

# Community-based school feeding during Indonesia's economic crisis: Implementation, benefits, and sustainability

Lisa J. Studdert, Soekirman, Kathleen M. Rasmussen, and Jean-Pierre Habicht

## Abstract

*The Indonesian Government initiated a community-based national school-feeding program in 1996. Implementation was decentralized and involved multiple participants. In 1998 we evaluated the implementation of the program and the perceived benefits for community stakeholders using a survey of principals in 143 randomly selected schools and follow-up with in-depth interviews and observations in a subsample of 16 communities. The evaluation covered the period of the 1998 Asian economic crisis, affording the opportunity to assess its impact on the program. The program was implemented in all targeted schools, with excellent community participation. Feeding was sustained through the crisis, in spite of a dramatic escalation in food costs. The families of schoolchildren, farmers, and those who prepared food received economic benefits. The snacks replaced those sold at schools and were of better nutritional value. The children benefited because the snacks compensated for losses in the home diet resulting from the economic crisis. Characteristics of the program that may be important in explaining its success include the involvement of a range of community stakeholders, engagement with existing village administrative structures, scope for local community adaptation and innovation, and the use of local foods that dispersed benefits and ensured sustained implementation during the crisis.*

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**Key words:** Community-based, economic crisis, Indonesia, school feeding

## Introduction

In the 1990s, the Government of Indonesia introduced a national school-feeding program that was planned and funded entirely with government resources. The program was ambitious, with broad goals that targeted children, schools, parents, and the broader village community (table 1) [1]. The program was part of the national poverty alleviation strategy of the Sixth Five-Year Development Plan for Indonesia, using school feeding as a community-level entry point. The mechanisms for program delivery were innovative as compared with other Indonesian government programs and in the context of school-feeding programs internationally [2, 3].

Pilot program trials were conducted in six provinces in 1991–92 [4]. Following evaluation of these trials, national implementation started in 1996 for approximately 2.1 million primary schoolchildren in more than 16,000 schools in villages designated as poor according to the Inpres Desa Tertinggal (IDT) or “Presidential Instruction for Villages Left Behind” program criteria. These criteria identified villages with economic growth less than the regional average according to a list of 36 indicators of village infrastructure and household socioeconomic factors [5, 6]. By 1998, the

TABLE 1. Goals of Indonesia's school-feeding program

- » To improve the health and nutritional status of primary schoolchildren
- » To improve the learning motivation and capacity of schoolchildren
- » To empower parents and community to be more concerned about their children's schooling, health, and nutrition
- » To improve the village economy with market opportunities for home or school-produced food products

schools in all IDT villages were mandated to implement the school-feeding program.

Implementation of the school-feeding program involved the provision of a mid-morning snack three days a week through the school year, for a total of 108 snacks a year. Program guidelines stipulated that the snack must not include the local staple food in order to avoid the impression that the food was a main meal that replaced a meal children would otherwise receive at home. Despite protests from industry groups at the time of the program's inception, the program guidelines also stipulated that industrially produced foods such as milk powder and noodles not be used [Soekirman, Personal communication, Jakarta, Indonesia, 1996]. To ensure that funding was directed into the local economy, only locally grown commodities could be used. The program also stipulated that children should receive deworming medicine twice a year [7].

Program funds, based on a per-snack, per-child, per-day amount, went directly from the national level to a local bank, bypassing the provincial and district levels of government. This was a new approach to delivery of program funds in Indonesia that was designed to minimize the attrition of funds that occurs as each level of government administers funds, and thus to ensure that more of the allocated funds reached the targeted program beneficiaries. From 1996 to late 1998, the allocated amount was 250 rupiah per snack in Java, Sumatra, and Bali, and 350 rupiah per snack in the rest of Indonesia (equivalent in 1996 to approximately US\$0.10 and 0.15, respectively). Only the school principal could withdraw funds from the local bank and to do this was required to present a menu plan signed by the village leader, the village midwife, and the heads of the local women's and school parents' associations. This process was designed to ensure that multiple local parties verified student numbers and were aware of the funds being provided for the program. The menu plan was prepared at the village or subdistrict level with technical advice from Ministry of Health staff.

The snacks were to have a minimum of 300 kcal and 5 g of protein. The type of snack served varied seasonally and regionally. Examples included *Getuk Ubi* (sweet potato with red palm sugar and coconut, from West Kalimantan) and *Bubur nasi sup* (a rice soup with meat, onion, and coconut, from West Nusa Tenggara). The program guidelines left scope for specific implementation plans to be designed according to village circumstances. The guidelines suggested that the village women's association be responsible for food preparation and that the village leader, parents, or midwife monitor the program [7].

The guidelines stated that when the snack was delivered to the school, the teachers should organize the children to wash their hands and give them a brief lesson on some aspect of health and nutrition, and that the children should pray according to their religion.

Figure 1 depicts school-feeding program inputs and stakeholder groups at the village level.

From 1996 the school-feeding program rapidly expanded. In the 1998–99 school year, all provinces were included, and the program served 8.1 million children in 53,000 schools, with a budget of 550 billion rupiah (equivalent to US\$50.5 million at the April 1999 exchange rates).

In 1997–98 Indonesia was severely struck by the Asian economic crisis. There were dramatic cuts in government programs, while donor funds were redirected to social safety net programs that targeted those worst affected. The school-feeding program was identified as integral to these efforts and was preserved within the International Monetary Fund loan agreement of July 1998 that required large cuts in government expenditures [8].

This paper presents the results of a study of the school-feeding program, its implementation, and its perceived benefits to stakeholders before and during the 1998 economic crisis. Although one of the program's stated goals was to improve children's health and nutritional status, the study did not aim to directly assess program impact in this area. The specific objectives of this study were to investigate how the school-feeding program was implemented and how the economic crisis affected implementation; and what the benefits were to the stakeholders involved in implementation.

## Methods

The study was based on a staged process that combined data-collection methods to form an emergent and adaptive evaluation strategy [9, 10]. Preliminary interviews and observations (stage 1) informed the design of a quantitative survey (stage 2). Data from stage 2 were used to select villages for intensive interviews and observations (stage 3). Insights from the results of stages 1 and 2 informed the design and approaches taken in the interviews of stage 3. Stage 3 was an adequacy study [11] that compared the findings with what was expected, rather than an impact study that compared intervention and control groups. All interviews were conducted with an interpreter who had English, Indonesian, and local language skills.

### Stage 1: Preliminary interviews and observations

Exploratory observations and interviews were carried out with key informants and program participants in 1996 and 1997, prior to the onset of the economic crisis. Key informants included government officials and program planners at the national, provincial, and district levels. Visits were made to schools in West Nusa Tenggara, Lampung, and West Java, where the early stages of program implementation were observed

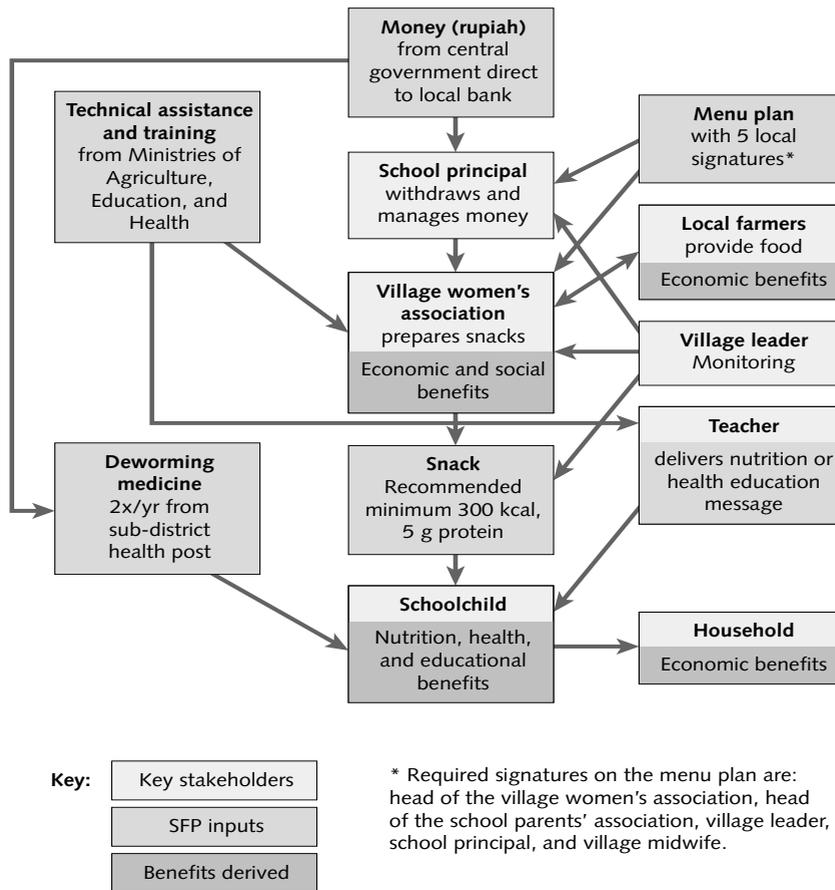


FIG. 1. Implementation flowchart for the Indonesia school-feeding program

and interviews were conducted with members of the village women’s association, parents’ association, school principals, village leaders, and the village midwife.

**Stage 2: School survey**

In August 1998, the Ministry of Education and Culture planned a study to assess the impact of the ongoing economic crisis on primary education in five provinces: West Java, South Kalimantan, South Sulawesi, East Nusa Tenggara, and West Nusa Tenggara [12]. In each province, two districts were selected, from which two subdistricts were selected. These selections were made purposefully to form a sample of contrasting rural and urban areas. Fourteen schools were randomly selected from each subdistrict to make a total selected sample of 280 primary schools.

The Ministry of Education and Culture survey was designed to collect data on student enrollments, absenteeism, dropouts, and a number of school quality variables (e.g., budget, facilities, and teachers) in the three school years preceding the onset of the economic crisis and for the current school year, in which the crisis was ongoing, in order to assess changes over this period.

Of the 280 primary schools selected for the Ministry of Education and Culture survey, 143 were identified as being in IDT villages, where it was expected the school-feeding program was being implemented. An additional survey component was administered in the schools of these IDT villages. This component asked specifically about issues related to implementation of the program. The school principals were asked to complete all sections of the survey forms, and trained fieldworkers managed the survey forms.

**Stage 3: Interviews and observations**

Sixteen school-feeding program schools were selected from the 143 schools in the Ministry of Education and Culture survey, where it was expected that the program was being implemented (stage 2), for an in-depth study of program implementation processes and benefits on the basis of changes in student absenteeism at the school since the start of the program. The eight schools that had shown the greatest increase in student absenteeism and the eight that had shown the greatest decline were selected. Absenteeism has previously been shown to respond to the introduction of a school-feed-

ing program [13–15]. Although no literature that we are aware of has related changes in absenteeism to differences in the quality of program implementation, we thought that the change in absenteeism might reflect the quality of implementation of the school-feeding program, and that choosing from the extremes of the changes would reveal maximum variability in implementation factors. The principal author was blinded to a school's record of absenteeism during data collection and analyses. The results from the absenteeism analysis have been reported elsewhere.\*

Interviews and observations were conducted between September and December 1998, during the economic crisis. The visits to schools were mostly unannounced, based on our experience in the preliminary fieldwork that showed this prevented over-preparation for the visit, particularly with school-feeding program activities.

At each school, data collection consisted of a series of open-ended interviews with five stakeholder groups: the school principal, the teachers, the parents, the women's association members involved in cooking, and the village leader. A core group of questions on program implementation was common to all interviews, combined with stakeholder-specific questions related to their role in the program. Women's association members were asked how they organized the preparation of the program snacks. The women were also asked what ingredients had been used for the snack served that day, what price they paid, and how much that commodity had cost a year ago. Past and present prices were always readily recalled. At selected sites, the prices given were validated at the local market.

Each interview took about one hour, and a set of interviews and observations at a school took one day to complete. Seventy-eight interviews were conducted with 172 informants, and observation of snack distribution was possible at 10 of the 16 selected schools.

### Data quality control and handling

Patton [16] describes four kinds of triangulation (methods, sources, analyst, and theory/perspective), of which we used two, methods and sources. The use of survey, key informant, and interview/observation data enabled triangulation of methods, and within the interview phase, the use of a core group of questions across stakeholder groups enabled triangulation of sources. Within an interview, multiple member checks (the reiteration of questions or responses) were used. Following administration of the survey, exit interviews were conducted with 13 school principals in two provinces to ascertain their understanding of the school-

feeding program component of the survey.

Peer debriefing and discussion of emergent findings was done with key informants in each province and with key ongoing interlocutors in Jakarta at the Indonesian National Planning Agency (BAPPENAS), UNICEF, and the Ministry of Education and Culture.

Survey data about program implementation from stage 2 were entered into the Statistical Package for the Social Sciences program [17] and analyzed for basic frequencies, with comparisons between the two groups of 8 schools selected for stage 3 and between these two groups of schools and all of the other 127 schools. Pearson chi-square tests were used to compare the findings from survey data with comparable interview and observation findings. A difference was considered significant when the *p* value was less than .05. In this study, a finding of no difference between groups is generally more important. We inferred that there was no important difference between groups when the magnitude of the observed difference was small and the pattern of differences was inconsistent.

All interviews were transcribed and analyzed for key emergent themes. Cases were contrasted across sites and across informant groups. Multiple passes were made through the interview and observation data to clarify and refine findings as they developed. The data were used to describe stakeholders' perceptions of the consequences of the school-feeding program and to examine the adequacy of program implementation in meeting the administrative protocols established for the program.

## Results

### Data validity and reliability and differences among schools

Comparison of the survey data on inputs and activities with interview and observation data on the same inputs and activities for each of the 16 selected schools revealed that six of the nine items were over-reported and three of the items were the same in the eight schools with decreased absenteeism. In the schools with increased absenteeism, seven of the nine items were over-reported, and two were the same. There were no major differences between the two groups of schools in the pattern of over-reporting. Table 2 shows that the magnitude of over-reporting was small, with a mean of 14% over-reporting in the survey responses relative to the more definitive interview and observation data for the same schools. None of the items was over-reported by more than 20%, except for the principal's self-report of training for the program, which was over-reported by about 25% in the survey.

Table 3 contrasts the survey data from the 16 selected schools with the other 127 schools surveyed. The com-

\* Studdert LJ. Indonesia's school feeding program: benefits in a time of crisis. Unpublished doctoral thesis, Cornell University, Ithaca, NY, USA, 2001.

pliance factors measured in the 16 selected schools were similar (less than 5% difference) to those in all the other 127 schools, with the exception of teachers receiving instruction manuals (greater among schools where interviews and observations did not take place,  $p < .05$ ) and students receiving deworming treatments (less among schools where interviews and observations did not take place, but not statistically significantly different because of variance between the two groups of eight schools). However, none of these differences point to any apparent systematic or otherwise significant differences that would affect our interpretation of the findings.

The data did not reveal any important differences between the two groups of eight schools for key program implementation inputs or activities; thus, the data did not support the hypothesis that the eight schools with improved attendance under the school-feeding program would show different implementation inputs than the eight schools where attendance declined.\*

### Widespread implementation according to guidelines

All 143 schools in the stage 2 survey that were identified as being in villages where the school-feeding program should have been implemented (i.e., designated IDT villages) reported that they were actively implementing the program. Survey and interview/observation data showed program implementation to have been largely uniform and according to program guidelines for all key inputs and activities (tables 2 and 3), with the exception of provision of deworming medicine.

Interviews with key stakeholders in stage 3 revealed uniformity of implementation across the 16 sites. The awareness of program processes and adherence to these was marked, confirmed in observations, and indicated by the following descriptions:

[The process is] to wash hands, queue, and check the cleanliness of students, especially their hands and nails. Then we distribute the snack and tea and the child enters the class. We inform students about the nature of the snack and describe the materials and what nutrition the food has. We ask the cooks about what ingredients are in the snack. (teacher, Nusa Tenggara Barat)

Before the children eat the food, they have a prayer or a lesson about nutrition or health. Before the children are given the food, they wash their hands and pray. (teacher, South Sulawesi)

At the 16 sites where interviews were conducted, there was only one identified case of program funds

TABLE 2. Input and activity at schools selected for interview/observation ( $n = 16$ ): comparison of survey data from selected schools with interview/observation data from the same schools

Input and activity	Survey data (% of principals reporting)	Interview/observation data (% of sites selected)
Snack food to children 3×/wk <sup>a</sup>	100.0	93.8
Deworming medicine to children 2×/yr <sup>a</sup>	42.8	35.7
Instruction materials to school and women's association	93.8	100.0
Community meeting	100.0	93.8
Cooking equipment to women	100.0	81.3
Handwashing facilities at school	93.8	81.3
Health/nutrition lessons from teacher	100.0	81.3
Teacher has instruction manual	100.0	100.0
School principal has training	93.8	68.8

a. Prescribed amount according to government guidelines and budget provided.

