits analysed had low fat levels, always below 5 g/100 g, and a considerable level of nitrogen-free extract, particularly those of *O. bataua*

TABLE 1. Chemical composition of the different fractions of the fresh fruits of five Amazonian palms[a]

Palm	Moisture	Fat	Ash	Protein (N × 6.25)	Total dietary fibre	N-free extract	Gross energy (kcal/100 g fresh weight)
	g/100 g fresh weight						
Attalea racemosa mesocarp	10.3 ± 0.4	58.1 ± 2.8	1.4 ± 0.1	7.2 ± 0.3	9.6 ± 0.4	13.4 ± 2.8	759.2 ± 15.1
Euterpe precatoria mesocarp	4.5 ± 0.1	28.4 ± 1.6	1.3 ± 0.1	5.5 ± 0.3	19.9 ± 1.8	40.6 ± 1.8	605.2 ± 12.8
E. precatoria kernel	7.2 ± 0.1	2.5 ± 0.1	1.0 ± 0.1	3.2 ± 0.2	16.6 ± 1.7	69.5 ± 1.7	436.3 ± 8.4
Mauritia flexuosa outer shell	2.70 ± 0.03	26.7 ± 1.8	2.5 ± 0.3	6.7 ± 0.2	21.6 ± 1.9	39.8 ± 1.9	592.0 ± 11.3
M. flexuosa mesocarp	5.8 ± 0.1	49.1 ± 2.7	1.9 ± 0.2	5.2 ± 0.2	12.5 ± 1.1	25.5 ± 2.7	637.4 ± 14.9
M. flexuosa kernel	8.3 ± 0.2	0.60 ± 0.02	1.4 ± 0.2	3.8 ± 0.1	13.4.±.0.9	72.5 ± 0.2	400.1 ± 9.6
Oenocarpus bacaba mesocarp	5.8 ± 0.1	30.2 ± 1.9	1.2 ± 0.2	4.6 ± 0.2	18.9 ± 1.7	39.3 ± 1.9	606.3 ± 12.8
O. bacaba kernel	5.7 ± 0.1	4.1 ± 0.3	1.2 ± 0.1	4.7 ± 0.2	14.2 ± 1.3	70.1 ± 1.3	441.2 ± 8.7
Oenocarpus bataua mesocarp	9.7 ± 0.2	10.7 ± 0.7	1.7 ± 0.2	4.4 ± 0.2	42.2 ± 3.7	31.3 ± 3.7	524.2 ± 9.6
O. bataua kernel	7.5 ± 0.2	1.30 ± 0.08	1.1 ± 0.1	4.8 ± 0.2	1.4 ± 0.2	83.9 ± 0.2	393.8 ± 6.5

a. Values are means ± SD for triplicate analysis.

and *M. flexuosa,* which had 83.9 and 72.5 g per 100 g of sample.

The only outer shell analysed was that of *M. flexuosa*, which was analysed because of its oily texture, so different from the more fibrous and dry shells of the other palms. It is noteworthy mainly because of its high fat content (26.7 g/100 g), although its protein content (6.7 g/100 g) and nitrogen-free extract (39.8 g/100 g) are both significant. The outer shell of this palm has been traditionally used to make animal feed.

The levels of proteins in all the fractions analysed were quite low, never exceeding 7.2 g/100 g of product. Although the protein content was lower than that of certain oil-bearing plants such as soya (40 g/100 g) and cottonseed (36 g/100 g), it is nevertheless higher than that of olives, with 1.5 g/100 g of product [9].

As regards the chemical composition of the different fractions of the palm fruits studied, we may conclude that these foodstuffs provide high levels of energy, since in general they contain a high content of fat in the mesocarp and carbohydrates in the kernels.

Fatty acid composition

Table 2 shows the fatty acid composition of the oils extracted from the fractions of fruit with the highest fat content: *A. racemosa* mesocarp, *E. precatoria* mesocarp, *O. bacaba* mesocarp, *M. flexuosa* mesocarp, and *M. flexuosa* outer shell, and also the oil extracted by hand in the Amazon region from the *O. bacaba* and *E. precatoria* mesocarps. The results were compared with those from commercial olive (*Olea europea*) and African palm *(Elaeis guineensis*) oils.

All the oils studied had higher levels of unsaturated fatty acids than saturated fatty acids. As in many vegetable oils, such as olive, sunflower, corn, and soya bean, the main unsaturated fatty acid was oleic acid [12]. Apart from the oil of the *A. racemosa* mesocarp, the oleic acid content of the other oils (especially *E. precatoria* mesocarp oil extracted in the laboratory and hand-made *O. bacaba* mesocarp oil with zancona leaves) was similar to that of olive oil. The unsaturated fatty acid second highest in quantity was linoleic acid, ranging from 1.3 mg/g in *M. flexuosa* mesocarp oil to 10.4 mg/g in the *A. racemosa* mesocarp oil.