TABLE 3. Comparison of survey data from the 16 schools<sup>a</sup> selected for stage 3 data collection with all other schools ( $n = 127$ )

Input and activity	16 selected schools (% of principals reporting)	All other schools (% of principals reporting)
Snack food to children 3×/wk <sup>b</sup>	100.0	100.0
Deworming medicine to children 2×/yr <sup>b</sup>	42.8	65.4
Instruction materials to school and women's association	93.8	98.4
Community meeting	100.0	98.4
Cooking equipment to women	100.0	96.9
Handwashing facilities at school	93.8	98.4
Health/nutrition lessons from teacher	100.0	97.6
Teacher has instruction manual	100.0	66.1
School principal has training	93.8	97.6

a. The statistical test compared the two groups of 8 schools with the other 127 schools (see description in text).

b. Prescribed amount according to government guidelines and budget provided.

\*Studdert LJ. Indonesia's school feeding program: benefits in a time of crisis. Unpublished doctoral thesis, Cornell University, Ithaca, NY, USA, 2001.

being used inappropriately. At this school, it was found that the principal was implementing the program independently, without community involvement, and there were suggestions from other informants of mismanagement of program funds. Nevertheless, a snack distribution was observed at the school, although the ongoing frequency could not be determined.

One procedural complaint that was occasionally heard in interviews concerned delays in the disbursement of funds from the government to the local bank. However, there was no evidence that this disrupted implementation. Indeed, it is notable that those responsible ensured that implementation proceeded, as evidenced by this particular comment:

The distribution of money is sometimes late, but to overcome this I borrow money from school cash. (women's association member, Nusa Tenggara Barat)

### High degree of community participation in program implementation

At 15 of the 16 interview and observation sites, it was determined that members of the village women's association prepared the school snack. At 10 sites multiple teams with two or more members had some form of rotating schedule, and at the other sites there was a single team of three to five women. The specifics of these preparation arrangements were unique to each school.

The women were asked if the work was a burden to them, and they invariably insisted that it was not. Moreover, the women talked about their motivation to perform the work, including social interaction with other women while cooking, and said that they were happy to do the work for the benefit of the children:

[The school-feeding program is good because] students get healthy and I get activity. Sometimes I only cook at home, but with this I get activity away from home. (women's association member, South Sulawesi)

I learn to make better food and I learn by example how to cook hygienically. (women's association member, Nusa Tenggara Barat)

Throughout the survey, 75% of principals reported that commodities for the snacks came from local markets, 56% from local farmers, and 49% from local gardens (the total exceeds 100% because food was purchased from multiple sources). Markets in neighboring villages were the other main source (43%). Seventy-two percent of those surveyed said the school-feeding program had benefited farmers by giving them opportunities to sell produce.

In addition to the role of the women's association members and local farmers, the interviews revealed that

there were multiple ways in which other community members participated:

I give advice to the groups: they must cook food the children like. If the children don't like the food, they must change. Sometimes I look at food and the children don't finish eating the snack; therefore, they must not like it, and after that I give advice to change the menu. (village leader, South Kalimantan)

Sometimes I come to school to try the food, when I have the opportunity. Last year I came about six times. Sometimes I get food from the children. I come to test the food. (head of parents' association, South Sulawesi)

The midwife gives advice about the menu, such as how many calories. She tells us we should wear a mask and gloves when cooking and be clean. She tells us not to touch already cooked food. (women's association member, West Timor)

### Food costs increased but feeding continued

Dramatic increases in food commodity prices were reported at all interview and observation sites, reflecting the effects of the ongoing economic crisis. The women reported that the price of items used in the snack they prepared the day of our visit had increased by an average of 160% in the previous 12 months (this figure is a simple mean of the increase in prices of all food items and gives no weighting to the relative proportions of the different commodities used in a particular snack). This figure is broadly consistent with official national data for this period that found the average increase in food prices to be 135% [18]. The range of increases reported across the 16 interview and observation sites was 73% to 250%.

At least one stakeholder at each site spoke about the impact of the increased prices on snack size and/or quality, but there were no reports that snacks were being served less than the prescribed three times per week:

The crisis does have an impact, because the price of the materials for school feeding should be adjusted to the real price of the day. The size of the snack is smaller. (teacher, Nusa Tenggara Barat)

In 1997 the children got two cakes and one glass of tea. Now they get only one cake. (school principal, South Kalimantan)

Before the crisis the kind of food for children was varied—eggs, vegetables, and sometimes meat—but now this is not possible. (school principal, South Kalimantan)

At 14 of the 16 interview sites, it was reported that children were receiving less food at home since the crisis:

The [children] now have a big meal only at lunch. Here the rice is 4,000 rupiah per kilogram, and not less than 3,000 rupiah per kilogram, so of course many families can't support having rice three times per day. Now they don't have breakfast or eat only cassava. (teacher, South Kalimantan)

Before, the children drank milk every day, but now they only drink it sometimes. And now we eat meat only infrequently. If there is a wedding party, we eat meat. (women's association member, South Sulawesi)

### **An income transfer benefit for community participants**

There was initially some difficulty in identifying whether there was some incentive for women who worked to prepare snacks. In the survey, less than 12% of school principals responded affirmatively to the question about incentives. With careful questioning, the women at 15 of the 16 interview sites reported that they did receive some compensation for their work. However, they reported that the value of that compensation had diminished with the crisis. The site that did not report such benefits was that where the women's association was not involved.

At 11 sites women reported that they received a monetary payment; at 10 sites they reported that they received "leftover food":

There is explicitly no profit. But we get a lot of food left over, e.g., rice, banana, and cooking oil. So there is no incentive in the form of money. If any food is left, we distribute it among those who work. (women's association member, Nusa Tenggara Barat)

Before the crisis we got 12,000 to 20,000 rupiah each time we cooked. Now there is no profit. We try to reduce the size of the food and make it smaller. Sometimes we can take food home. The rest of the ingredients, e.g., leftover sweet potato skins, we can feed to the cows. (women's association member, West Timor)

There was widespread acknowledgment that farmers were receiving benefits from the program. At all interview and observation sites, it was reported that farmers received benefits from selling produce for snack preparation:

The farmers sell banana leaf and sell cassava and banana and rice. The farmers are happy because they can sell these products and their children get the food. (village leader/farmer, South Kalimantan)

Because most of the materials for snacks are from the community, the economy can increase and

grow. We get good prices from the women's association members. (parent/farmer, South Sulawesi)

At 15 of the 16 interview and observation sites, it was reported that an important benefit of the school-feeding program was the money parents saved on feeding days. This benefit had not been identified in earlier stages of data collection (precrisis), and thus was not asked about in the survey. The saving appeared to come about in two ways: by enabling parents not to give children money to buy snacks from local vendors (an important feature of the schoolyard and day), and by saving money that would be spent on food given to the children at home (breakfast and/or lunch). Although it was not possible to determine the size of these savings, a range of comments made this a clear message:

The school feeding helps with the effects of the crisis because the parents can reduce the money they give to the students. The students cancel lunch because they get food from school. It is better, because they can eat the food from lunch for dinner. (parent, South Kalimantan)

School feeding is helpful for the crisis because it gives food to the children. With the crisis, the food for children at home is not the same as before. The material for food is very expensive. (village leader, South Sulawesi)

### **School-feeding snacks of better nutritional value than food from vendors**

As reported above in the description of the program's implementation, the school-feeding program snacks generally included a diverse range of commodities and were of sound nutritional value. Although the nutritional quality declined with the crisis, the snacks were still of superior quality to those otherwise bought from the vendors who operated informally at schools. Their snacks included flavored ice, sugared coconut or "fairy floss" treats, and commercially produced fried cassava or potato chip packets. The finding that parents saved money on days of school feeding because they did not give their children money to buy food from vendors supports the proposition that nutritional school-feeding program snacks replaced these vendor snacks. It was not possible to quantify these observations in the study conducted.

## **Discussion**

The evaluation for adequacy [11] of the Indonesian school-feeding program showed it to be well established and implemented across a number of provinces and contrasting rural-urban, social, and environmental settings, even during a period of adverse circumstances.

This conclusion is based on survey data on implementation collected from 143 principals of schools representative of all the schools in which the program should have been implemented in the five provinces. Probing interviews and observations among the program stakeholders in 16 of these schools validated the principals' reports, in spite of a tendency to over-report specific implementation factors in survey responses. The program was implemented to a major and adequate extent in all schools, including one school that was not following the financial management procedures correctly. The 16 schools had originally been chosen on the basis that they represented extremes on the dimension of changes in school attendance. It turned out that all schools (the 16 and the remaining 127) were similar in their reports of implementation. Therefore, we conclude that our findings in the 16 schools were similar to what we would have found in the full sample of schools, even though the 16 were not a random sample of the total. Because the 143 schools were identified through a combination of purposeful and random selection, we infer that our findings of widespread, adequate implementation in these schools can be extended to all schools in IDT villages in these five provinces.

In this adequacy evaluation, we compared the findings with the official criteria of performance for the school-feeding program and with stakeholders' perceptions about the program. Control groups without the program, which are necessary for a conventional impact evaluation [11], would have been superfluous in this study, because without school-feeding program activities there could be no program-related findings. The differences between program and nonprogram schools would obviously have been important, but much less relevant to the questions of program management and policy makers that we set out to answer: whether the program was implemented as expected and what benefits were perceived by stakeholders.

Apart from the appropriateness of the design, the quality of the observational and interview data must be adequate to infer that the principals' survey reports were correct. The "truths" reported by the survey and interview respondents were those perceived by the respondents and were further interpreted by the interviewer. They are thus subjective. However, we believe that the several methods of data-checking that were used across the stages of data collection (e.g., key informant interviews) and within stages (e.g., data checks across stakeholders and within interviews, and verification through observations) ensure the validity of the data and their interpretation. Where there were discrepancies between the reports of informants, they reflect the specific knowledge of the informant and not deliberate biases. The only exception was the over-reporting by school principals of their own training for the program. This exaggeration, however, had no effect on the actual implementation of the program.

### **Strengths of program design and implementation**

Several features of the program's design were both innovative in the context of program implementation in Indonesia and, we believe, critical to the fact that implementation was maintained through the crisis. These are summarized in table 4.

In relation to financial benefits to the women who cooked, it should be noted that the basis for selection of the women appeared to vary between villages. Selection was described, variably, as being based on those "who lived closest," "who volunteered," and "who are poor." Similar reasons were given for selecting those farmers from whom to purchase food commodities.

The fact that school-feeding program snacks were highly valued by households with children at school is attributed to several factors: families saved money because they did not have to give money to the children to buy snacks from vendors; in some cases, the school snacks replaced food normally provided at home (breakfast and/or lunch); and the superior nutritional quality of program snacks compared with vendor-purchased snacks was recognized. Although it would seem there might have been a negative impact on the school-based vendors, this was not identified in the data.

### **Weaknesses in program implementation**

The strengths of the program's design and implementation lay in the village-based management structures and implementation mechanisms (table 4). The program weaknesses lay in a lack of external technical inputs and expertise to complement this decentralization. In particular, the widespread failure to provide deworming medicine twice yearly was attributed to the failure of health authorities at the subdistrict and district level to provide the medicine. We suggest that without the flow of program monies through these levels of government, there were no triggers or incentives for these authorities to fulfill this role.

A challenge for the future implementation of the program was to improve the nutritional quality of the snacks in the postcrisis setting. A range of program stakeholders readily acknowledged that since the crisis the snacks were now "half" of their precrisis size and contained less of the "expensive ingredients," such as meat, eggs, and some vegetables. Independent of the monetary constraints, there was a suggested role for health authorities in training women on the size of the snacks and their nutritional value, and this was not being fulfilled either before or during the crisis. The reasons for this are probably similar to those that underlay the weaknesses in the distribution of deworming medicine.

TABLE 4. Summary of factors identified as critical to the successful and sustained implementation of Indonesia's school-feeding program during the 1997–98 economic crisis

Factor	Explanatory notes
Implementation engaged established groups and structures in the village setting	The school principal, teachers, women's association, village leader, and midwife were all identified individuals or groups within the local political/administrative structures
Multiple local parties signed to school snack menu plan before funds could be received	The mechanism of requiring five local signatories aimed to develop shared knowledge of, and responsibility for, the program's implementation
There was a requirement to use local foods, not industrially produced food products	Enabled some purchasing power to be maintained during the period of rapid inflation in food prices, particularly for industrially produced commodities compared with locally grown foods <sup>a</sup>
The process of preparing menu plans and snacks was not specified and was left to the individual village and/or school communities to design	The selection of seasonal foods and the organizing for cooking was left to local groups to plan according to local needs and capacity
Women who cooked were motivated by social interaction, learning new cooking methods and recipes, and satisfaction in preparing food for children at school	All cited as reasons women were motivated to spend the time to cook school-feeding program snacks, in addition to the financial benefits identified

a. The average increase in the price of the "basketful" of commodities for all villages and schools was 160%, as compared with a 225% increase over the same period in the price of noodles, the commodity that industry leaders had suggested the program use at its inception [19].

## Conclusions

The Indonesian school-feeding program is an important example of how a community-based school-feeding program can be designed and implemented to involve, and provide benefits to, a range of community stakeholders, including schoolchildren. The benefits to program stakeholders included income benefits to the families of the schoolchildren, the farmers from whom the food was purchased, and the women who prepared the food. We also conclude that the program contributed to better nutrition of the schoolchildren, because the program snacks were of better nutritional quality than the vendors' snacks they replaced, and because the program provided food during a period of economic stress for households. Moreover, we identified widespread community acknowledgment of the linkages between children's education and nutrition and the role of the school-feeding program in this, particularly during the crisis. Further educational benefits, in particular to school attendance, are presented elsewhere.\*

The documented successes, in particular the sustained implementation, are all the more remarkable given the significant change and turmoil Indonesia experienced in 1997–98. Given the program's success, despite such conditions, we believe the innovative features of the program might be further tested in the implementation of community-based programs.

\*Studdert LJ. Indonesia's school feeding program: benefits in a time of crisis. Unpublished doctoral thesis, Cornell University, Ithaca, NY, USA, 2001.

For school-feeding programs, they form the basis of valuable lessons on the potential for such programs to benefit a wide range of community stakeholders, as well as the children to whom they are targeted.

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The findings, interpretations, and conclusions

expressed in this paper are entirely those of the authors and do not necessarily represent the views of the institutions they work for.

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# Weight of foods and number of portions consumed are not proxies for expressing nutrient intakes in field studies

Roxana Valdés-Ramos, Inés Cervantes, Ivan Mendoza, Noel W. Solomons, and Annie S. Anderson

## Abstract

*In order to determine whether simplified indicators for usual consumption of selected food groups, specifically those derived from either the percentage of the number of daily portions, the percentage of total daily weight consumed, or both, could serve as proxies for the conventional expression of daily energy intake, these indicators were computed and compared from food-frequency data in a data set. Food consumption was reported in frequency categories and portion sizes per month, per week, or per day, and the cumulative sum was divided by 365 to provide a daily average. The survey was done in the township of Santa Cruz and three hamlets of a rural county seat in Guatemala. Data from food-frequency questionnaires from 269 individuals (55 men and 214 women aged 16 to 86 years) were analyzed. For foods of plant origin, the percentage of total energy, percentage of total food weight, and percentage of total number of portions consumed showed low correlations ( $r < .45$ ). When subdivided into specific foods and food groups (fruits and vegetables, red meat, etc.), marked differences were revealed across sites and among different indicators of consumption. Despite the simplicity of calculation, neither the percentage of weight of food in a group nor the percentage of portions consumed could serve reliably as proxies for their contributions to the percentage of total energy in this rural population in Guatemala.*

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**Key words:** dietary intake, dietary energy, food frequency questionnaires, nutritional surveys, Guatemala

## Introduction

Dietary assessment methods have acquired increasing interest in recent years [1–5]. Some new methods have been developed and validated in the industrialized world, and researchers in the developing countries have adapted versions of these same instruments [6–9]. When food-frequency questionnaires are used to assess dietary intake, they are easily modified to suit specific research needs. These modifications, however, can make difficult the use of computer software packages originally designed for input and analysis of data derived from unmodified questionnaires.

The greater the extent to which data reduction and interpretation of an instrument are simplified, the closer is the information to the individual of interest and the more empowered is the practitioner—or even the patient—in terms of the management of his or her own health. A simple count of food or beverage items and servings is mathematically straightforward; it can be managed by all individuals with a secondary-school education. Applying the weight factor of a serving portion corresponding to common household measures (cup, spoon, etc.) to these foods increases the complexity of the mathematics but still allows for the use of a hand calculator.

With these considerations in mind, we explored the ability to create valid proxies for the contribution of total energy of food, based on the weight of food or the number of portions, from a food-frequency questionnaire for the assessment of concordance with the recommendations of the World Cancer Research Fund (WCRF)/American Institute for Cancer Research Guidelines for the prevention of global cancer [10]. We used archival data generated with a food-frequency questionnaire modified from the original instrument of Willett [11] in the Nurses Health Study.