A. racemosa mesocarp oil had the highest level of saturated fatty acids of all the oils analysed (almost 39 mg/g), although the level was lower that those of palm (*Elaeis guineensis*) and palmist (obtained from *Elaeis guineensis* kernels) oils [13]. However, whereas the major saturated fatty acids in each of these last two oils were palmitic acid (almost 42 mg/g) and lauric acid (almost 44 mg/g), respectively, the major saturated fatty acid in *A. racemosa* mesocarp oil was myristic acid (21.0 mg/g). The saturated fatty acid found in the greatest quantities in the other oils analysed was palmitic acid (ranging from 14.8 to 21.6 mg/g). These levels are higher than the palmitic acid level in olive oil (9.4 mg/g), but far lower than the level mentioned earlier found in African palm oil [13].

We may conclude that apart from *A. racemosa* mesocarp oil, the content of fatty acids, especially oleic acid, in Amazonian palm oils is similar to the levels found in oils with a high market value, such as olive oil, and is therefore quite different from the levels found in traditional African palm oil.

TABLE 2. Fatty acid content (mg/g) of oils obtained from the fractions of Amazonian palm fruits with the highest fat content and of commercial olive and palm oil

Oil	UFA	Palmitoleic 16:1	Oleic 18:1	Linoleic 18:2	Linolenic 18:3	SFA	Lauric 12:0	Myristic 14:0	Palmitic 16:0	Stearic 18:0
Attalea racemosa mesocarp oil	56.7	ND	44.0 ± 0.3	10.4 ± 0.9	2.3 ± 0.4	38.7 ± 0.8	7.3 ± 0.9	21.0 ± 1.6	10.4 ± 0.9	ND
Euterpe precatoria mesocarp oil	84.1	0.4 ± 0.1	80.6 ± 0.8	3.1 ± 0.8	ND	15.4 ± 0.4	ND	0.3 ± 0.2	14.8 ± 1.3	0.3 ± 0.1
Hand-made *E. precatoria* mesocarp oil[a]	78.0	ND	70.5 ± 1.3	7.4 ± 1.6	0.1 ± 0.07	21.3 ± 0.6	ND	ND	20.8 ± 1.9	0.5 ± 0.2
Mauritia flexuosa outer shell oil	84.7	ND	75.8 ± 1.6	6.5 ± 0.9	2.4 ± 0.3	15.3 ± 0.7	ND	ND	15.3 ± 0.8	ND
M. flexuosa mesocarp oil	72.3	0.10 ± 0.06	70.7 ± 1.4	1.3 ± 0.1	0.20 ± 0.04	22.1 ± 0.6	ND	ND	21.6 ± 0.7	0.5 ± 0.1
Oenocarpus bacaba mesocarp oil	82.3	0.3 ± 0.04	79.4 ± 2.5	2.2 ± 0.4	0.4 ± 0.1	18.5 ± 1.9	ND	ND	16.8 ± 1.1	1.7 ± 0.4
Hand-made *O. bacaba* mesocarp oil[a]	78.4	0.3 ± 0.02	76.1 ± 1.8	1.7 ± 0.2	0.3 ± 0.1	16.9 ± 1.2	ND	ND	15.6 ± 0.8	1.3 ± 0.3
Hand-made *O. bacaba* mesocarp oil with *zancona* (*Socratea exhorriza*) leaves[a]	83.1	0.3 ± 0.02	80.4 ± 1.3	2.4 ± 0.3	ND	15.6 ± 0.8	ND	0.20 ± 0.05	15.4 ± 0.9	ND
Commercial olive oil (*Olea europea*) [13]	88.5	ND	80.5	7	1	10.9	ND	0.1	9.4	1.4
Commercial palm oil (*Elaeis guineensis*) [13]	49.8	1.8	38	10	ND	50.3	ND	2.4	41.6	6.3

Abbreviations: ND, not detected (< 0.01 mg/g oil); UFA, unsaturated fatty acids; SFA, saturated fatty acids.
a. Oil was extracted by hand by native Amazonian Indians.

Conclusions

The fruits of the Amazonian palms studied are of potential interest because of their high nutritive value and lipid content, and because their high fatty acid content is similar to that of other high-quality commercial oils, such as olive, corn, sunflower, and soya bean. Not only are they alternative foods for the population of the Amazon region, but they could be a source of high-quality vegetable oils that could be sold to increase the income from the tropical moist forests, hence contributing considerably to their conservation. The cultivation of these palms, as carried out traditionally by the natives since ancient times, should therefore be encouraged while avoiding one-crop farming, which would increase the spread of pests and degrade the soils.

This study was conducted in the hope of encouraging further research in the immediate future, with a view to using the natural resources in Amazonian jungle areas and thus avoiding the deforestation of such areas.

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Erratum

The editor is extremely embarrassed that an error occurred in the *Bulletin* on page 3, volume 18, number 1, March 1997, column 1, line 15 from the bottom. Of course the definition of BMI (body mass index) is weight in kilograms divided by height in metres squared.

Letters to the editor

Blindness is in the eye of the beholder

To the Editor

The December 1998 issue of the *Food and Nutrition Bulletin* (vol. 19, no. 4) provided us with two views on the findings from Bangladesh on duration of breastfeeding and on their implications for assessing the risk of a localized community's having hypovitaminosis A of public health relevance using the Helen Keller International (HKI) food-frequency method (FFM). The centre of contention is the multicentric validation study in which the two of us and other colleagues participated entitled "The validity of semiquantitative food frequency method" [1]. The extent of the applicability of this generic HKI FFM approach is called into question in an article by Persson et al. [2], with the title "The Helen Keller International food-frequency method underestimates vitamin A intake where sustained breastfeeding is common," which presented data from Bangladesh. The third element was an erudite editorial by the editor of the *Bulletin* [3] entitled "The blind men and the elephant."

In the editorial, Prof. Nevin Scrimshaw used the metaphoric story of various blind men's perception of an elephant, depending on which appendage they were stroking. In many ways, we were rubbed the right way by the general concept advanced by Dr. Scrimshaw, namely, that when the experiences from one country differ from those from another country, it does not mean that one needs to be wrong and the other correct. This fact seems to be lost in the contemporary proliferation of meta-analyses trying to find the "common biologic truth" among a series of methodologically consistent studies with distinct outcomes [4, 5]. Consistency is a good standard, and we had that caveat in mind in the design of our comparative study of the ability of the HKI FFM to discriminate and identify localities at risk for hypovitaminosis A in three diverse ethnic and ecological settings: Tanzania in Africa, the Philippines in Asia, and Guatemala in Central America [1].

As one can conclude from our foregoing commentary, we embrace the notion that situational factors make "truths" from one setting into "falsehoods" in another. Our agreement with the important principle of geographic specificity aside, however, we disagree with what Nevin Scrimshaw draws as his lesson, namely, that the Bangladesh-based paper "reports that even evaluation of a method in three different countries was apparently not sufficient to ensure its applicability to all countries" [3]. Who tested the applicability? Would not a test of the application be more to the point? We disagree that the work in question [2] comes close to producing direct evidence refuting the consistency of our published findings.

So, we move from Prof. Scrimshaw's elephant to another stocky creature in an animal-based metaphor, the insect enshrined in the etude for an aspiring young pianist, "Flight of the Bumblebee." The fact of the flight of this hymenopteroid is intriguing because aeronautical engineers have examined the phenomena from every precept of aerodynamics and have concluded—based on theoretical principles—that the bumblebee cannot fly. In first instance, the buzz caused by Persson and collaborators must be looked at in terms of conveying the misperception in the title and in the contents that the HKI FFM estimates vitamin A intake *per se*. Rather, what it estimates is the number of days in the previous week that each vitamin A–rich food listed on an instrument (generated on the basis of each locality's food habits) was consumed, as a means to dichotomously classify communities at risk of having ≥15% of children aged one to six years with circulating retinol concentrations less than 20 μg/dl (0.70 mmol). Secondly, the data they generate concern milk consumption, *per se*, and the intake of vitamin A from this single source. A basic weakness in the Persson et al. [2] argument is that, across the range of one to six years, the disproportionate number of children in any representative, age-balanced sample would not derive the major amount of their diet's vitamin A from maternal milk. In both rural Guatemala and rural Tanzania, areas covered in the valida-

tion exercise [1], breastfeeding is commonly an important part of the diet in children beyond infancy.

Returning to the flight of the bumblebee, the entomologist's challenge to the aeronautical engineer is to perform the empirical test, toss the insect into the air and determine the facts: Does it fall or does it fly? In fact, just as the airport in La Paz, Bolivia, is littered with the hulls of DC-3 aircraft that were able to land at that altitude but could never get airborne again, there may be settings and circumstances (the rarefied air of high altitudes, for instance) in which the bumblebee indeed cannot fly. Is Bangladesh's prolonged breastfeeding a rarefied circumstance for the HKI method? Raising the question is not the same as providing the answer. Hence, the title of the Persson article is misleading: it implies an empiricism that is not forthcoming in the text.

We would challenge Persson and colleagues to move beyond circumstantial evidence of nursing habits to an extension of our hypothesis-testing model [1]. The appropriate outcome variation is not lactation behaviour, but rather prevalences of low retinol levels in the circulations; blood specimens—not milk samples—are the arbiters in this debate. We thank both Persson and colleagues [2] and this journal's Editor [3] for drawing attention to the HKI method. Moreover, there is no doubt over one set of facts that we all share in common: that further validation of the HKI FFM would be beneficial and that breastmilk is undeniably an important component of nutrition.

Nancy L. Sloan, Dr.P.H.,
Population Council, New York

Noel W. Solomons, M.D., CeSSIAM,
Guatemala City, Guatemala

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Reply to N. L. Sloan and N. W. Solomons

To the Editor

We thank Drs. Sloan and Solomons for their metaphorical and enlightening letter. We join them in their enthusiasm regarding the potential value of the Helen Keller International Food-Frequency Method (HKI FFM) [1] and indeed suggest another potential use for which it might prove valuable. It has been designed to be a simple and rapid assessment tool for non-research organizations and policy makers of community-based health, agricultural, and development programmes [2]. The last two International Vitamin A Consultative Group (IVACG) meetings have shown that it has come into frequent use. In poorer countries, it has even been used in national surveys, in Laos [3] and Mozambique [4]. This indicates the need for a simplified method such as the HKI FFM in the study of vitamin A deficiency.