## Methods

### Population

The data were collected in the Republic of Guatemala in a region of the eastern highlands, Santa Rosa Province. This is a rural and agricultural setting in which coffee cultivation and subsistence farming are the primary pursuits for the largely ladino (Spanish-speaking individuals of mixed Spanish-Mayan descent) peasantry who inhabit towns, townships, hamlets, and homesteads along the mountainous ridge that runs toward the Caribbean coast. The climate is temperate year round; the dry season lasts for six months, and the other six have tropical monsoon rains. Illiteracy is widespread, especially among adult women. The subjects were invited to participate if they were between 16 and 86 years old; the rejection rate was less than 5%. However, since the interviews were conducted only on weekends, male subjects were rarely available, because they were working in the fields. The sample in this study represents a convenience sample of the population accessible in their homes or in the streets on the interview days. In 1994, a total of 271 individuals from the county seat of Santa Cruz Naranjo and its hamlets (El Naranjo, Potreríos, Don Gregorio, and Santa Cruz Naranjo), were interviewed. From these, we obtained 269 usable individual data forms, including 55 men and 214 women aged 16 to 86 years. This database has been used in earlier publications [9, 12].

### Questionnaire interview instruments

The original Willett [11] semiquantitative food-frequency questionnaire, which lists 61 foods, served as the template for the instruments used in the present study; it was developed in the Spanish language and in common local names for the foods of interest. A research activity in Santa Rosa Province, analogous to the Costa Rican study of Campos et al. [6] and involving the same analytical laboratories and collaborators in Boston, had been planned. For use in Santa Rosa, preliminary interviews with key informants were held to obtain 24-hour recalls of foods and beverages consumed. Questions about consumption of seasonally available foods were asked in the county seat and its peripheral hamlets. Approximately 45 individuals were interviewed once to determine which foods to incorporate into the food-frequency form. Two focus groups were used to determine which items on the Willett questionnaire were not or were never consumed by the study population. If a food (e.g., milk, white bread, or coffee) was already listed in the basic instrument, its code number was conserved. Substitutions were made of code numbers for items in the Willett questionnaire that were not part of the diet of the study population. Guatemalan staples such as maize tortillas and tamales

occupied vacated code numbers in the list. When the adaptation was completed, the food-frequency questionnaire for the Santa Rosa population had a final roster of 88 food and beverage listings for interviews. For purposes of analysis, however, certain items, such as different preparations of beans (*Phaseolus vulgaris*), were aggregated into a single food category. In order to assess food quantities, the portions from all questionnaires were standardized to cups (240 ml), spoons (15 g), teaspoons (5 g), or 100-g portions (and their fractions), according to the information registered in the questionnaire forms.

The Willett food-frequency questionnaire was designed and developed for self-administration [13]. However, because of the high rate of illiteracy among the study subjects and doubts about their ability to understand concepts such as current and historical frequency of consumption, we used a team of six trained students from the nutrition program at the national university to administer the questionnaire in Santa Rosa.

### Data and statistical analysis

The instrument recorded the frequency of each food consumed per month, week, or day; after all portions and frequency categories had been registered in an Excel database, they were multiplied to obtain total portions per year and then divided by 365 to obtain the daily quantities. Energy values were calculated according to nutritional values from the Institute of Nutrition for Central America and Panama (INCAP) food-composition tables [14].

The mathematical conversions described above allowed us to determine the percentage of daily energy obtained from a given food item, as well as from the respective food groups. For each individual, the weight and number of portions consumed of each food and beverage, and of each food group, were calculated. The percentage of consumption from each food group (fruits and vegetables; red meat; starchy and protein-rich plant foods; fats and oils; and all foods of plant origin) [10] was calculated in terms of weight, portions, and energy. Bivariate linear regressions (Pearson correlations) between portions and energy, weight and energy, and weight and portions were performed for each food group. Two-way analysis of variance, with the value according to food group as the dependent variable, was carried out to establish differences between communities and indicators of consumption (i.e., percentage of weight, percentage of portions, and percentage of energy).

## Results

There were no differences according to gender or age

in the data. The overall distribution of food sources is not atypical or unexpected for a rural, agrarian population in the interior of Guatemala. About 78% of the total energy came from plant sources, and the remaining 22% from sources of animal protein or fat. Fifty-six percent of total energy came from starchy or protein-rich plant foods (cereals, legumes, and tubers), primarily maize (in the form of tortillas) and black beans, with some contribution from white bread, rice, and potatoes. Twenty-two percent was from fruits and vegetables. Consumption of ethanol, meat, separated fats, and milk and its products was low, whereas that of fruits and vegetables, legumes, and grains was adequate; only sugar was consumed in excess according to the WCRF recommendations [9].

Table 1 provides the mean ( $\pm$  SD) values of the percentages of the number of portions, weight, or dietary energy contributed by foods of plant origin, and foods from each of four index food groups (fruits and vegetables, red meat, starchy and protein-rich plant foods, and fats and oils) to the cumulative total for each of the respective units of expression. For the township population (Santa Cruz) and for each of the peripheral hamlets, the mean intake, as expressed by any of the three indicators, is consistent among sites across the row in foods of plant origin. Moreover, within columns, the roughly comparable overall percentage values are also similar. The same was true for the aggregation of "animal-origin" foods (data not shown).

Turning to specific food groups, however, we see

a different pattern. For fruits and vegetables and for starchy and protein-rich plant foods, the values across the row for any given unit of expression are still closely comparable; but for fruits and vegetables, the weight and portion percentages far exceed the contribution of energy, whereas the converse is true for starchy and proteinaceous vegetable items. With respect to red meat, there is roughly a threefold difference between the mean intakes for the population of the township and that of the poorest and most remote hamlet (Potreríos), regardless of which expression is used. Moreover, for comparison within columns, numerical discrepancy, as found for the previously mentioned food groups, is obvious for red meat as well (table 1).

For fats and oils (table 1), there is again a 2.5- to 3-fold difference between the mean intake in Potreríos, according to any of the indicators, and that in the site with the highest consumption, which in this case is the hamlet of El Naranjo. Each indicator produces a consistent intercommunity rank order for both red meat and fats and oils.

The Pearson correlation coefficient values and their squared ( $r^2$ ) expressions were computed for each of the three bivariate combinations of the indicators. The matrix of the  $r^2$  values is presented in table 2. We have arbitrarily designated an  $r^2$  value of 0.6 as "acceptable." The percentage contributions of grams of items consumed and serving portions of items consumed, on an individual basis, have low associations for all groupings, except for the combination of red meat items ( $r^2 = .67$ ).

TABLE 1. Percentages of number of portions, weight, and energy from different food groups (mean  $\pm$  SD)

Food group and indicator	Santa Cruz (n = 53)	El Naranjo (n = 96)	Don Gregorio (n = 65)	Potreríos (n = 55)	Total (n = 269)
Plant origin					
Portions	74.4 $\pm$ 9.0	72.3 $\pm$ 9.4	75.1 $\pm$ 8.8	78.1 $\pm$ 14.7	74.6 $\pm$ 10.7
Weight	78.7 $\pm$ 9.6	75.3 $\pm$ 13.2	75.6 $\pm$ 13.2	84.8 $\pm$ 11.4	78.0 $\pm$ 12.7
Energy	75.9 $\pm$ 13.4	75.4 $\pm$ 12.0	76.5 $\pm$ 10.6	85.1 $\pm$ 10.9	77.7 $\pm$ 12.3
Fruits and vegetables					
Portions	31.8 $\pm$ 8.9	29.0 $\pm$ 10.4	30.5 $\pm$ 10.0	37.8 $\pm$ 10.5	31.7 $\pm$ 10.5
Weight	54.4 $\pm$ 12.1	47.1 $\pm$ 15.0	50.0 $\pm$ 15.7	59.8 $\pm$ 12.5	51.8 $\pm$ 14.9
Energy	19.4 $\pm$ 13.7	19.4 $\pm$ 13.9	21.2 $\pm$ 13.3	33.1 $\pm$ 14.3	22.6 $\pm$ 14.8
Starchy and protein-rich plants					
Portions	42.5 $\pm$ 11.2	43.7 $\pm$ 10.3	43.6 $\pm$ 13.1	43.1 $\pm$ 9.1	43.3 $\pm$ 10.9
Weight	24.0 $\pm$ 10.8	28.8 $\pm$ 11.1	26.3 $\pm$ 12.7	25.8 $\pm$ 9.0	26.6 $\pm$ 11.2
Energy	56.5 $\pm$ 16.2	57.8 $\pm$ 13.6	55.3 $\pm$ 18.3	53.3 $\pm$ 14.1	56.0 $\pm$ 15.4
Red meat					
Portions	2.3 $\pm$ 1.6	2.5 $\pm$ 1.9	2.1 $\pm$ 1.6	0.8 $\pm$ 1.1	2.0 $\pm$ 1.7
Weight	0.7 $\pm$ 0.6	1.3 $\pm$ 1.2	1.2 $\pm$ 0.9	0.4 $\pm$ 1.0	1.0 $\pm$ 1.0
Energy	2.0 $\pm$ 1.6	3.1 $\pm$ 2.7	3.2 $\pm$ 2.4	1.0 $\pm$ 1.2	2.5 $\pm$ 2.4
Fats and oils					
Portions	3.1 $\pm$ 2.9	5.0 $\pm$ 6.7	3.7 $\pm$ 3.1	2.0 $\pm$ 2.3	3.7 $\pm$ 4.7
Weight	0.5 $\pm$ 0.5	1.0 $\pm$ 1.2	0.9 $\pm$ 0.8	0.3 $\pm$ 0.4	0.8 $\pm$ 0.9
Energy	3.3 $\pm$ 3.3	4.6 $\pm$ 5.1	4.4 $\pm$ 3.8	2.0 $\pm$ 2.5	3.8 $\pm$ 4.2

TABLE 2. Comparison of Pearson correlation coefficients ( $r^2$ ) for percentages of weight, energy, and number of portions from various food groups<sup>a</sup>

Food group	Weight vs portions	Weight vs energy	Portions vs energy
Plant origin	0.31	0.31	0.44
Fruits and vegetables	0.53	0.42	0.47
Starchy and protein-rich plants	0.41	0.47	0.44
Red meat	<b>0.67</b>	<b>0.81</b>	<b>0.66</b>
Fats and oils	0.25	<b>0.61</b>	0.37

a. Correlation coefficients above  $r^2 = .6$ , which are considered “acceptable” values, are shown in boldface.

Moreover, at the level of disaggregation of plant origin versus animal origin, the squared correlation coefficients for indicators for items of plant origin are between .31 and .44, no matter which two indicators of the three are compared in a bivariate fashion. Our main hypothesis, however, that the weight of food or the number of portion sizes serves as a proxy for their contribution to total energy, is not supported. The correlation data for this hypothesis present a disappointing array, as only three of the eight associations for food groups—two for red meat and one for fats and oils—surpassed an  $r^2$  value of .60. As exemplified in figures 1 and 2, for the food group of fruits and vegetables, the higher association ( $r^2 = 0.53$ ) for weight versus portion number fades to a modest value when energy versus weight ( $r^2 = .42$ ) or energy versus portion number ( $r^2 = .47$ ) becomes the associations of interest.

In table 1, which compares the contribution of fruits and vegetables according to the three indicators, we can appreciate some of the bases for the discrepancies. If

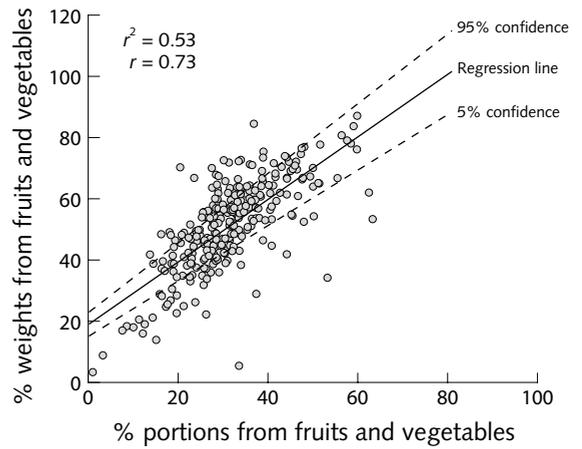


FIG. 1. Scattergram of the 269 simultaneous data points derived from the estimation of the individual’s portions of fruits and vegetables as a percentage of all daily portions (x-axis) and the same food group expressed as a percentage of the total daily weight of food (y-axis).

we isolate the Santa Cruz township and the Potreríos contribution by weight, this class of food items contributed 54% of the dietary weight in the former and 60% in the latter, a ratio of 9:10. Fruits and vegetables, however, contributed 19% of the total energy in the former community and 33% of the total energy in the hamlet, for a 2:3 ratio. The obvious conclusion is that a different selection of fruits and vegetables was to be found in the two sites within the county, and that more energy-dense fruits or vegetables make up the fare in Potreríos.

The analysis of variance showed separate, statistically significant ( $p < .001$ ) effects of community or type of indicator for plant origin, fruits and vegetables, red meats, and fats and oils; only type of indicator was

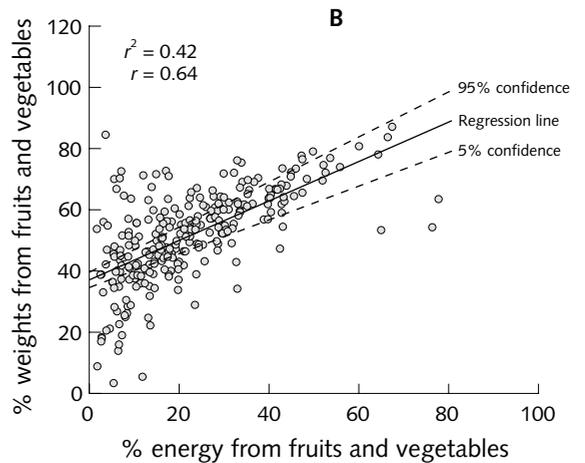
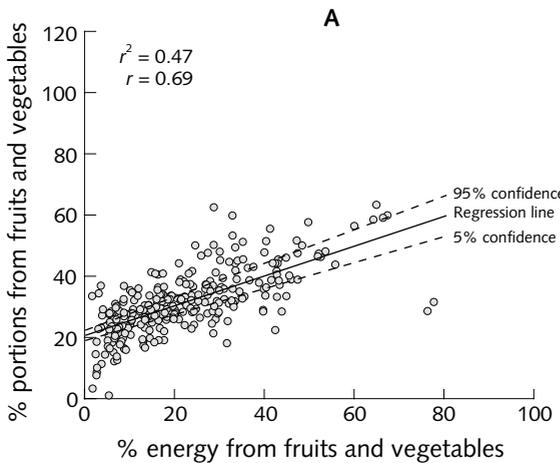


FIG. 2. A. Scattergram of the 269 simultaneous data points derived from the estimation of the individual’s intake of fruits and vegetables as the percentage of total daily energy intake (x-axis) and the same food group expressed as the percentage of all daily portions of food (y-axis). B. Scattergram arrayed for the correlation of the percentage of total daily energy (x-axis) versus the percentage of daily weight for the same food group.

significant for starch and protein-rich foods ( $p < .001$ ). The combined effect of community and type of indicator for calculation was statistically significant ( $p < .01$ ) only for the red meat group. These data indicate important differences between communities and type of indicator in practically all food groups.

## Discussion

An instrument devised in Boston, Massachusetts, USA, for use with 100,000 North American nurses [13, 15] was translated and adapted for use with the Spanish-speaking populations of Costa Rica, Mexico, and Spain itself [6, 7, 12, 16]. In Guatemala [9, 12], a similar modification was applied to a field survey. In the process of reducing and analyzing the data to create these publications, the inordinate dependence on sophisticated computer software and food-composition databases was recognized when it came to expressing values with reference to total energy. The raising of the questions of simplification of the management led to the present exercise.

Despite the fact that computer technology has become ever more available, accessible, and user-friendly, there are a number of reasons why reliance on other than nutrient-quantified data may be appropriate in clinical and public health settings. In some parts of the world and among some disadvantaged populations, even the cheapest computers are prohibitively expensive or impractical because of the absence of electricity; here, solar-battery hand calculators are the most reliable form of computation device. Moreover, in the clinical setting and for patient and public education, one may be able to empower both practitioners and clients by putting the deciphering and decoding of information into their own hands; an elementary scoring system reaches toward this ideal. This has been reflected in the development of various scoring indexes for dietary habits [17–19]. Moreover, the accuracy and representativeness of the quantitative values in food-composition tables may be called into question—or have gaps—with respect to nutrients of interest; hence, it becomes self-delusion to treat the numerical values, carried to several decimal places, as reliable.

All of the aforementioned considerations made

an inquiry into the feasibility of proxy indicators a worthwhile endeavor. With very limited success—and only at the level of the greatest aggregation—was either of the two proxy indicators (portion number or weight of consumption) a reasonable substitute for the comparable expression based on total energy in the denominator. It is perhaps not surprising that this is true, since the densities of the various nutrients and food constituents of interest have a wide spectrum, and whole foods of plant origin have an energy density quite distinct from foods of animal origin. It is not a matter of mixing apples and oranges, but rather of mixing apples and oranges with cheese and lard. These density gradients account for the impossibility of taking the shortcut approaches that would have made the calculations for individuals accessible by a simplified scheme on a hand calculator.

Clearly, if the primary epidemiological observations were generated in units of portion numbers or food weight, then predictive associations and goals and recommendations could be expressed in these same units. Currently, for reasons enumerated by Willett [11], nutrients of interest are expressed in relation to total dietary energy, and epidemiological association requires adjustment for dietary energy. However, in the original data sets of epidemiological research, the data are at the level of portion number and food weight. With sensitivity to the needs of practitioners in their offices and the population at large to gather more control over the keys to health-promoting behavior, demystification of the mathematical and chemical features of dietary recommendations could be made to achieve the goal of greater accessibility and empowerment for the public. This experience reveals, however, that the point of origin for this would be in the original epidemiological information used to find associations, and not in the back-calculation from a system that is intrinsically based on the denominator of total energy intake.

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# PAHO Regional Consultation of the Americas on Diet, Physical Activity and Health

Enrique R. Jacoby, guest editor

## A call to action

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In May 2002, 191 Member States of the World Health Organization (WHO) mandated that action be taken to develop a global strategy on diet, physical activity, and health (WHO/GS) to guide future efforts and resources in addressing the burgeoning problem of noncommunicable diseases worldwide. To that end, the Pan American Health Organization (PAHO) convened a regional meeting in Costa Rica on April 23–24, 2003. Delegates from 11 countries were in attendance, along with representatives of multisectoral institutions, nongovernmental organizations, and expert members of the scientific community.

In this brief introduction, I would like to address some issues before presenting the reader with a summary of the conclusions of the meeting. The issues are the magnitude of the epidemic of noncommunicable diseases, the key risk factors that need to be targeted and how best to deal with them, and the need for a common nutritional agenda attuned to the changing times.

### The problem and the challenges

The impetus of the WHO/GS was a result of recent data demonstrating that noncommunicable diseases and nonintentional injuries represent nearly 70% of all causes of death in the Region of the Americas among those 70 years of age and younger. The disability-adjusted life years (DALYs)\* lost to noncommunicable disease risk factors (high blood pressure and cholesterol levels, overweight, low intake of vegetables and fruits, and sedentary lifestyles) among the less developed countries in the region, excluding the United States and Canada, amounts to 12,458,000 DALYs added to the 4,677,000 DALYs lost to childhood and maternal undernutrition [1]. The repercussions of that situation on individuals and families are extraordinary, posing an even greater strain on already frail health-care systems, social services, and personal economic stability. Once thought to be “diseases of affluence,” noncommunica-

ble diseases are far-reaching and indiscriminate, and curing them is much more costly than curing common infectious diseases. All of these factors have contributed during the last decade to create a greater attention to preventive strategies. This is the new challenge to public health in the Americas [2].

Inadequate diets, physical inactivity, and tobacco use are the key health risk factors that account for most noncommunicable diseases and mortality. Thus, targeting those three behaviors is likely to yield better health results than emphasizing a disease-specific preventive approach. This concept was emphasized throughout the Consultation and is probably the most sensible strategy at hand. As was pointed out elsewhere [3], most patterns of unhealthy behaviors are set by the more affluent sectors of society, later to spread and cluster among the poorest. Economic, market, and cultural dynamics are powerful forces in shaping that process, and therefore they must be addressed to achieve the desired behavioral changes (see the report by Nugent [4] in this issue for an in-depth examination of the agricultural ramifications of the noncommunicable diseases issue). For health-conscious individuals, generally in the upper echelons of society, health literacy may suffice, provided material resources and time are plenty. For most that is not the case.

Successful public health interventions have to come to grips with the fact that eating and physical activity are human behaviors that respond to a variety of factors, not just to good information. In fact, individuals generally consider health as just one among many other factors when deciding what to eat and whether to exercise or quit smoking. For instance, in considering whether to make the choice of eating more fruits because that will bring health some 10 years down the road, many other competing factors are at stake. Serious competitors are notably short-term ones, such as convenience, immediate reward, time availability, and price, to cite just a few [5]. This is why public health strategists need to take into account all factors that influence key human behaviors, not only those associated with health motives.

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\* One DALY is equal to the loss of one healthy life year.

Child nutrition and maternal health are also vital to a long and healthy life. Thus, efforts to promote optimal women's diet and nutrition, healthy pregnancies, exclusive breastfeeding, and adequate complementary feeding not only are the foundation of optimal child growth and development, but also are key to promoting a long life free of noncommunicable diseases. This shows not only a clear convergence of objectives, but also that the underlying nutritional principle is similar: diet quality. In fact, for instance, undernutrition problems in the region focus on several micronutrient deficiencies leading to stunted growth, iron-deficiency anemia, low levels of vitamin A, and women's reproductive risk due to low folic acid levels. Likewise, dietary quality is crucial to preventing nutrition-related chronic diseases, such as cardiovascular disease, diabetes, and obesity.

If a life-cycle perspective is to be adopted, then optimal growth must be emphasized over gaining weight exclusively. By the same token, the age-old concept that a chubby child is a healthy child needs to be reconsidered as a gauge of health and a guide to child-feeding. Alarming escalating rates of obesity in children and adolescents require prompt action on this front. In children as well as in adults, it seems that merely quenching hunger will not necessarily carry health along.

## Main conclusions of the working groups

The following is a summary of the regional consultation's two working group discussions and conclusions. Those interested in reviewing complete transcripts of the working group conclusions can obtain a copy upon request to the author.

### Diet and nutrition working group

*Inadequate diet of the population.* In developed and developing countries of the Americas, the available data show an overall low and decreasing level of consumption of fruits, vegetables, whole grains, cereals, and legumes, while the consumption of foods rich in saturated fat and sugar, oils, and meats is on the rise. As Uauy and Monteiro note in this issue [6], those dietary changes are to a large extent supply-driven. The authors argue that the lower price of food as compared with most other commodities, such as education, health, clothing, and communications, coupled with new marketing strategies, has contributed to the aforementioned dietary changes. Priority actions to improve the quality of the population food supply are the development of policies aimed at increasing availability of and access to healthful unprocessed foods; reduction of salt, sugar, and saturated fat in processed foods; and substantial intersectoral collaboration at the national and international level, particularly among health, agricultural, educational, and regulatory organizations.

*Inadequate understanding of the problem and lack of public health leadership.* There is a preconception that most national public health systems and public health authorities remain unaware of the problem that elevated rates of noncommunicable diseases pose in the region, namely, the high burden of morbidity and mortality that is associated with them. The disproportionate toll of noncommunicable diseases on poorer populations has many negative social and economic consequences. In order to reverse this current situation, it was deemed a necessity to publicly call attention to the catastrophic impact of inaction; hence, the role of WHO and PAHO was perceived as crucial.

*Health services should include diet- and health-promotion activities.* Most health personnel are far from being active promoters of healthy dietary habits. Specialization and curative approaches are pervasive in most professional training and supported in health systems. Interaction with patients increasingly requires a more integrated approach to behavioral change than mere transmission of health information. The group called for a reorientation of health-care services to provide greater emphasis on disease prevention. Health-care providers should be trained to assess and counsel patients on disease-prevention behaviors, such as improved diet, regular physical activity, and smoking cessation, rather than on disease-specific prevention. Similarly, current nutritional programs aimed at children and women of childbearing age can improve their medium- and long-term health outcomes by focusing on children's growth and development, and by emphasizing quality over quantity in existing nutritional programs and national dietary guidelines.

*Better information to the public.* In a world saturated with food advertising that more often than not promotes unhealthy dietary habits or makes unfounded beneficial health claims, effective food labeling is recognized as an important resource to consumers. It was also considered necessary that public health systems more often and more consistently employ mass media approaches to develop health literacy. Finally, regulation of advertising was suggested as an option to protect consumers, particularly children.

### Physical activity working group

*A new paradigm in physical activity promotion.* Today the key public health recommendation for preventing or delaying morbidity and mortality is to accumulate a minimum of 30 minutes of moderate physical activity throughout the day, on most days of the week. This recommendation has been well established in the scientific literature and goes well beyond the practice of vigorous sports and aerobics to include more moderate activities such as walking, climbing stairs, dancing, or bicycling, which can be easily incorporated into the daily routine. Health professionals should play an active role

in explaining and promoting the adoption of the new physical activity recommendations.

*Public policies and environments for active lifestyles.* A successful promotion of an active lifestyle requires more than the best possible public information program. There is a need to establish public policies and norms, in conjunction with environments that enable individuals to remain active for life. Some examples are effective physical education programs in the schools, community walking clubs, good public transportation systems that include rapid motor transportation, encouragement of bicycling and walking, and policies to control crime on the streets.

*Multisectoral alliances.* The diversity of actions needed to promote physical activity, such as those listed above, requires multidisciplinary as well as multisectoral interventions. Thus, public health efforts should incorporate vital partnerships and alliances with sectors such as transportation, education, local governments, and sports, as well as private industry and nongovernmental organizations. Sometimes the actions of different players converge in practice, although their motives or objectives are not necessarily identical. The

ability to walk peacefully from work to home without running the risk of being mugged is an aspect of quality of life to one person, crime control to others, and physical activity to many in this Consultation.

*Role of the health and education sectors in the promotion of physical activity.* Disease prevention is now accepted as the most cost-effective way to tackle the epidemic of noncommunicable diseases. Thus, health-promotion activities ought to be part of the health provider's counseling repertoire. Hence, the training of health professionals and the norms of clinical management must reflect the proposed changes in professional practice. Likewise, the education sector has an enormous potential to instill healthy habits of entire generations, provided they keep physical education programs and other health-promotion activities alive and in good shape.

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# The challenge of improving food and nutrition in Latin America

Ricardo Uauy and Carlos Augusto Monteiro

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## Abstract

*The Latin American Region has exhibited a marked increase in the consumption of high-energy-density foods (high in fats and sugars) and a decrease in physical activity, with rising trends of sedentary life among the urban population. Social and economic progress led to a decline in infectious diseases, while higher income fostered the consumption of meats, fats and oils, and sugar and reduced the consumption of grains and legumes. The result has been a gradual increase in life expectancy at birth and a greater burden of disease linked to obesity and other nutrition-related chronic diseases (diabetes, cardiovascular disease, certain types of cancer, and osteoporosis). The region is currently facing the challenge of a double disease burden—the unresolved problem of malnutrition caused by nutritional deficits on the one hand, and the steady increase in chronic disease on the other. The need to develop policies and programs that make the healthy choice the easy choice in terms of diet and physical activity is presented. These should encompass not only individual choices, but also environmental factors that condition food and physical activity behavior. Food supply, and hence consumption, is largely driven by the productivity of the food-production chain; demand and consumption are determined by the way food is produced, processed, distributed, marketed, and advertised. These factors are beyond the consumer's control, and they oper-*

*ate to maximize profit, not health. Public health policies should focus not only on the demand side, but also on the supply of more healthful food products. Examples of potential interventions to increase the demand for healthful foods and the supply of healthier choices are presented and discussed.*

**Key words:** Chronic disease, diet, nutrition, policy, prevention

## Introduction

The “nutritional transition” is defined as changes in the food and nutrition profile of populations as a result of the interaction between economic, demographic, environmental, and cultural factors in society [1]. Nutritional patterns have changed in the Latin American Region, marked by an increase in the consumption of high-energy-density foods (high in fats and sugars) and a decrease in physical activity, with sedentary urban populations predominating [2–10]. Social and economic progress has improved environmental sanitation, contributing to a decline in infectious diseases. At the same time, higher income has fostered the consumption of high-energy-density foods and reduced the consumption of grains, legumes, and other sources of fiber. The result has been a gradual increase in life expectancy at birth and a greater proportion of obesity and other nutrition-related chronic diseases (type 2 diabetes, cardiovascular disease, certain types of cancer, and osteoporosis) in the total burden of disease. Latin America is currently facing the challenge of a double disease burden, dealing with the unresolved problem of malnutrition caused by nutritional deficits on the one hand, and facing a steady increase in nutrition-related chronic diseases on the other. In the majority of the countries, the transition toward the predominance of nutrition-related chronic diseases is in an advanced stage [4, 8–11].

The greatest challenge to health in the region,

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according to recent statements by the World Health Organization (WHO) [4, 7, 10, 11], is the premature death and physical and mental disability resulting from chronic noncommunicable diseases. WHO has recently begun to examine the importance of the links between diet, physical activity, and nutrition-related chronic diseases—especially obesity, diabetes, cardiovascular disease, certain types of cancer, and osteoporosis. Worldwide and in Latin America, infant mortality has been on the decline, while the proportion of deaths from cardiovascular disease and cancer is rising and deaths from respiratory illnesses and infections are dropping sharply. In several Latin American countries, the age-adjusted rates for heart attacks and cancer are comparable to the figures found in a developed country such as Canada, while the rates of diabetes and stroke tend to be higher [2, 8].

Until recently, it was commonly thought that these chronic diseases were associated with excess—that is, with a wealthy environment. Another theory is that differences between countries are due to differences in genetic susceptibility, which would lead to the conclusion that this is a problem for individuals and almost a necessary evil or, even worse, a sign of social and economic progress. The reality in Latin American cities is that nutritional problems associated with nutritional imbalances, especially the imbalance between energy intake and energy expenditure, are most frequently observed in poor urban populations [2, 3, 5]. Changes in diet and physical activity can explain most of the increase in nutrition-related chronic diseases, which have reached epidemic proportions in many countries in recent decades. Clearly, this is the result of environmental changes, since genetic drift occurs over longer periods. What is certain is that our current genes were selected over the six million years of our species' evolution to maximize the use of ingested energy and store as much of it as possible for when it is needed. Today, in an environment that no longer demands physical labor to produce a little food, these same genes help to produce obesity, insulin resistance, and the associated metabolic consequences: diabetes, dyslipidemia, atherosclerosis, and hypertension.

Furthermore, according to the traditional medical model, nutrition-related chronic diseases are diseases associated with personal responsibility. This view emphasizes the identification of risk factors for each individual, which leads to an emphasis on a curative approach rather than primary prevention as the principal public health measure. Most developing countries presently do not have the means to provide effective care for all people at risk and are used to planning only for the short-term situation. The steady increase in life expectancy and in the proportion of the population over 65 years of age clearly indicates the need for Latin American countries to steadily increase their health expenditure for the prevention of nutrition-related

chronic diseases. For most countries in the region, curative approaches are simply not compatible with the economic resources at their disposal. Latin America is aging before having reached an income level that will allow for adequate expenditure to provide for basic health care and treatment for the diseases of adults and the elderly. Unlike the developed countries, which managed to achieve economic well-being side by side with an increase in life expectancy and today spend from US\$2,000 to 4,000 per capita annually on health, the region does not have the resources to provide adequate curative care. Even if these funds were available, the outlays would be greater than the total per capita income of many countries in the region. It would be far more effective to control and prevent nutrition-related chronic diseases at a population level than to place emphasis on individual treatment [10].

Economic growth, so necessary to secure the material and human resources needed to combat nutritional deficiencies, can have adverse effects on health, since it can heighten the risk of nutrition-related chronic diseases, especially in transitional societies. Economic growth in these societies is associated with environmental changes that lead to unhealthy diets and sedentary lives. From the nutritional standpoint, we should note the increase in the availability of foods of animal origin, which are high in saturated fat, and of processed foods, which are usually rich in fats and sugar and low in fiber—that is, high-energy-density foods. Physical activity patterns change, since the technological development that accompanies economic growth reduces the physical labor required in urban and rural occupations alike, reducing daily energy expenditure. Economic growth leads to changes in diet that can neutralize or even reverse the relative protection against nutrition-related chronic diseases afforded by the traditional diets of the poorer population sectors. This is because the poorer sectors are more likely to change their eating and physical activity patterns, either because they do not have the knowledge required to resist the adverse changes in the environment, or because they lack the material conditions required to make use of this knowledge. Clearly, we are talking about the potential, not the inevitable, consequences of economic growth for nutrition-related chronic diseases. The important thing is to remember that it is perfectly possible to avoid these consequences through public policies and education and health-promotion strategies.

Traditional diets, based on primary foods with little processing except for the traditional methods of preservation (e.g., solar drying or dehydration, fermentation, and salting), are predominantly found in rural areas. Urbanization is often associated with the abandonment of traditional diets and their replacement with an urban dietary culture. The rural diet, based largely on vegetable products with small quantities of foods of animal origin, stands in contrast to the typical Western urban

diet with regard to the different quantity and quality of fat that it contains, the virtual absence of sugar or other refined carbohydrates except honey or dried fruits, and its higher fiber content. In several parts of the region—for example, northern Mexico—there is evidence of a dramatic increase in obesity and diabetes among indigenous populations who abandon their traditional diets in favor of the Western diet, with serious consequences for health [5, 7]. Likewise, on migrating to the cities and increasing their income, people from rural areas of the region tend to become less physically active and to adopt a diet rich in high-energy-density foods loaded with fat and sugar, frequenting fast-food restaurants that encourage overeating, with an increase in the prevalence of nutrition-related chronic diseases. Urbanization, however, also favors a more diversified diet with higher nutrient density, since today's market offers a wide variety of food all year round. The urbanization process by itself is not responsible for its negative consequences; it is possible that, with educational support and the promotion of healthy eating, the urban dietary culture will make a better diet possible. Urban sprawl around the major cities, which contain 20% to 40% of the population of their countries, has been a powerful force that alters all the components of the food-production chain. Urbanization certainly has major implications for the distribution and final marketing of food, and ultimately for dietary intake. Urban areas have facilitated the gradual concentration of delivery systems in fewer and fewer hands. They have also promoted the proliferation of mega-supermarkets to the detriment of the small corner markets in every neighborhood that were once the norm in food distribution. The concentration on intensive crop production has led to the disappearance of small producers who cannot compete with major agroindustrial conglomerates in either productivity or prices [12–14]. At the transnational level, the liberalization of trade has facilitated the penetration of Latin American markets by large multinational companies.