They seem to have no complaint with our brief description of the purpose of the method, as they point out and we mention, the method "is intended for use in assessing whether or not vitamin A deficiency is a public health problem in a population."

The first point they appear to be concerned about is that our reference to vitamin A intake in our title will mislead people who do not read our article [5] or their article [2] carefully into believing that this method actually measures intake *per se*. It clearly does not. On the other hand, the validation study they published [2] was intended to determine whether the method was a close enough proxy for an intake study to be able to identify communities with and without vitamin A deficiency. The title of our paper was perhaps provocative, given their understandable concern that their method not be misunderstood. Though cumbersome, we admit that "The Helen Keller International food-frequency method may overestimate the risk of a community having vitamin A deficiency as a public health problem where sustained breastfeeding is common," whether or not it would have "flown" with the editor and readers, would have been a better title. They also

are correct that we did not directly test the applicability of their findings in the sense that we were unable to run a repeat validity trial. This was our original intention, but it proved too expensive—as they must have experienced themselves, since they utilized only five communities in each country instead of 15, which presumably would be the ideal.

Most importantly, however, we stand behind the major point we made in the article. Although from a Northern perspective, breastfeeding durations in two of the three countries they studied are long, they are not as long as in South Asian countries. They ask whether Bangladesh is a "rarefied circumstance," and our answer is that only in the sense that this is the case for all of South Asia. And, as we pointed out in our article, South Asia is where most of the world's vitamin A deficiency is located [6]. The proportions of children still breastfed at 20 to 23 months in Bangladesh, Nepal, India, and Pakistan are 90%, 88%, 67%, and 56%, respectively, compared with 18%, 43%, and 53% in the Philippines, Guatemala, and Tanzania, respectively [7].

We perceive as their most substantive criticism of our findings their implication that even if many children are still breastfed in the second year of life, this will have little relevance for a method designed to examine vitamin A deficiency risk in the entire age range of one to six years. But the mean duration of breastfeeding in Bangladesh is 28 months, and the median is 36 months [8]. In Guatemala the mean duration of breastfeeding was 20 months [9] and in Tanzania the median duration of any breastfeeding was around 22 months [10]. Thus, half the children in Bangladesh are still being breastfed at an age that is 40% of the way through the age range covered. Half are breastfed longer than this—and these figures can be expected to be only slightly lower for the other South Asian countries cited above.

Most people are likely to assume that breastfeeding at such ages is "token" breastfeeding, but our data and other data we cited suggest that this is not the case. In Bangladesh, at least, when children are breastfed even into the fifth year of life, it appears to be a survival strategy, and they are breastfed seven to nine times a day [11]. And indeed, breastfeeding had been found to be protective against vitamin A deficiency in Bangladesh [12], even when it takes place beyond three years of age [13]. Similarly, we are publishing another paper showing that the consumption of cow's milk in one part of India (and this is likely to be true in much of that country, but not Bangladesh or Nepal) among young children is high enough to also call into question the wisdom of ignoring it [14]. In this case, consumption increases with age, so that cow's milk and breastmilk together are quite unlikely to be as unimportant as the original method description [15] suggests, at least in parts of South Asia where people have cattle.

We wanted to warn investigators using the HKI FFM to be aware that vitamin A deficiency is less likely to be a public health problem than they might expect if either breastfeeding or cow's milk feeding is common among pre-school children. We believe that either or both are much more common in much of South Asia than in the three countries where the initial validation study was done. We fully agree that the method should be validated in other parts of the world, particularly South Asia. We also would like to see its use validated for other purposes, including measuring large-scale shifts in consumption of vitamin A–rich foods, for example, in response to campaigns promoting dietary improvement. Furthermore, in areas where both short-term and long-term strategies to ameliorate vitamin A deficiency are running concurrently, diet-based indicators are needed to tell decision makers when untargeted distribution of vitamin A capsules can be phased out as diets improve.

Ted Greiner, Ph.D.

Mehari Gebre-Medhin, Ph.D., M.D.

Viveka Persson, M.Sc.

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To the Editor

I did not experience much difficulty in recognizing myself as the first blind man in your commentary [1]. The blind and other disabled are frequently misunderstood and misrepresented, so perhaps I might be given the chance to set the record straight.

My experience of childhood malnutrition was not confined to the 1970s, as implied, nor to a single country. I spent 1950–54 in rural India, 1958–62 in Tanzania, and 1962–76 in Lebanon and Jordan. None of these experiences fits the description given of "a country with marasmus…but with no kwashiorkor." It is further wrongly stated that I "believed that protein deficiency was not a serious problem if infants and young children received sufficient calories." These words, or any others of similar meaning, are not to be found in any of my publications on the subject.