### Changes in the demand for food

A review of the changes in food availability in the countries of the region, based on information compiled by the Food and Agriculture Organization (FAO)[15], shows that energy availability has increased in almost every country except Cuba. The same increasing trend is also seen for the proportion of total calories obtained from fat. In practically all countries, the percentage of calories obtained from fat now exceeds 20%. These averages mask huge inequalities produced mainly by differences in income, so that after correction for the corresponding elasticities, it can be seen that a significant proportion of the population in several countries consumes a diet with more than the recommended

maximum of 30% of calories from fat. The percentage of calories obtained from protein has not changed, ranging from 10% to 12%, which is consistent with adequate intake and a diet sufficient in proteins. In fact, protein malnutrition in the region is uncommon, except in young children who suffer from repeated infections and inadequate supplementary feeding and who are living in environments characterized by extreme poverty or marginality [9, 10].

There has been a marked increase in the availability of animal protein in the region, led by poultry consumption, which has grown by five to six times in most countries. The consumption of red meat has held steady, except for a decline in Argentina and a marked increase in Brazil and Chile, although Argentina continues to consume two to three times more meat than the other countries of the region. There has been a significant rise in the consumption of whole milk, while seafood consumption is low in virtually all the countries of the region. The per capita consumption of vegetable oils has increased by 200% to 300% in most countries. At the same time, the consumption of refined sugar has almost doubled in some countries. On examining fruit consumption, we see that the figures are relatively high, on average, for nearly all countries, but vegetable consumption is low except in Argentina and Chile. The recommendation to consume at least 400 g of fruits and vegetables implies a total of 160 kg per capita annually. The information from the FAO indicates that few countries in the region reach that minimum goal [10, 11, 15]. Finally, if we examine the consumption of grains such as wheat and corn, we see the importance of these two grains for the region, and a clear preponderance of corn in Mexico and wheat in Argentina and Chile.

Income is the main determinant of the availability of and demand for food. This is evident from the FAO data on the different countries and regions. The higher the income, the greater the availability of energy, the higher the consumption of animal products (meat and dairy products), and the lower the consumption of grains and complex carbohydrates. The amount of sugar, total fat, and animal fat consumed also increases as earnings increase, leading to a diet of higher energy density. The reduction in the intake of fiber and vegetables completes a dietary pattern that, in conjunction with physical inactivity, promotes nutrition-related chronic diseases.

Very few countries in the region conduct periodic surveys of real food consumption. Mexico is a notable exception [5]. The consumption trends extrapolated from real food-consumption surveys are of great value, since they bear a direct relation to the risks of nutritional disorders. The trends from the consumption surveys in the region are compatible with the trends observed in the data on availability. However, the consumption surveys make it possible to examine

differences between regions or special groups due to their vulnerability. The Mexican data show a significant increase in the intake of calories from fat in the northern part of the country and low levels of intake in the south. Viewed as an average, the figure is reasonable, since the inadequacies stemming from excess or deficit cancel each other.

The data from the household expenditure surveys that some countries conduct to determine the number of poor people in their population provide valuable information on the impact of income on the relative weight of the different components of household expenditure. Thus, the higher the income, the lower the percentage of income spent on food; this percentage is often used to determine the level of poverty in a population. In general, a poor household is defined as one in which 50% or more of its income is spent to purchase the basic food basket for a typical family. Higher-income households, in contrast, spend no more than 12% to 15% of their income on food.

The data from these surveys do not allow us to assess individual consumption or dietary adaptation, unless we apply the information to a typical family. However, they do allow us to examine the priority that the poorest and wealthiest families assign to the components of food expenditure [2, 5, 16]. If we divide households by income, we will find that in many countries, lower-income households do not give priority in their purchases to the amount of nutrients in the food, but to the symbolic value linked to what is socially acceptable. The purchase of soft drinks and of sweet and salty fatty snacks is given priority over that of fruits and vegetables or milk. The preferred products are those promoted in the mass media, which generally contribute calories and little else. Higher-income households increase their food expenditures outside the home, and meats and other animal products are heavily represented, with a relative decline in the weight of grains and oil. In general, the data show major differences in the consumption of the foods that are most expensive and denser in specific nutrients. The poor have monotonous diets that meet or exceed their energy needs but are deficient in vitamins and minerals, especially iron, zinc, vitamins A and C, and folate.

The impact of income on expenditures for certain foods can be quantified by measuring changes in expenditure by type of food when income increases by 1%. This index is known as expenditure elasticity. Data from household expenditure surveys in the United States demonstrate that for low-income families, the expenditure elasticity for meat and dairy products is on the order of 0.6 to 0.8, while for the wealthiest, this index is from 0.3 to 0.4 [13, 17, 18]. That is, as their income increases, poorer households increase their spending on foods of animal origin in greater proportion than do the wealthiest households. Elasticity values are lower for grains, and in the case of higher-income

families, they can become negative—that is, when earnings increase, grain consumption decreases. There is no doubt that increasing income is positive, since it enables families to diversify their diet, but unless eating habits and physical activity levels are modified to preserve the balance between energy expenditure and energy intake, the consequences for health can be adverse.

Access to food is also a function of prices. For a given income-level group, the expectation is that the prices of foods in high demand will rise, while those of foods in lower demand will fall. This is the law of supply and demand, a basic law of economics. The law holds true with certain foods, such as seasonal fruits, which are expensive at the beginning of the season and become less so as the days or weeks go by. However, recent trends for some foods, such as vegetable oils and sugary soft drinks, indicate just the opposite: as demand rises, their prices drop because of the greater volume of production and hence consumption. In this case, the higher demand is offset by greater supply, and thus unit prices fall while the volume of production increases. Producers therefore lower their profit per calorie but increase their sales volume to more than compensate for this. The forces of the market thus push for an increase in consumption, even though it leads to a lower unit price, which is compensated by delivering and marketing the product in larger-volume containers. For example, in the case of fast food, higher consumption leads to the optimization of production systems, thus lowering the unit price, which is compensated for by a higher volume of product per serving. If to this we add fat, salt, sugar, and coloring to make the food more attractive and enhance the flavor, we have the foundations for the overconsumption of high-energy-density, sweet and salty fatty foods. The consumer is offered more product for less money, and the system that regulates the appetite is not prepared to resist the temptation.

Data from the United States indicate that at least 40% of the increase in the prevalence of obesity over the past 25 years is due to the reduction of the unit price of food, especially of sweet and salty fatty snacks [13, 16, 17, 19, 20]. There is no doubt that increased livestock productivity has made it possible to free us from hunger, but along with this come new risks to health and some threats to the environment. We should be able to maximize the benefits and minimize the risks posed by advances in technology, with the object not only of securing higher consumption at lower prices, but also of minimizing the risks, including the impact of these production processes on the environment and human health [7, 16, 21]. Our inability to modify individual behavior by increasing physical activity and decreasing intake is predictable. Unless we examine the underlying causes of our food preferences and our physical activity habits, we will not be successful in controlling this epidemic. Policies such as direct sub-

sidies, price regulation, and food advertising also play an important part in shaping consumption patterns, as we will see further on [7, 13, 21].

## What drives food choices?

It is normally believed that food choices depend essentially on the law of supply and demand. Thus, the consumer's preference is the basis of the demand and determines the supply. This model places consumers as the principal driver of supply, with industry merely meeting their needs. In this case, the factors that usually determine food purchases and consumption patterns are the consumer's income, the prices, and the intrinsic and perceived quality of the products.

A more in-depth analysis of what drives consumption reveals that nowadays supply does not passively wait to respond to demand but has a life of its own and actively influences the choice of goods for purchase and consumption. That is, we buy and consume what is offered to us, not what we need to live a healthy life. What drives supply, and hence consumption, today is largely dominated by the factors that determine the productivity and profits of the food-production chain. In this model, demand and consumption are determined by the ways we produce, process, distribute, trade, market, and advertise food. All these factors are beyond the consumer's control, and they operate mainly on the maximization of profit. The food-production chain responds to the need to produce progressively cheaper food and promote the highest possible consumption. As evidenced daily in the press, the eagerness to maximize profits creates both advantages and risks. The possibility of producing safe and less expensive food is no doubt the greatest advantage. However, the risk of ignoring concerns about a safe and healthy diet is also inherent in a model that puts commercial interests above consumer health. Some say that the responsibility for resolving this dilemma lies with the consumer, and that it is enough to provide information through nutritional labeling, public service announcements about healthy eating, or nutritional guidelines that promote healthy eating. What is certain is that the food-production chain and the engines that drive the food supply are very powerful, and they do not have a real counterpart in the efforts to educate, guide, and facilitate the selection and consumption of safe, wholesome food by the consumer [7, 10, 11, 13, 16, 19–21].

In this battle the consumer is David, since the forces that drive supply are largely invisible and unidentifiable, and have powerful resources that motivate and determine consumer behavior. Thus, we enter a restaurant or eatery, attracted by an environment that for a few minutes makes us feel like members of the “first world” and as good as anybody else—an environment

with a little luxury that sparkles like the stars, where each piece of furniture, container, and product is an icon that in some way symbolizes our aspirations for success, where our ancestral hunger for sweet, salty, and fatty foods is whetted with tempting offers of more food for less money, a double portion for a few cents more, buy two and get one free, buy an A + B + C combination meal for a moderate price and experience bliss in this paradise of consumption for the sake of fun and instant gratification. The dilemma of personal responsibility coupled with an environment that encourages healthy eating and an active life versus an environment that can discourage healthy food choices and promote a sedentary life is illustrated in figure 1. Certainly, we can help our consumers in the uphill battle against environmental influences, but we will be much more successful if at the same time we can make the hill less steep by promoting changes in the environment that will make the healthy choice the easy choice.

## What can public policies do?

Public policies can modify the way the supply of food influences consumption patterns and health; we provide below some examples of possible interventions.

» *Optimize the food-production chain to offer more healthful products at lower prices for poor consumers.* The private sector has introduced technology to improve agricultural production, concentrating on a few crops with greater potential added value for exports. Improving the marketing of fruits and vegetables and decreasing the number of middlemen can help raise consumption levels among low-income groups, preserve and support small farmers' produce markets in Latin American cities,

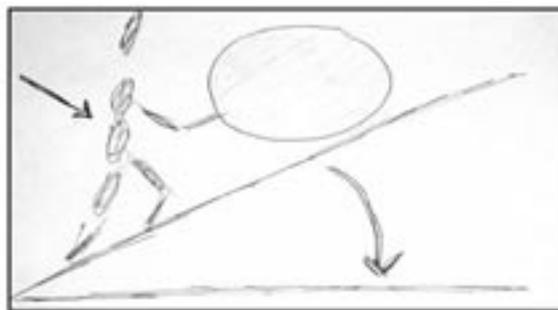


FIG. 1. Helping individuals carry the burden versus lowering the slope to make the load lighter. Graphic representation of individual responsibility of consumers in making healthy choices in terms of diet and physical activity, as illustrated by the man pushing a large rock up the hill. We can certainly support his effort by health-promotion and educational programs, but we can achieve even more if at the same time we make the slope less steep by changes in the environment that support the consumption of healthy diets and active living

and promote healthful and safe food production.

- » *Eliminate subsidies and economic incentives for the production of foods rich in saturated fats and facilitate the production of foods low in animal fat.* Several countries provide incentives for milk and meat production through subsidies or price-setting that favors producers. In some countries, the quality regulations require higher prices for meat and milk with a higher fat content, which has a clear impact on the supply of these products. Furthermore, at the point of sale, skimmed milk and lean meats are more expensive. An alternative policy that would benefit health would be to equalize skim and whole milk prices, along with the prices of lean and fatty meats. These changes would shift the incentives and benefits from the large producers to the consumers, bearing in mind that the economic benefits of achieving healthier eating patterns are more than compensated by the subsidies that producers may currently be receiving.
- » *Review the regulations governing the international food trade from a nutritional and health perspective.* Today, it is acceptable to impose trade barriers for phytosanitary reasons—that is, when products can pose a threat to animal or plant health. The Codex Alimentarius has provisions governing the chemical and microbiological safety of foods. However, except for baby formulas, there are no restrictions on international trade in products that can affect human health; thus, countries that produce a milk surplus and have a higher consumption of skimmed milk generate a surplus of milk fat that they market in the developing world at low cost, with harmful consequences for sedentary urban populations. Here, the economic benefits of a free market should be balanced against the economic costs of an unhealthy diet's impact on health.
- » *Review the regulations governing the institutional food offered in schools, public utilities, the armed forces, and the workplace.* Institutional food programs financed with public moneys in the countries of the region do not meet the standards of a healthy diet. An effort should be made to determine whether the food provided in institutions contains the right quantity and quality of fats, promote the recommended consumption of fruits and vegetables, and foster healthy eating habits. This is a matter of great importance. When commercial interests prevail, institutions tend to install vending machines filled with high-energy-density foods (sweet and salty fatty snacks and beverages with little or no nutritional value).

Public policies can work also at the demand side, and we provide below examples of interventions to increase the demand for healthful foods.

- » *Increase the relative prices of unhealthful foods.* The laws of economics indicate that the higher the price, the lower the consumption. It is a hard thing to say

that food should be subject to these policies, but at the very least we can make healthier food choices less expensive. In some countries, for example, fast-food restaurants that sell the usual foods loaded with saturated or hydrogenated fats must also offer salads or fruit at the same price to encourage the healthier option. That is, for the price of a hamburger with French fries, customers should have the option of substituting a salad for the fries. In other cases, the prices of skim and whole milk have been equalized.

- » *Facilitate the selection and consumption of healthful foods at lower prices.* Information on the experiences of several countries in the region in how to select the best nutrition at the lowest possible price, based on the composition of local foods and prices at a given time, can be disseminated with software to assist groups or families in this process. PLANUT (PAHO) and Best Purchase in Peru are examples of such efforts. Combining this strategy with consumer cooperatives formed to obtain better food prices and better quality will create a powerful tool for promoting a safe and healthy diet for the consumers who most need it.
- » *Provide consumer information at the point of purchase.* Evaluations of the use of nutritional guidelines and nutritional labeling as a tool for promoting a healthy diet reveal significant limitations, especially the limited effectiveness of these strategies in modifying consumption patterns. Providing information at the point of purchase through consumer educators, attractive handouts, and icons to indicate healthful foods is more effective. Recent assessment of an activity in Chile shows that giving consumers information at the point of purchase has significant potential for influencing food choices.

Table 1 illustrates policy instruments and activities that can be applied at different stages of the food-production chain to reduce saturated fat intake, as well as its potential impact on consumption. We have spoken about intervening in the food-production chain. In many cases, this will affect the powerful economic interests of the producers or marketers of certain products. These groups represent not only economic but also political power, which implies a potential conflict that must be addressed taking the public interest into account. These issues must be debated throughout society, and it is the political rules of the democratic process that must determine how to protect community interests. Here, the press and opinion makers have a key role to play. In a democratic system, the state and governments are the ultimate guarantors of community well-being. They are elected for this purpose and must be accountable for the policies implemented to promote the health of the population. Citizens and those who help to shape public opinion must play a key role in demanding and ensuring safe and healthful food as a basic right. The Latin American Region should not

TABLE 1. Potential supply- and demand-side interventions in the food production chain to modify food consumption, for example, in this case to reduce saturated fat intake

Link in the food-production chain	Food policy instruments with nutritional impact	Examples of impact on fat consumption affecting quantity or quality of fat intake	Effectiveness in reducing intake of saturated fat
Food production	Subsidies or price supports	Subsidies for feed production Support for dairy products; price guarantees for producers	Very negative Very negative
	Import and export quotas	Export incentives for vegetable oil Restrictions and/or tariffs on meat imports	Uncertain Uncertain
Food processing	Quality grading	Definition of the level of quality (changes in the criteria for selecting quality, e.g., lean versus fatty)	Very positive
	“Identity standards”	“Identity standards—switch to low-fat milk and yogurt”	Positive
	Nutrition labeling	Descriptors in nutrition labeling (e.g., low-fat milk, ice cream)	Very positive
Distribution, marketing, and advertising of food	Advertising campaigns for dairy products	Changes in the demand of Government programs for milk products (low-fat to replace full-fat milk)	Negative
	Nutrition labeling	Use % lean in the labeling of ground meat Labeling in restaurant menus to indicate the quantity and quality of fat, low in saturated fat	Negative Positive
	Marketing standards	Need for standardization of the various sector descriptors: agricultural, health, trade	Uncertain
Food choices and consumption	Nutrition labeling	Label indicating the quantity and quality of fat	Very positive
	Public information campaigns to promote good nutrition	Nutritional guidelines for consumer orientation	Very positive
		Icon to orient food choices (pyramid)	Very positive
	Promotion groups for specific products	Promotion of cheese, milk, meat, ice cream, eggs	Very negative

Source: modified from ref. 13.

only complete the task of eradicating hunger, but it should promote healthy diets and active living as a way to ensure optimal health and quality of life while reducing loss of healthy life years.

## Conclusions

Dietary patterns, nutrition, and the level of physical activity not only affect current health but determine the risk of developing nutrition-related chronic diseases in the future. These diet-related diseases are the leading cause of disability and death in the industrialized countries and in most of the developing countries. The prevalence of risk factors for nutrition-related chronic diseases is progressively increasing both in the developing countries and among the poorer populations of the industrialized countries. In Latin America, this risk also includes the legacy of early malnutrition, both in

the womb and after birth. Communities, regions, and countries that have undertaken integrated, nationwide mass interventions have managed to reduce risk factors and deaths from nutrition-related chronic diseases dramatically. Success has been possible when societies have come to understand that premature deaths from nutrition-related chronic diseases are mostly preventable, and when they have mobilized to demand that their political representatives create environments and institute public policies that promote and support healthy living. This has been achieved when governments, communities, and the private sector share the notion that laws and regulations should be changed to ensure that neighborhoods, schools, and the workplace promote and support the consumption of healthy diets and encourage the level of physical activity necessary to attain a healthy weight.

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# Promoting physical activity in the Americas

Michael Pratt, Enrique R. Jacoby, and Andrea Neiman

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## Abstract

*Physical inactivity, obesity, and noncommunicable disease rates are rapidly climbing to epidemic proportions and are becoming the leading causes of death and disability in the Americas and globally. The causes are complex and will require a multifaceted, multisectoral approach. Recognizing this, the World Health Organization adopted a broad-ranging process to develop a Global Strategy for the Promotion of Diet, Physical Activity, and Health, as mandated by the World Health Assembly in May 2002. The results of the yearlong effort are to be presented at the World Health Assembly in May 2004.*

**Key words:** physical activity, non-communicable diseases, Americas region, disease prevention, health promotion, policy

## Note from the guest editor

*This paper reports the efforts of the World Health Organization Regional Consultation on Diet and Physical Activity in the Americas. The authors' main concerns are the problem of physical inactivity at the population level, and how it can be addressed in order to improve health and quality of life. Although the rationale for promoting physical activity and the blueprint for doing*

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*so are clear, most national public health agendas in the region do not address the emerging problems posed by the epidemic of noncommunicable diseases, and the capacity to develop, target, implement, and evaluate programs is limited. Strengthening capacity and providing training for policy development, surveillance, evaluation, and partnership building is essential for effective physical activity promotion and disease prevention. These major challenges confront public health practitioners around the globe. They are especially salient in the Americas, where the epidemiologic transition to predominance of chronic diseases is coupled with rapid urbanization. However, the Americas also have an abundance of creative, community-based physical activity-promotion programs, a network linking these programs, and examples of cities transformed into environments friendly to pedestrian life and recreation. All of this is occurring against the backdrop of an unquestionable strong national and regional interest in physical activity and health.*

—Enrique R. Jacoby, M.D., M.P.H.

## Introduction

Physical inactivity, obesity, and noncommunicable diseases are rapidly climbing to epidemic proportions and are becoming the leading causes of death and disability in the Americas [1]. This is of concern because inactivity and obesity are no longer seen as by-products of affluence, but are now a phenomenon increasingly observed among middle- and low-income groups in developing countries [2]. It is widely recognized that energy- and fat-rich diets, inactivity, and smoking underlie the epidemic of noncommunicable diseases. Much greater focus is now being directed toward understanding why individuals choose poor diets and lead sedentary lifestyles, and how modern environments and public policies may influence those choices. It is clear that in order to design effective interventions for inactivity, poor diet, and obesity, a broad, multisectoral approach, incorporating a variety of strategies and partners, will be required.

In this paper we are mainly concerned with the problem of physical inactivity at the population level, and how it can be addressed in order to improve health and quality of life. We will address eight major questions in the paper and in the regional consultation:

- » Why is physical inactivity a critical public health issue in the Americas?
- » What are the health and associated social benefits of regular physical activity?
- » How much physical activity is recommended for health?
- » How physically active are adults and children in the Americas?
- » What are the most important individual, social, and environmental determinants of physical activity?
- » What strategies and interventions have proven to be effective in increasing population levels of physical activity?
- » What are the components of a national physical activity policy, and how can they be effectively implemented?
- » What are some examples of successful programs for promoting physical activity in the Americas?

## A critical public health issue

Physical inactivity has become a major public health problem throughout the Region of the Americas, for several reasons. First, the prevalence of inactivity has markedly risen over the last half century as urbanization, motor transportation, computerization, communications technology, and increasingly sedentary jobs and pastimes have more than counterbalanced an apparent increase in leisure time or recreational physical activity [3, 4]. Second, physical inactivity is an important risk factor for obesity, cardiovascular disease, colon and breast cancer, and diabetes [5]. These noncommunicable diseases, formerly associated with high-income populations, now account for a large share of total morbidity and mortality across every socioeconomic group in almost every country in the Region of the Americas [6]. It is estimated that in the United States, physical inactivity and poor diet account for at least 14% of all deaths [7], and globally, inactivity accounts for more than two million deaths annually [8]. Physical inactivity also has substantial economic costs. Analyses from Australia, Canada, the United States, São Paulo State in Brazil, and Switzerland indicate that physical inactivity is responsible for 2% to 6% of total health-care expenditures [2]. In the United States, this represents as much as \$76 billion annually in potentially avoidable health-care expenditures [9]. Lastly, effective interventions exist to increase population-level physical activity. Thus, physical inactivity is a classic public health problem: large amounts of disease are attributable to inactivity, a majority of the

population is at risk, and effective strategies to address the problem exist.

The role of physical inactivity in the current global obesity epidemic is of special interest. Obesity is a consequence of positive energy balance, resulting from a combination of excess energy consumption and diminished energy expenditure. Almost a century ago, a worldwide phenomenon of increases in secular weight and height began to gain attention, but it was only recently that obesity emerged on a global scale [10]. Powerful societal and environmental forces may have contributed to shape our physical activity patterns and diets; among them, the unprecedented surplus and declining real price of food, urbanization, motor transportation, and increasingly sedentary jobs and pastimes [3].

Recent economic studies highlight the fact that technological change has both raised the cost of physical activity and lowered the cost of calories. Cheap, available food, rich in energy and high in saturated fat, coupled with labor-saving technology in the workplace, leads us toward progressively more sedentary lifestyles, facilitating an economic environment that favors weight gain [3]. Many people were formerly employed in jobs that required significant caloric expenditure, but today fewer and fewer jobs require regular physical activity. For most persons of middle and upper socioeconomic classes, participation in physical activity often requires an expenditure of both time and money for equipment or facilities [3, 9].

## Health benefits of physical activity

At the root of the multiple health benefits associated with physical activity are the many physiologic and metabolic responses. Physical activity requires increased energy expenditure and imposes demands and stresses on multiple organ and enzyme systems. These demands lead to acute and long-term responses of the circulatory, respiratory, nervous, endocrine, and skeletal systems. The most direct benefits of physical activity are cardiovascular and musculoskeletal adaptations, which increase functional capacity in these organ systems. Increased aerobic capacity and muscular strength and endurance have been well documented following training programs in individuals of all ages. Maintenance of functional capacity and strength is especially important for preventing disability and maintaining independence among older adults. Many disease- and risk factor-specific benefits of physical activity have also been identified in epidemiologic and clinical studies. Convincing data link regular physical activity to lower rates of coronary heart disease, diabetes, and colon and breast cancer, as well as to improvements in mental health, glucose metabolism, and bone density [11].

### Coronary heart disease

Epidemiologic studies over the past 50 years demonstrated that heart disease was less likely to develop in active railroad workers and in conductors on double-decker buses in London than in the less active drivers, and that among longshoremen, the most active men had the lowest risk of coronary heart disease [12]. Longitudinal studies of college alumni have shown a reduced incidence of coronary heart disease and lower mortality from coronary heart disease and from all causes among regularly active men as compared with their sedentary counterparts [13]. Previously sedentary men who initiated regular physical activity in middle age also reduced their risk of death from coronary heart disease and all-cause mortality when compared with men who remained sedentary [13]. Increased physical fitness has been linked with lower mortality from all causes and from coronary heart disease among both men and women. Overall, the risk of coronary heart disease in sedentary men is about twice that in men who are habitually active [14]. To date, no randomized clinical trial of physical activity for the primary prevention of coronary heart disease has been conducted. However, the association of regular physical activity with reduction in coronary heart disease meets strict epidemiologic criteria for causality: the association is strong, consistent, graded, temporally appropriate, and biologically plausible.

The evidence for regular physical activity in the secondary prevention of coronary heart disease is at least as strong as that for primary prevention. Patients with coronary heart disease who engage in regular physical activity as part of a cardiac rehabilitation program have lower mortality from all causes and from coronary heart disease than do nonparticipants one to three years after initial hospitalization. Exercise-based cardiac rehabilitation programs have also been shown to increase functional capacity and reduce coronary heart disease symptoms and may improve quality of life. Appropriate physical activity should be a part of the management and rehabilitation of most patients with coronary heart disease [15].

### Weight control

Individuals who are regularly active tend to weigh less and have a lower percentage of body fat than sedentary individuals, despite the fact that physically active persons are consistently observed to consume more calories than sedentary individuals. Regular physical activity increases caloric expenditure indirectly by raising the resting metabolic rate after activity, as well as directly by the activity itself. A combined program of diet and regular physical activity appears to be the most effective means of maintaining ideal body weight. Regular physical activity appears to alter body fat dis-

tribution beneficially, independently of its effects on body weight and total adiposity. The quantity of daily physical activity required to maintain body weight in the context of a modern, developed society is in debate. Although longitudinal data are lacking, recent reports suggest that as much as 60 minutes per day of moderate-intensity physical activity may be necessary to prevent weight gain [16, 17].

### Diabetes

Physical activity increases muscle glucose uptake directly and also increases insulin sensitivity. Physical activity is commonly prescribed for managing non-insulin-dependent diabetes mellitus (NIDDM). Physical activity may also prevent NIDDM through its effects on insulin and glucose metabolism and maintenance of body weight. In well-conducted longitudinal studies, the incidence of NIDDM has been observed to be lower in regularly active male college alumni, physicians, and female nurses than their sedentary counterparts [18].

### Osteoporosis

Physical activity may play an important role in maintaining bone mineral density, preventing osteoporosis, and reducing fractures. Bone density is reduced by bed rest and can be increased by weight-bearing activity. Regular physical activity has been demonstrated to increase bone mass in young women and reduce the decline in bone mass seen in postmenopausal women, and it may increase bone density in patients with osteoporosis. Postmenopausal women who walk approximately one mile per day have higher bone mineral density and slower rates of bone loss than do sedentary women. Regular physical activity also increases muscle mass and strength, perhaps reducing the risk of falls and protecting against fractures when falls do occur [5].

### Cancer

Both regular physical activity and physical fitness have been associated with lower mortality from cancer in longitudinal studies. Although data for most specific cancers are limited, studies of occupational and leisure-time activity indicate that physical activity is protective against colon cancer [19]. Several studies, and most of the more recent studies, suggest a reduced risk of breast cancer in regularly active women, but many earlier studies failed to demonstrate this relationship [5]. The protective effects may be mediated by reduced intestinal transit time (colon cancer) and altered endocrine function [20].

## Mental health

Regular physical activity and physical fitness are positively associated with mental health and well-being. Persons who are regularly active report less anxiety and depression and lower levels of stress than do sedentary persons. Exercise programs may be useful as adjunctive therapy for treating mild to moderate depression [21].

## Social benefits

Regular participation in physical activity has been shown to provide social benefits through enhanced social interaction and integration. Several studies suggest that individuals who are physically active are more likely to take an active part in their community, are less likely to withdraw from society, and have widened social networks. In addition, studies have shown that children and adolescents who are regularly active attain higher scholastic achievement and are less likely to be involved in drugs, alcohol, or other negative behaviors compared with adolescents and children who are not regularly active [8, 22].

## Physical activity recommendations

An important issue for public health policy is how much physical activity is required for significant health benefits. Very good epidemiologic and clinical research data indicate that substantial health benefits may be achieved with at least 30 minutes of daily physical activity of moderate intensity, such as brisk walking [5, 23]. Public health institutions in many countries around the world, including the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), have endorsed a recommendation of at least 30 minutes of moderate-intensity physical activity accumulated over the day in bouts of at least 10 minutes, on most days of the week [2, 5, 23]. Additional benefits may be obtained by most individuals if they participate in higher-intensity or longer-duration physical activity [5]. However, between half and three-quarters of most adult populations are sedentary or only minimally active, and the basic 30-minute recommendation poses enough of a challenge for this group [5, 6]. Recent reports from WHO and the US Institute of Medicine have specifically addressed the role of physical activity in preventing weight gain and obesity [8, 16, 24]. In spite of these efforts, the amount of physical activity needed to prevent weight gain is still in debate, and most probably varies considerably from person to person, in part because dietary intake varies considerably from person to person. However, it appears that persons who were previously obese may require more than 30 minutes of moderate-intensity

physical activity per day, usually 60 to 90 minutes, to maintain a healthy weight. [16, 24]

## Levels of physical activity and inactivity in the Americas

Physical activity occurs in five primary domains: transportation, recreation, domestic, occupational, and school. Physical activity levels in these domains have changed significantly in recent decades in many, if not most, countries in the Americas. Occupational physical activity has declined markedly with increased mechanization and computerization; domestic and transportation-related physical activity probably is declining; and leisure-time physical activity is increasing in at least some countries [4, 25]. The prevalence estimates for adult physical activity vary considerably, depending on how many domains are included within a given survey and how physical activity is defined [26]. When only leisure-time activity was included in a 1996-97 survey, 13% of adults in Brazil were categorized as regularly active [27]. By contrast, a more recent study of a representative population in the southern Brazilian city of Pelotas utilizing the short International Physical Activity Questionnaire (IPAQ), which assesses domestic, occupational, and transportation physical activity in addition to leisure-time activity, reported that 58.9% of adults were regularly active and 41.1% were inactive [28]. Similarly, in 2001, when the US Behavioral Risk Factor Surveillance System included physical activity from occupational, transportation, and recreational domains, the prevalence of regular physical activity reached 45.4% [26]. In most published studies from Latin America, physical inactivity, defined as no or very little recreational or sports-related physical activity, is reported in a form that allows at least some degree of comparison. Data from Chile [29], Peru [30], Argentina, Brazil, and a PAHO study of seven metropolitan areas in Latin America show adult prevalences of physical inactivity between 50% and 91% [25]. Although estimates of the prevalence of physical activity vary considerably due to varying definitions of physical activity and survey methods, the overall pattern of physical activity is quite similar across the Americas (fig. 1).

Taken together, these studies allow the following conclusions to be made:

- » More than two-thirds of adults in many countries in the Americas do not engage in sufficient regular physical activity to accrue significant health benefits
- » People of all ages lead inactive lifestyles
- » Physical activity decreases with age
- » Women tend to be more inactive than men [5, 26, 27]
- » Low-income and less-educated sectors participate in less sports and recreational physical activity but more

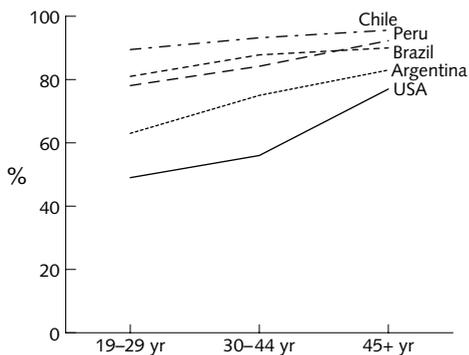


FIG. 1. Rates of low frequency of leisure-time physical activity (once a week or less) among adults in selected countries. Sources: Peru [31], Chile [32], Argentina [33], Brazil [27], United States [34]

occupational and transportation physical activity than higher-income or better-educated populations [26, 30] (fig. 2).

### Determinants of physical activity

A large number of demographic, biologic, psychological, cognitive, social and cultural, and environmental factors influence participation in physical activity [35]. The determinants of physical activity and inactivity are truly multifactorial and vary according to person, setting, and culture. The availability of time, facilities, and other material resources probably contributes to the higher participation in leisure-time physical activity of the more educated and wealthier segments of most populations. To reach less advantaged populations, it is important to expand our understanding of the determinants of inactivity beyond individual characteristics. It has become increasingly apparent that patterns of activity are a result of more than individual volition [36]. New research suggests that environmental vari-

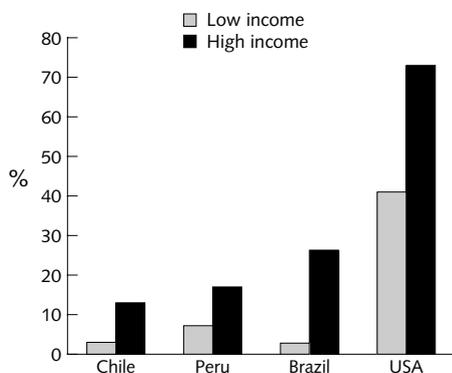


FIG. 2. Percentage of adult women engaged in leisure-time physical activity at least once a week according to income level and country. Sources: Peru [31], Chile [32], Brazil [27], United States [34]

ables, such as access to recreational space, neighborhood design, weather, and safety, contribute to patterns of inactivity [37].