So what did I believe and say? During the summer after being appointed professor of clinical nutrition in the school of medicine at the American University of Beirut in 1962, I had been astonished to encounter scores of skin-and-bone infants suffering from gastroenteritis. At that time, severely malnourished children were said to be suffering from protein malnutrition. However, this looked nothing like the kwashiorkor that I had seen in Africa and that was the subject of the classic descriptions from Ghana [2] and Uganda [3]. It was clearly starvation, or total inanition, due to deficiency of energy sources, protein, vitamins, and elements.

Our study of a large series of severely malnourished children in Jordan [4] revealed a spectrum of clinical disease. Early weaning, with breastmilk replaced by unhygienic and diluted bottle-feeding leading to diarrhoea and vomiting, was primarily responsible at the overwhelmingly predominant marasmus end of the spectrum.

By this time, the formulation of many kinds of protein-rich food mixtures and their advocacy as the solution to what was being termed "the impending protein crisis" [5] was rapidly going ahead with strong advocacy from UN agencies. In July 1974 the *Lancet* published my paper [6], which challenged this concept and showed that the vast majority of malnourished children were suffering from general undernutrition precipitated by infections. It was evident that marasmus had a much more complex aetiology than pure protein deficiency and was much more difficult to eradicate, as subsequent experience has proved. Food consumption data provided confirmatory evidence [7, 8]. Over the next six months, support flowed in through the correspondence columns of the *Lancet* and elsewhere. By the time of the World Food Congress in Rome later that year and subsequently, the "protein crisis" was no longer taken seriously, but a great deal of harm had been done.

As had been predicted [9], the breakdown of traditional rural social structures and their replacement by crowded, insanitary conurbations has largely resulted in marasmus replacing kwashiorkor, even in the relatively few places where the latter was common.

Although the lesser degrees of protein–energy malnutrition predominate everywhere today [10], the severe forms have not disappeared. For example, in India data from the National Nutrition Monitoring Bureau over a 10-year period show that in children one to five years of age, marasmus has been reduced from 1.3% to 0.6% and kwashiorkor from 0.4% to 0.1%. This suggests that there are still millions of severely malnourished children worldwide today.

Donald S. McLaren, M.D., Ph.D.

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Books received

Complex carbohydrates in foods. Edited by Susan Sungsoo Cho, Leon Prosky, and Mark Dreher. Marcel Dekker, New York, 1999 (ISBN 0-8247-0187-9). 676 pages, hardcover, US$195.00.

This book is based on an international workshop of the Association of Official Analytical Chemists (AOAC) that sought to resolve the analytical and nomenclature issues that have delayed the appearance of complex carbohydrate information on nutritional food labels. This is similar to the long debate over the definition of dietary fibre for food labeling purposes that was ultimately resolved by agreement based on research findings. Fifty-seven participants from the United States and Europe represented the foremost authorities from academia, government, and industry. As authors of individual chapters, they reviewed the health benefits and definitions of complex carbohydrates and dietary fibre (8 chapters), chemistry and analytical methodology of complex carbohydrates (3 chapters), analysis of resistant starch (2 chapters), analytical methodologies for resistant oligosaccharides (4 chapters), and analytical methodologies for dietary fibre (10 chapters) and wrote a 60-patent literature review of complex carbohydrates as fat mimetics. By the end of the workshop, the participants unanimously agreed that dietary fibre should be included in the definition of complex carbohydrates and that resistant oligosaccharides are part of dietary fibre. With this understanding, complex carbohydrates could be derived as the sum of analytically measured starch and dietary fibre values or as the calculation of total carbohydrates minus sugar minus available oligosaccharides for most nutrition labeling. This obviates the possibility of claiming that candy is a source of complex carbohydrates. A 61-page appendix gives the total carbohydrates and the total dietary fibre content of foods.

Nutritional biochemistry. Tom Brody. Academic Press, San Diego, Calif., USA, 1999 (ISBN 0-12-134836-9). 1006 pages, hardcover, US$79.95.

This is the second edition of a popular textbook of nutritional biochemistry that is comprehensive, well presented, and convenient to use and to locate information in. Its methodological appendices contain information not easily available elsewhere.

Salt, diet and health. G. A. MacGregor and H.E. de Wardener. Cambridge University Press, Cambridge, UK, 1998. (ISBN 0-521-583527, hardcover; 0-521-635454, paperback). 233 pages, hardcover, US$64.95; paperback, US$24.95.

This book provides a look at the history and mythology of the role of salt (sodium chloride) in diet and health. It is only with civilization that salt has been added to food. It became important industrially and economically in many countries, even as a source of tax revenue. The chapters on salt addiction, sex, symbolism and sanctity, and salt and society are both fascinating and entertaining. The many methods that have been devised throughout history for extracting salt from sea water are described. Six chapters are devoted to the effects of salt on blood pressure. The last chapter is devoted to the "industrial conspiracy" of excessive use of salt for preserving and processing food. Each chapter has a bibliography for further reading. The Appendix provides practical advice on reducing salt in the diet. Any lay person or professional interested in food, nutrition, and public health would find this book both interesting and informative.