Mounting evidence suggests that environmental and policy approaches aimed at increasing a population's physical activity levels are efficacious. For example, studies have shown that the physical and mental health benefits of moderate, unstructured physical activity are similar to those described for a more structured approach, such as aerobics or practicing sports [38, 39]. Lifestyle interventions, such as brisk walking, bicycling, and using stairs, can be easily integrated into our daily life and facilitate adherence to regular physical activity more than other forms of vigorous exercise [40]. Moreover, walking is the choice of most individuals who engage in regular physical activity [35, 37].

Regular routine physical activity may be the factor behind the low rates of obesity observed in certain countries (fig. 3). The Netherlands and Sweden have the highest rates of walking and bicycling, and obesity is less of a problem there than in more car-bound societies. Environments and policies that facilitate routine walking and bicycling offer a promising means of improving population levels of physical activity and overall health.

### Interventions to promote physical activity

A wide range of strategies and interventions have been used to promote physical activity in schools, worksites, health-care settings, and communities. Over the last decade, a growing body of research has accumulated that can be used to guide public health action. The US Preventive Services Task Force and the CDC are carrying out a systematic review of all of the English-language scientific literature on physical activity interventions. Fourteen categories of physical activity

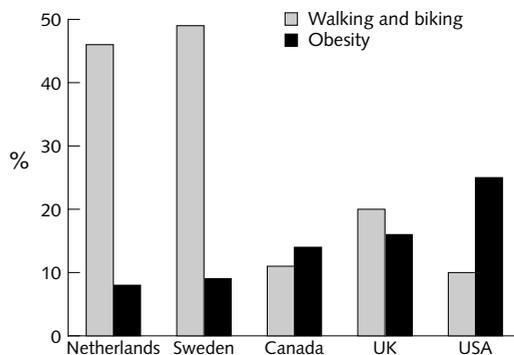


FIG. 3. Percentage of nonmotorized travel (walking and bicycling) and obesity rates in selected countries. Source: authors' elaboration based on data from the Victoria Transport Institute, 2002, and Obesity: preventing and managing the global epidemic. Report of a WHO consultation on obesity, 2000

interventions are being assessed. To date, analyses of 11 categories have been completed and the results have been published [41]. Six types of interventions are recommended:

- » Community-wide campaigns incorporating mass media and multiple other strategies
- » Point-of-decision prompts, such as signs recommending stair use
- » High-quality school physical education
- » Individually adapted health behavior change utilizing behavioral strategies such as goal setting, social support, reinforcement, and structured problem-solving
- » Social support in community contexts, for example, walking clubs
- » Creating or enhancing access to facilities or sites for physical activity, such as trails or worksite programs

Evaluations of transportation and urban planning related interventions are ongoing. The recommended interventions may be conceptualized as a menu of tested, proven, effective interventions that health departments, ministries, and local governments may draw from to create a combination of strategies and interventions that suits the local environment, culture, and circumstances.

In addition to effective intervention strategies, an important component of effective physical activity promotion programs is partnership development and communication. In the Americas, an excellent example of this type of information sharing and networking exists in the form of La Red de Actividad Física de las Américas/The Physical Activity Network of the Americas (RAFA/PANA). RAFA/PANA was created to build a “network of national networks” integrating members of public and private institutions, nationally and internationally, to promote health and quality of life through physical activity. RAFA/PANA works to develop, disseminate, and coordinate information and strategies for physical activity promotion in the Americas. The network includes about 75 members from over 20 countries representing public and private institutions that have physical activity promotion programs, as well as national and international organizations that can advise and sponsor member activities.

In the Americas, municipal and local governments can play an important role in fostering the public health agenda of physical activity promotion.

- » They are already working in physical activity and sports promotion. This contrasts with the still-limited health-promotion agenda in the public health sector.
- » They have decision-making power over the physical environment such as land use, transportation systems, and public safety, areas closely related to physical activity. They can also build related policies and influence legislative processes.
- » They can bring together different partners to build coalitions around the promotion of physical activity, including the private sector, the media, nongovern-

mental organizations, and the public sector.

- » In most cities there is an important demand from the public for action on issues related to public transportation, environmental health, green space, crime control, and facilities for physical activity.

Daily activities such as walking can have great impact on human health, and the physical environment can play a crucial role in encouraging them [5, 35, 37]. Many communities and local governments in the Americas are already engaged in creating healthful environments and devoting local resources to promote utilitarian nonmotorized transportation systems, as well as recreational physical activity in their communities, although not always inspired by physical activity promotion principles [36, 42]. In fact, pressing issues related to transportation, air quality, crime control, and zoning regulations are more often the impetus for community change.

### Components of a national physical activity policy

Developing a national, state, or regional policy for physical activity is a complex process. However, public policy for physical activity can be based upon good science and traditional public health approaches. A model framework is presented below. This model was developed as part of a joint WHO/CDC workshop on Physical Activity Policy Development that took place in Atlanta, Georgia, USA, from September 29 to October 2, 2002. The workshop was hosted by the CDC/WHO Collaborating Center for Physical Activity and Health Promotion, and the results are in press [43].

The comprehensive physical activity policy framework is a four-step process guided by an overall vision of sustainability, credibility, equity, and creativity. Although the steps follow in a logical sequence, countries may actually start the process at any point. Sound national physical activity policy will probably include all of the components of the framework.

#### Steps:

- » Make the case for physical inactivity as an important public health issue
- » Define the country-specific situation with respect to physical activity, noncommunicable diseases, determinants and barriers, and target populations
- » Identify both effective strategies and interventions and the settings that they may be applied in, as well as existing interventions and programs, actors, and resources
- » Implement interventions using a systematic approach characterized by 10 elements drawn from successful programs from around the world

Lastly, the comprehensive physical activity policy framework incorporates evaluation into each step along

the way. Evaluation may be simple or sophisticated and can include formative, process, and impact or outcome elements. Good evaluation is essential for developing, targeting, and maintaining an effective public health policy for physical activity. Figure 4 summarizes the framework described here.

## Examples of successful interventions in the Americas

### Community-wide campaigns

Community-wide campaigns involve the application of multiple types of interventions to different populations in multiple settings. For example, the Agita São Paulo program targets students in primary and secondary schools, older adults, and workers with a combination of special events, informational materials, mass media, school curricula, training for physical educators and physicians, worksite health-promotion programs, community exercise classes, and cooperative ventures with public agencies from several sectors (health,

education, transportation, and sports). Partnerships and public-private collaboration have been critical to the success of Agita São Paulo. Community-wide campaigns require integration and scope that usually depend upon the intense involvement of local city and community authorities in the design and execution of the interventions and programs. The mass media are an important part of community-wide campaigns, but mass-media interventions alone do not appear to be an effective way to promote physical activity. However, in conjunction with broad-based community programs, mass media can be very useful. [41]

#### Examples:

- » Agita São Paulo [44] (<http://www.agitasp.com.br>)
- » Muévete Bogotá ([www.idrd.gov.co](http://www.idrd.gov.co))
- » Healthy Municipalities ([http://www.paho.org/English/D/ops98-02\\_ch05.htm](http://www.paho.org/English/D/ops98-02_ch05.htm))
- » Vida Chile (<http://www.minsal.cl>)
- » Stanford 5 Cities Project [45]
- » Promoting Nutrition and Physical Activity through social marketing [46]

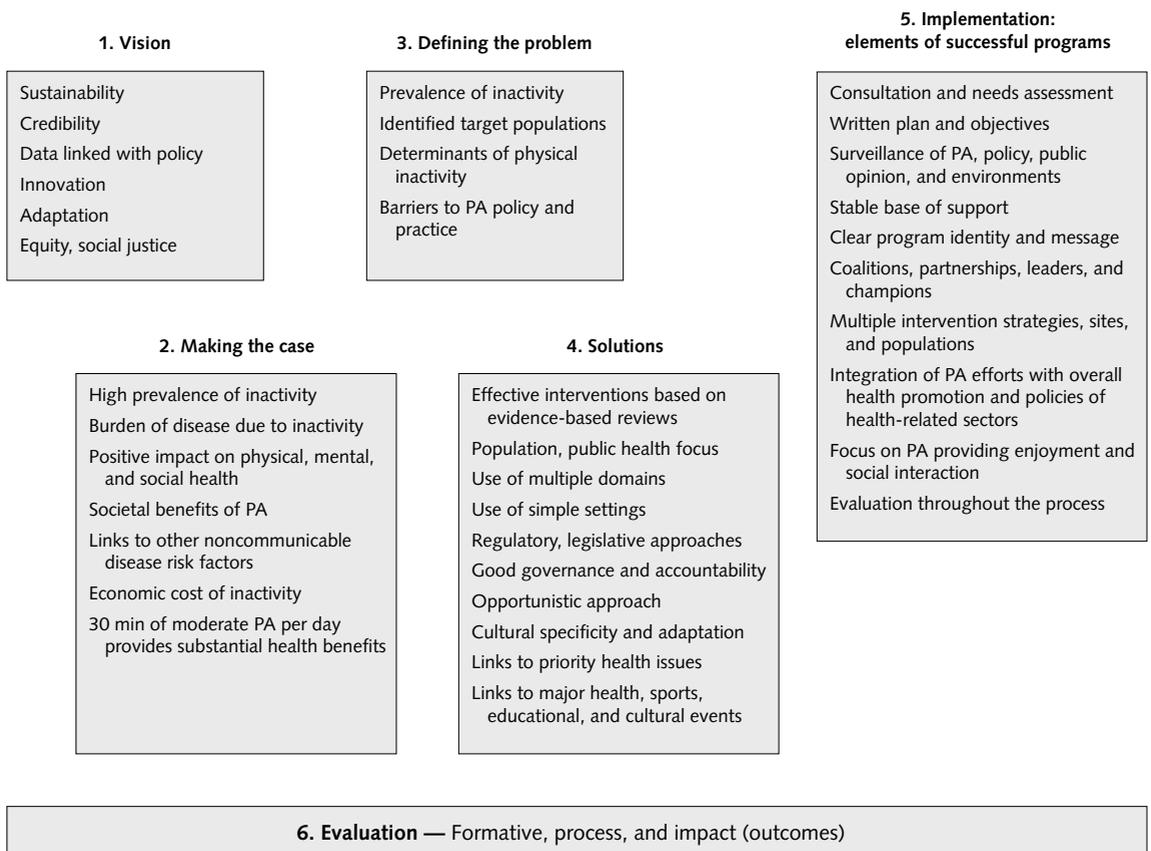


FIG. 4. Comprehensive physical activity (PA) policy framework

## Workplace interventions

The workplace is a very efficient means of reaching a majority of the adult population. A large body of research and practical experience exists on worksite health promotion. Worksite interventions include the promotion of stair use, on-site recreational facilities and programs, incentives for active commuting to work, and physical activity and nutrition counseling. Many of the recommended interventions from the US Preventive Services Task Force are worksite-based [41].

### Examples:

- » Kerr J, et al. Can posters prompt stair use in a work-site environment? [47]
- » Coleman KJ, Gonzalez EC. Promoting stair use in a US-Mexico border community [48]
- » CDC Stairwellness Project ([http://inside.nccd.cdc.gov/employee\\_handbook/serv\\_orgs/hns/about/activities.htm#stairwell](http://inside.nccd.cdc.gov/employee_handbook/serv_orgs/hns/about/activities.htm#stairwell))

## Physical education in schools

School physical education has great, but largely unrealized, potential for physical activity promotion. A large majority of children can be reached through physical education, but physical education programs are often of low quality and are increasingly being eliminated in order to reduce costs or increase focus on core academic subjects. High-quality physical education programs are an effective means of increasing physical activity among children and teaching skills, and they do not reduce academic performance [49]. A good physical education curriculum includes cognitive content as well as a variety of learning experiences in activities that range from basic movements skills to sports, dance, and gymnastics. Ideally, a good physical education program should be enjoyable and provide the basis for active living in the adult years. Effective physical education programs that are enjoyable, teach lifetime skills, increase levels of physical activity among children at school, and can be taught by a combination of physical education specialists and classroom teachers have been developed and implemented. [41]

### Examples:

- » The Coordinated School Health Program (CDC) ([http://www.cdc.gov/nccdphp/dash/about/school\\_health.htm](http://www.cdc.gov/nccdphp/dash/about/school_health.htm))
- » Take10 (ILSI) (<http://www.take10.net>)
- » SPARK Program. Sallis JF, et al. The effects of an innovative school physical education program with a focus on fun, skills, and lifetime physical activity (<http://www.sparkpe.org/index.jsp>) [49]

## Urban planning and community design

Pedestrian-oriented community design may improve health and quality of life by facilitating walking and cycling and increasing routine nonmotorized transportation and recreational physical activity. Although this is a new area of research, there is already good evidence that access to safe, attractive places to be active will increase participation in regular physical activity [35, 37]. There are also practical examples of urban planning and community design in Latin America that are leading to safer and more attractive environments for physical activity and may also stimulate social interaction and sense of community [36]. Indeed, in countries and cities where good alternative modes of public transportation systems exist and incentives for bicycling are in place, the situation is different than in cities where options for public transportation and bicycling are limited. In Bogotá, Colombia, introduction of an extensive network of bicycle lanes throughout the city has led to increased bicycle ridership in the last four years [50].

### Examples:

- » Montezuma R. La Transformación de Bogotá 1995–2000. Entre Redefinición Ciudadana y Especial. Ciudad Humana. 2002 [51]
- » Neiman AB, Jacoby ER. The First “Award to Active Cities Contest” in the Region of the Americas [36]

## Conclusions

Lifestyles and patterns of disease and health behavior have changed dramatically in the Americas over the past half-century. The Americas are highly urbanized; at least half of adults are physically inactive in most countries within the region; and 76% of mortality is due to noncommunicable diseases [6, 8]. Based on the evidence reviewed in this paper we can conclude that:

- » Physical inactivity is a critical public health problem in the Americas and contributes to the growing epidemic of obesity and noncommunicable diseases.
- » The majority of adults are insufficiently active to receive the health benefits associated with an active lifestyle.
- » Meeting the guideline of at least 30 minutes of physical activity a day is within the reach of almost all adults, and meeting this guideline provides substantial health benefits.
- » Although the exact amount of physical activity needed to prevent obesity is dependent upon energy consumption and energy expenditure, some individuals may require more than 30 minutes of moderate physical activity a day.
- » Effective population-based strategies exist for promoting physical activity in schools, worksites, and

communities, and good examples of their application are present in the Americas.

- » The successful promotion of physical activity rests on a broad spectrum of stakeholders and partners that are not necessarily linked to the health sector. Key sectors that may need to be involved are education, sports, transportation, local governments, environmental protection, public safety, and the private sector.
- » A logical policy and programmatic framework may be used to guide the development of national physical programs within public health and other sectors.
- » Promotion of physical activity will be enhanced by integrating and coordinating with broader health-promotion and noncommunicable disease-prevention programs.

Over the past decade, there has been a progressive consolidation of knowledge about physical activity and public health. By 1996, with the publication of the Surgeon General's Report on Physical Activity and Health, the extensive health benefits associated with physical activity were clearly established and widely accepted [5]. Similarly, our understanding of the behavioral determinants of physical activity has rapidly evolved [35]. Within the last three years, a large enough body of research has accumulated to develop evidence-based recommendations for community

interventions to increase physical activity [41]. The building blocks are in place to put together population-level programs to promote physical activity. The WHO Global Strategy for Diet, Physical Activity, and Health serves as a call to action to do so [52]. Although the rationale for promoting physical activity and the blueprint for doing so are clear, there is limited capacity in most countries within the Americas to actually develop, target, implement, and evaluate programs. This is true for noncommunicable disease prevention and health promotion in general, as well as physical activity specifically. Strengthening capacity and providing training for policy development, surveillance, evaluation, and partnership-building are essential for effective physical activity promotion and disease prevention. These major challenges confront public health practitioners around the globe. They are especially salient in the Americas, where the epidemiologic transition to predominance of chronic diseases is coupled with rapid urbanization. However, the Americas also have an abundance of creative community-based physical activity promotion programs, an effective network linking these programs, and strong national and regional interest in physical activity and health. The Americas are well positioned to take on the challenge of physical inactivity.

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# A public health framework for chronic disease prevention and control

Sylvia C. Robles

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## Abstract

*Chronic noncommunicable diseases are leading causes of death and disability in many developing countries. Several low-income countries lack mortality and morbidity data and do not yet know their burden of noncommunicable diseases. Cost studies are scarce, but in middle-income countries such as those of Latin America and the Caribbean, the cost of illness not only represents much of the direct costs of medical care, but also has an impact on family disposable income. Studies have reported that in low-resource settings, given incomplete health coverage and partial insurance, out-of-pocket expenses are high. Persons with chronic conditions, in many instances, have to forego care because of their inability to pay. Poverty and chronic noncommunicable diseases have a two-way interaction. These conditions warrant attention from poverty-reduction programs. Evidence shows that to have an impact on the burden of chronic diseases, action must occur at three levels: population-wide policies, community activities, and health services. The latter includes both preventive services and appropriate care for persons with chronic conditions. A public health approach embodies a systems perspective, containing the continuum of prevention and control, from determinants to care. In this framework it is critical to identify and address interactions and interventions that connect between and among the three levels of action.*

**Key words:** Americas, costs, noncommunicable diseases, prevention

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## Introduction

There is a pressing need in the international public health community to take action with regard to the epidemic of chronic noncommunicable diseases, given the burden on developing countries and among the poor. Traditionally, two contrasting approaches have been discussed. One is based mostly on health promotion, addressing the determinants of risk factors and disease. The other is based on clinical cost-effective interventions. A public health response must bridge these two approaches and integrate prevention and control of noncommunicable diseases in comprehensive programs. In this paper we discuss a first approximation to develop a conceptual framework to achieve integration of noncommunicable disease prevention and control, with particular reference to the situation of Latin America and the Caribbean.