Management of severe malnutrition: a manual for physicians and other senior health workers. World Health Organization, Geneva, 1999 (ISBN 92-4-154511-9). 60 pages, paperback (available in English; French in preparation), Sw fr 23.–/US$20.70 (in developing countries Sw fr 16.10).

This manual provides expert practical guidelines for the management of severely malnourished children. Addressed to doctors and other senior health workers, the manual explains exactly what must be done to save lives, achieve successful management and rehabilitation, prevent relapse, and thus give these children the greatest chance for full recovery. Throughout, the importance of treating severe malnutrition as both a medical and a social disorder is repeatedly emphasized. Successful management does not require sophisticated facilities and equipment or highly qualified personnel. The manual also performs a persuasive function, encouraging health professionals to do all they can to save these children and meet their great need for care and affection.

Recommended procedures draw on extensive practical experience as well as several recent therapeutic advances. These include improved solutions of oral rehydration salts for the treatment of dehydration, better understanding of the role of micronutrients in dietary management, and growing evidence that physical and psychological stimulation can help prevent long-term consequences of impaired growth and psychological development. Noting that the physiology of malnourished children is seriously abnormal, the manual gives particular attention to aspects of management—whether involving the interpretation of symptoms or the use of specific interventions—that differ considerably from standard procedures for well-nourished children. Details range from the reasons why intravenous infusion easily causes overhydration and heart failure, through a list of treatments that have no value and should never be used, to the simple reminder that underarm temperature is not a reliable guide to body temperature in a malnourished child during rewarming.

The manual opens with a concise introduction to the principles of management during three phases: initial treatment, rehabilitation, and follow-up. Chapter two briefly discusses treatment facilities, explaining why hospital or other residential care is essential for initial treatment and when a child can be moved to a rehabilitation centre. Chapter three, on evaluation, provides advice on how to assess nutritional status, take a medical history, and conduct a physical examination. Some useful laboratory tests are listed, through the book stresses that such tests are needed to guide or monitor treatment.

Against this background, the most extensive chapter gives detailed guidelines for initial treatment. Separate sections are devoted to hypoglycaemia, hypothermia, dehydration and septic shock, dietary treatment, infections, vitamin deficiencies, very severe anaemia, congestive heart failure, and dermatosis of kwashiorkor. Information includes instructions for the preparation of formula diets from a few basic ingredients, and numerous tables and charts for determining the amount of food to give, at which intervals, to achieve an acceptable daily intake of calories. Subsequent chapters provide equally detailed guidelines for rehabilitation, including emotional and physical stimulation as well as feeding, for follow-up and for managing cases that fail to respond to treatment. The manual concludes with brief advice on the management of severely malnourished children in disaster situations and refugee camps, and of severely malnourished adolescents and adults.

Further practical guidance is provided in eight appendices, which use numerous tables, charts, sample recording forms, instructions for preparing foods, and examples of easily constructed toys to help ensure that management is thorough, safe, and in line with the latest knowledge.

News and notes

SEAMEO-TROPMED Regional Center for Community Nutrition Indonesia

The SEAMEO (South-East Asia Ministers of Education Organization) TROPMED (Tropical Medicine and Public Health) Regional Center for Community Nutrition, hosted by the University of Indonesia in Jakarta, is a unit under the jurisdiction of the Indonesian Government's Ministry of Education and Culture. The Center offers several non-degree programmes. The diploma programme in the management of community nutrition (six weeks) is usually conducted between August and November each year. The field research programme (about six months) is offered at three different starting times each year, in March, July, and November. Each year several short courses (one to four weeks) are offered. In addition degree programmes are offered in Master of Science in Community Nutrition (two years) and Doctorate in Community Nutrition (three years). For information contact:

Training Program Coordinator
The SEAMEO-TROPMED Regional Center
for Community Nutrition
University of Indonesia
P.O. Box 3852
Jakarta 10038, Indonesia
Tel 61 21 330 205; fax 61 21 390 7695
E-mail: gtzseame@indo.net.id or
stropmed@rad.net.id

Course announcement

The 14th course of the Regional Training Programme on Food and Nutrition Planning, which leads to a Master in Professional Studies in Food and Nutrition Planning, will commence in April 2000 at the University of the Philippines Los Baños. The 17½-month course is organized in cooperation with the Netherlands and the Food and Agriculture Organization (FAO) of the United Nations. The course is open to a wide range of professionals from governmental, non-governmental, and private institutions involved in planning, implementation, training, monitoring, evaluation, and teaching in the area of food and nutrition. It aims to establish a cadre of trained human resources who can formulate as well as integrate food and nutrition considerations into national and sectoral development policies and programmes. Training covers general course work in Food and Nutrition, Economics, Statistics, Development Communication, and Food Science. Seminar-workshops on relevant issues such as gender and environment, research management, as well as supervised practicum at the macro and micro levels, case studies, simulated games, and workshops complete the training course.

A limited number of fellowships may be available. Therefore, applicants are strongly advised to explore sources of funding such as their respective institutions like FAO, UNDP, WHO, UNICEF, UNESCO, USAID, SEARCA, the World Bank, etc. Candidates for the course must possess a bachelor's degree or equivalent in a related field, must have an academic record indicating capability to pursue a graduate programme, and should preferably come from countries of East and South Asia.

All completed application documents should be submitted to the Dean of the Graduate School, University of the Philippines Los Baños, College, Laguna, not later than January 2000. Those who wish to avail themselves of an FNP fellowship should submit their completed documents to UPLB-FNP on or before 16 November 1999 for preliminary evaluation.

Application forms are available upon request. Address all inquiries and correspondence to:

The Director
RTP-FNP
University of the Philippines Los Baños
College, Laguna
4031 Philippines
E-mail: fnp@laguna.net

Note for contributors

The editors of the *Food and Nutrition Bulletin* welcome contributions of relevance to its concerns (see the statement of editorial policy on the inside of the front cover). Submission of an article does not guarantee publication—which depends on the judgement of the editors and reviewers as to its relevance and quality. All potentially acceptable manuscripts are peer-reviewed. Contributors should examine recent issues of the *Bulletin* for content and style.

Language. Contributions may be in English, French, or Spanish. If French or Spanish is used, the author should submit an abstract in English if possible.

Format. Manuscripts should be typed or printed on a word processor, **double-spaced**, and with ample margins. Only an original typed copy or a photocopy of equivalent quality should be submitted; photocopies on thin or shiny paper are not acceptable.

When the manuscript has been prepared on a word processor, a diskette, either 3½- or 5¼-inch, should be included with the manuscript, with an indication of the disk format and the word-processing program used.

Length. Ordinarily contributions should not exceed 4,000 words.

Abstract. An abstract of not more that 150 words should be included with the manuscript, stating the purposes of the study or investigation, basic procedures (study subjects or experimental animals and observational and analytical methods), main findings (give specific data and their statistical significance if possible), and the principal conclusions. Emphasize new and important aspects of the study or observations. Do *not* include any information that is not given in the body of the article. Do not cite references or use abbreviations or acronyms in the abstract.

Tables and Figures. Tables and figures should be on separate pages. Tables should be typed or printed out double-spaced. Submit only original figures, original line drawings in India ink, or glossy photographs. Labels on the figures should be typed or professionally lettered or printed, not handwritten.

Photographs. Ideally photographic materials should be submitted in the form of black and white negatives or black and white glossy prints. Photographs will not be returned unless a specific request is made.

Units of measurement. Preferably all measurements should be expressed in metric units. If other units are used, their metric equivalents should be indicated.

Abbreviations. Please explain any abbreviations used unless they are immediately obvious.

References. References should be listed at the end of the article, also double-spaced. Unpublished papers should not be listed in references, nor should papers submitted for publication but not yet accepted.

Number references consecutively in the order in which they are first mentioned in the text. Identify references in the text and in tables and figure legends by arabic numerals enclosed in square brackets. References cited only in tables or figure legends should be numbered in accordance with the first mention of the relevant table or figure in the text. **Be sure references are complete.**

Reference citations should follow the format illustrated below.

Journal reference

—*standard journal article* (list all authors):

1. Alvarez ML, Mikasic D, Ottenberger A, Salazar ME. Caracteristicas de familias urbanas con lactante desnutrido: un análisis critico. Arch Latinoam Nutr 1979;29:220–30.

—*corporate author:*

2. Committee on Enzymes of the Scandinavian Society for Clinical Chemistry and Clinical Physiology. Recommended method for the determination of gammaglutamyltransferase in blood. Scand J Clin Lab Invest 1976;36:119–25.

Book or other monograph reference

—*personal author(s):*

3. Brozek J. Malnutrition and human behavior: experimental, clinical and community studies. New York: Van Nostrand Reinhold, 1985.

—*corporate author:*

4. American Medical Association, Department of Drugs. AMA drug evaluations. 3rd ed. Littleton, Mass, USA: Publishing Sciences Group, 1977.

—*editor, compiler, chairman as author:*

5. Medioni J, Boesinger E, eds. Mécanismes éthologiques de l'évolution. Paris: Masson, 1977.

—*chapter in book:*

6. Barnett HG. Compatibility and compartmentalization in cultural change. In: Desai AR, ed. Essays on modernization of underdeveloped societies. Bombay: Thacker, 1971:20–35.

Identification. Please give the full name and highest degree of all the authors, the name of departments and institutions to which the work should be attributed, the name, address, and fax number of the author responsible for correspondence about the manuscript, and sources of support for the work. If the material in the article has been previously presented or is planned to be published elsewhere—in the same or modified form—a note should be included giving the details.

Manuscript copies. The contributor should keep a duplicate copy of the manuscript. Manuscripts will not be returned unless specifically requested. Proofs will be sent to the authors only in exceptional circumstances.

Contributions should be addressed to:

The Editor
Food and Nutrition Bulletin
Charles Street Sta., P.O. Box 500
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Note à l'intention des auteurs

La rédaction du *Food and Nutrition Bulletin* recherche des articles traitant de sujets correspondant à ses thèmes (voir au vérso de la couverture la politique éditoriale de cette revue). La remise d'un manuscrit ne signifie pas sa publication, qui dépend de l'opinion de la rédaction et des réviseurs sur son intérêt et sa qualité. Tous les manuscrits susceptibles d'être acceptés sent révisés par des pairs. Les auteurs sent invités à se pencher sur les récents numéros du *Bulletin* pour prendre connaissance de son contenu et de son style.

Langues. Les manuscrits peuvent être rédigés en anglais, en français ou en espagnol, et dans ces deux derniers cas, l'auteur ajoutera, si possible, un résumé en anglais.

Format. Les manuscrits doivent être dactylographiés ou imprimés sur une machine de traitement de texte, **en double interligne**, avec une marge suffisante. Ne doit être présenté qu'un exemplaire original dactylographié ou une photocopie de qualité équivalente.

Lorsque le manuscrit a été préparé sur une machine de traitement de texte, une disquette de 3,50 ou de 5,25 pouces devrait dans toute la mesure possible y être jointe en précisant son format et le programme utilisé.

Longueur. Les manuscrits ne doivent pas, normalement, dépasser 4000 mots.

Résumé: Un résumé de 150 mots maximum doit accompagner le manuscrit. Il devra donner les buts de l'étude ou des recherches, les procédures de base (sujets de l'étude ou animaux expérimentaux et méthodes d'observation et d'analyse), les principaux résultats (fournir des données spécifiques et indiquer dans la mesure du possible leur importance statistique) ainsi que les principales conclusions. Veuillez mettre en relief les aspects nouveaux et importants de l'étude ou des observations. Prière de *ne pas* inclure des informations qui ne figurent pas dans le corps de l'article. Dans le résumé, ne citez aucun ouvrage de référence et n'utilisez ni abréviations ni sigles.

Tableaux et figures. Ils doivent être reportés sur des feuillets séparés. Les tableaux doivent être dactylographiés ou imprimés en double interligne. Veuillez soumettre uniquement des figures originales, des dessins à l'encre de Chine ou des photographies tirées sur papier glacé. Les labels qui apparaissent sur les figures doivent être dactylographiés ou gravé ou imprimés de manière professionnelle et non pas écrits à la main.

Photographies. En principe, les matériaux photographiques doivent être remis sous forme de négatifs noir et blanc ou d'épreuves noir et blanc sur papier brillant. Sauf demande expresse les photographies ne seront pas renvoyées.

Unités de mesure. On utilisera de préférence le système métrique. Si d'autres systèmes sent utilisés, l'équivalent métrique doit être indiqué.

Abréviations. Prière d'expliquer les abréviations utilisées à moins qu'elles ne soient évidentes.

Références. Les références doivent apparaître à la fin de l'article, en double interligne également. Les documents non publiés ne doivent pas figurer dans les références pas davantage que les documents présentés à des fins de publication mais qui n'ont pas encore été acceptés.

Veuillez numéroter les références dans l'ordre où elles sent mentionnées dans le texte. Identifiez au moyen d'un chiffre arabe placé entre crochets les références dans le texte, les tableaux et les légendes des figures. Les références citées uniquement dans les tableaux ou les légendes des figures doivent être numérotées en fonction de la première fois où il est fait mention du tableau ou de la figure appropriée dans le texte. **Assurez-vous que les références sont complètes.**

Les références citées doivent suivre le format décrit ci-dessous.

Journal

—*article de journal type* (énumérer tous les auteurs):

1. Alvarez ML, Mikasic D, Ottenberger A, Salazar ME. Caracteristicas de familias urbanas con lactante desnutrido: un análisis critico. Arch Latinoam Nutr 1979;29:220–30.

—*auteur d'une société:*

2. Committee on Enzymes of the Scandinavian Society for Clinical Chemistry and Clinical Physiology. Recommended method for the determination of gammaglutamyltransferase in blood. Scand J Clin Lab Invest 1976;36:119–25. Livre ou autre monographie

—*auteur(s) à titre personnel:*

3. Brozek J. Malnutrition and human behavior: experimental, clinical and community studies. New York: Van Nostrand Reinhold, 1985.

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4. American Medical Association, Department of Drugs. AMA drug evaluations. 3e éd. Littleton, Mass. (E.-U.): Publishing Sciences Group, 1977.

—*éditeur, compilateur, président en tant qu'auteur:*

5. Medioni J, Boesinger E, éds. Mécanismes éthologiques de l'évolution. Paris: Masson, 1977.

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6. Barnett HG. Compatibility and compartmentalization in cultural change. Dans: Desai AR, éd. Essays on modernization of underdeveloped societies. Bombay: Thacker, 1971:20–35.

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2. Committee on Enzymes of the Scandinavian Society for Clinical Chemistry and Clinical Physiology. Recommended method for the determination of gammaglutamyltransferase in blood. Scand J Clin Lab Invest 1976;36:119–25.

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4. American Medical Association, Department of Drugs. AMA drug evaluations. 3ra edición, Littleton, Mass., EE.UU.: Publishing Sciences Group, 1977.

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5. Medioni J, Boesinger E, editores, Mécanismes éthologiques de l'évolution. París: Masson, 1977.

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