## Social and economic burden of chronic diseases

There is wide recognition that chronic noncommunicable diseases are the leading cause of premature mortality and disability in the vast majority of countries of the Americas [1]. Among those under the age of 70, noncommunicable diseases account for 44.1% of deaths among males and 44.7% among females. The work force of most countries is affected by illnesses and risk factors that are highly preventable. The increasing relative importance of noncommunicable diseases in terms of disability-adjusted life years (DALYs) [2] is depicted in figure 1.

The importance of noncommunicable diseases is evident in persons of all ages and both sexes. Studies show that the prevalence of hypertension ranges from 14% to 40% among those 35 to 64 years of age, but nearly half are not aware of their condition, and on average, only 27% control their blood pressure [3]. Among the 9% to 18% of persons 35 to 64 years of age living with diabetes, nearly 60% already have at least

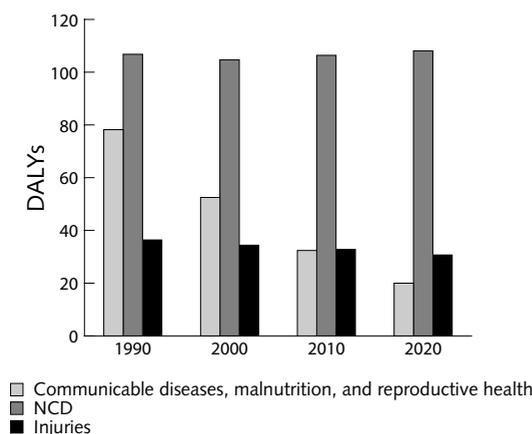


FIG. 1. Estimated trends in disability-adjusted life years (DALYs) according to cause in Latin America and the Caribbean, 1990–2020. NCD, Noncommunicable disease

one microvascular complication when diagnosed [4]. These complications, which can be prevented, lead to significant disabilities, such as blindness, amputation, and chronic renal failure. The number of persons with diabetes will increase almost twofold in Latin America and the Caribbean by the year 2020. It is estimated that nearly 80% of cases will be related to obesity. Women require special attention, because they have higher rates of obesity and physical inactivity than men [1]. It is not surprising that currently cardiovascular diseases are the leading cause of premature death among women in Latin America and the Caribbean.

No comprehensive study on the cost of noncommunicable diseases in Latin America and the Caribbean has been published. It is known that in the United States, the cost of cardiovascular diseases is on the order of 2% of the gross domestic product [5]. A study on the cost of illness in Canada found that 21% of all such costs are attributable to cardiovascular diseases, for a total of US\$12 billion annually [6]. These costs included treatment, consultations, and indirect costs, such as loss of income due to disability and death. Cardiovascular diseases were also considered responsible for the highest proportion (32%) of lost income due to premature death. The annual cost of diabetes in Latin America and the Caribbean has been estimated at US\$65.2 billion (2000) [7]. The different components used to estimate the total cost are presented in table 1. The highest costs are attributed to permanent disabilities due to complications from diabetes.

The cost and overall efficiency of interventions must be evaluated in terms of effectiveness and health gains for the population at large, but it is particularly important that consideration be given to those who bear the cost of such interventions, both the society and the individual patient. For example, antihypertensive treatment can cost up to \$100 per month, putting it

out of reach of persons from countries where the average monthly income may be only \$50 or less. A study in Jamaica reported that 57% of persons with cancer and diabetes became medically indigent because of the high proportion of the cost that required direct payment from patients; thus, 50% had to forego treatment because of inability to pay [8]. Health-services financing and policies impact on the possibilities that the population has to prevent and control chronic noncommunicable diseases, but the situation has yet to be appropriately documented in developing countries

Noncommunicable diseases have been erroneously regarded as diseases of affluence. This myth has led to misguided policy decisions [9]. Growing evidence demonstrating otherwise [10, 11] warrants attention from poverty-reduction programs. Although it has been widely demonstrated that persons with higher levels of physical activity and high consumption of fruits and vegetables have lower incidence rates of cardiovascular diseases and diabetes [12], it is very difficult for those living in a poor, unsafe neighborhood and working long hours to increase their physical activity and improve their diets. Neighborhoods and communities in the same country or city can have varying availabilities of food, access to health services, and opportunities to benefit from health-promotion initiatives.

Given the complexity that the burden of chronic noncommunicable diseases imposes on developing countries, the problem cannot be analyzed only in epidemiological terms. One-dimensional solutions, dealing with risk factors or diseases independently, have too narrow a scope. There are underlying common elements to several diseases and risk factors, as well as social dynamics and external influences. Public health agencies must adopt a comprehensive systems perspective that examines the multilevel processes that frame the prevention and control of noncommunicable diseases.

TABLE 1. Cost of diabetes in Latin America and the Caribbean, 2000

Type of cost	Amount (billions US\$)
Indirect	
Premature mortality	3,099
Permanent disability	50,633
Temporary disability	763
Direct	
Drugs	4,720
Hospitalizations	1,012
Consultations	2,508
Complications	2,480
Total	65,215

Source: ref. 7.

## Evidence for action

### Prevention

The incidences of disease and risk factors, as well as implementation of interventions, are affected by the societal context, which refers to the physical, social, and cultural environment (e.g., urban layout, safety factors, social support, social networks, cultural beliefs, language, gender roles, family composition, education, and income). The state and social groups play crucial roles in shaping the social context. Thus, prevention efforts need to extend beyond the individual to the environment that affects behavior. In order to improve understanding of how social dynamics influence health, several community-based trials of noncommunicable disease prevention were initiated in the United States and Finland in the 1970s and 1980s [13]. The results of these trials varied, probably because of various methodological considerations [14, 15]. In several studies, the control group accessed the intervention too soon after the study group to measure meaningful differences [16], either because of contamination or because of a policy decision to extend the program. Although some studies were inconclusive or the changes were difficult to interpret, the community organization process in conjunction with preventive health services seemed to be at the core of successful programs [17]. Some specific programs demonstrated reduction of risk factors and disease in closed population groups [18], such as interventions in the workplace consisting of a combination of regulations, health education, and individual interventions [19]. In view of the conflicting evidence, some have argued for a focus on health-services-based preventive interventions aimed at individuals [20, 21], such as smoking-cessation programs and nutrition counseling and screening. From an epidemiological point of view, it may be more feasible to demonstrate a statistical relationship for interventions aimed at individuals than to evaluate complex multilevel, multifactorial interventions. More recently, evaluation models that integrate behavioral and social science and consider multiple dimensions of interventions [22] are providing interesting results and another view to assess evidence.

Recent studies have attempted to determine what is required to achieve successful changes that both are effective and have the potential to reach all sectors of the population. The 2002 World Health Report [23] identified high blood pressure, overweight, and alcohol consumption to be the leading risk factors for mortality in Latin America and the Caribbean. Further analyses suggest that population-wide policies, such as legislation to reduce salt intake, combined with absolute risk reduction, are the most cost-effective interventions for the set of highly prevalent risk factors for cardiovascular disease in the region [24]. A previous review by

the Institute of Medicine of the United States points to community-based interventions in combination with preventive health services as the key strategy to reduce morbidity and mortality from noncommunicable diseases [25].

### Control of risk factors and disease

There is an important amount of research documenting the benefits and risks of various strategies for the control of risk factors and disease. The US Preventive Services Task Force [26] permanently reviews and grades the evidence for possible preventive interventions. In the area of chronic noncommunicable diseases, two strategies are noteworthy: screening, in particular for cancer of the cervix, breast, and colon as well as for hypertension; and counseling, for example, providing intensive behavioral dietary counseling for adults with hyperlipidemia and other known risk factors for cardiovascular disease. A third strategy for which there is increasing evidence is chemoprevention, such as the use of aspirin to prevent myocardial infarction and statins to control hyperlipidemias.

Therapeutic advances have been at the forefront in the improvement of disease management. Various researchers claim that the results of the WHOMONICA study on cardiovascular disease show that the reduction in cardiovascular disease mortality may be primarily due to the improvements in the treatment of disease rather than prevention [27, 28]. Others have challenged this interpretation on the bases of the large transformation power of population-based interventions at the policy level and the large variability in mortality and case-fatality rates among countries [29]. Most recently, a Finish study supported the latter, based on a significant decrease in mortality and a nonsignificant decrease in case fatalities [30].

The control of chronic noncommunicable diseases depends not on improving already available individual interventions, but in determining whether these interventions would be effective and sustainable under real-life conditions. Much of the evidence comes from efficacy trials conducted in well-controlled environments. Effectiveness or, more accurately, "population-based effectiveness" implies that the benefits of an intervention can reach all those who need it and that the system has the capacity to implement and sustain any given delivery program. The World Health Organization recently stated that the current acute health-care model has not proven effective in dealing with the prevention and control of chronic conditions [31]. Prevention and control of chronic noncommunicable diseases requires long-term contact with primary health-care services and good quality of care in order to be effective.

In general, it can be stated that strategies or favorable conditions at multiple levels are needed to trigger

overall system change. Three synergistic levels of action can be identified: policies and regulations addressing macro-level determinants, community-based actions that promote the participation of the population and affect demand, and health-service-centered modifications to address the needs of those with a given condition and offer preventive services.

### Policy-building

In industrialized countries, several adopted policies, laws, and regulations have been successful in preventing disease and injury, such as tobacco taxation and use of seat belts and helmets. The challenge, however, is in the process by which health policy is developed. Comparative analyses have demonstrated that these processes differ across social contexts and the nature of the proposed change, as well as preexisting political conditions [32]. Government action, either national or at the state and municipal levels, may require the support of internal or external technical and scientific establishments. In addition, the participation of the civil society is particularly influential for legislative changes that affect the interests of various stakeholders. Pivotal policy changes pertaining to noncommunicable disease prevention affect both public and private entities, often operating internationally. In this case, many small countries are unlikely to be successful by undertaking changes on their own [33]. Concerted international action and intercountry support are necessary to achieve outcomes.

### Community involvement

The decentralization of health services has focused primarily on the provision of care, transferring decision-making to the local level. In contrast, within the health sector, public health decisions have remained highly centralized in national, state, or provincial ministries of health, either because public health has not been part of reform efforts or because capacity has not been developed at the local level. At the same time, a process of government decentralization has taken place, giving more decision-making power to municipal governments. These local governments are increasingly addressing health issues beyond traditional basic sanitation activities, to include behavior change or “healthy lifestyles” within a larger social framework. Several of these activities need technical support, as investments without appropriate returns may occur. Thus, it is imperative to build local public health capacity and to bring to the table evidence of the public health impact of various strategies, by participating in the design, monitoring, and evaluation of these initiatives [34].

The integration of public health with local government initiatives calls for an active participation of the

population to which these initiatives are directed. Methodologies to learn and understand their views, perceptions, and needs, if incorporated into program design and evaluation, are likely to improve the possibility of successful outcomes.

### Shift toward responsive health services

Traditionally, interventions have been aimed at health-care delivery, at management, or at individual health professionals, such as physicians and nurses. To address chronic noncommunicable diseases, emphasis must be placed on demand, enabling patients to make informed decisions. It is the system behavior that makes the difference and not partial interventions. Based on this premise, a model for the care of chronic conditions aimed at improving outcomes includes five dimensions: clinical information systems, decision support, delivery system design, self-management support, and the use of community resources [35, 36]. Further evaluation is necessary to ensure the applicability of this strategy to developing countries, particularly in low-resource areas. The discussion of the development of a chronic care model clearly acknowledges that the policy and financial context must be conducive to change. In a study conducted by PAHO on Essential Public Health Functions, the area of quality assurance and population-based health services scored the lowest among 11 functions evaluated [37]. There is a lack of definition of standards and evaluation to improve quality, and incipient development of health technology assessment.

### Conclusions

A public health response to the prevention and control of chronic noncommunicable diseases requires the following:

- » The problem is addressed from a broad but cohesive systems perspective, based on epidemiologic evidence, and at the same time takes into account the social context and international environment;
- » Actions, whether to promote policy changes or to develop community-based programs or individual health service interventions, are evaluated in order to ascertain their population effectiveness;
- » Financing and a supportive infrastructure are present to assure sustainability and coverage;
- » The needs and perspectives of the population served are considered, so that they can be proactive participants in prevention and control programs.

These principles should guide the implementation of actions at the three levels identified: population-wide policy-making, community involvement, and health-services infrastructure. The three levels are interrelated but occur in different scenarios with different

stakeholders. It appears that approaches that bridge across levels necessarily include the involvement of the community and are generally more successful and efficient. Therefore, it is important that we understand the interactions across these various levels.

Figure 2 presents a graphic interpretation of this framework. The main challenge to the application of such a framework is the lack of institutional capacity in most developing countries. The organization of the public sector has been traditionally tailored to address communicable diseases and to provide direct patient care. There is a limited capacity for intersectoral action, but a large potential in decentralized govern-

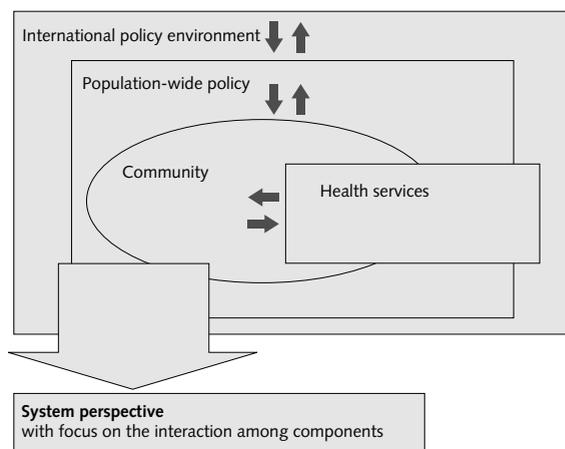


FIG. 2. Framework for a public health approach to the prevention of noncommunicable diseases

ments. The complexity of chronic diseases, their risk factors, and their determinants may require rethinking organizational models that can provide a public health response.

Figure 2 depicts the three levels of action: health services, community, and health policy, as well as the interaction among these levels.\* Population-wide policies have been separated from the international policy environment. The former can be national or subnational in scope, whereas the latter refers to transnational policies that can affect health, such as trade agreements and environmental protection. Application of this framework and the use of appropriate methods will contribute to elucidate the overall system dynamics in various settings.

\* Most research and interventions in public health occur within each of the different components of the system or levels of action: health services, community, and health policy. However, to understand the system as a whole, the points of interaction should be better understood, for example, the points of interaction for people with chronic conditions, which require a strong link between health services and the community, as well as outreach strategies for screening and counseling. Further development of the system would look at the mechanisms for the community to fully participate in policy-building processes and policy implementation. We have separated population-wide policy, which may be national or subnational in scope, from the international policy environment, which refers not only to health policy but more broadly to policies that affect health, such as trade and environmental protection. Methodologies for health impact assessment can make an important contribution to the understanding of these associations. Further development of this analytical framework and the application of appropriate methods will help clarify the overall system dynamics.

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# Food and agriculture policy: Issues related to prevention of noncommunicable diseases

Rachel Nugent

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## Abstract

*Good nutrition depends on access to a healthful food supply. Although a great deal of attention has been paid to food intake as a determinant of nutrition and overall health, little attention has been paid to the food supply system, health risks embedded in it, and its effect on people's choices. Most national governments intervene in their agricultural sectors in order to provide benefits to producers and consumers; however, these interventions are not designed with public health in mind. Governments should consider population nutrition and chronic disease risk when devising and implementing agricultural and food policies. They should seek opportunities to adjust agricultural and trade policies to be consistent with national health and nutritional priorities and guidelines. Although the paper gives several examples, country-specific policy changes can be determined only through analysis of individual country policies and nutrition conditions.*

**Key words:** Agriculture policy, food consumption, noncommunicable diseases, nutritious food supply

## Introduction

Nutritionists and public health experts have worked for years to inform the public about the relationship between the food we eat and our health. The topic of

food and health is a favorite of family magazines, health sections of newspapers, and even television doctors. Many governments, private associations, and consumer and producer organizations have issued advice and models to follow for healthy eating and drinking. Examples are the US Department of Agriculture dietary guidelines and food pyramid and the World Cancer Research Fund Guidelines. Through these efforts, a greater awareness and understanding of energy balance, micronutrients, nutrition-related diseases, and healthy diets has been achieved among the public, and new information is emerging all the time.

However, despite the sound professional advice of the experts and the voluminous information available to consumers about dietary health, trends in overweight and obesity prevalence across the Americas Region and worldwide worsen along with the incidence of diabetes, heart disease, stroke, and other nutrition-related non-communicable diseases [1]. Consumer knowledge of obesity issues and causes is not uniformly good across countries and populations in the Americas [2]. The problem is growing, and experts acknowledge that new solutions are needed [3, 4].

Although a great deal of attention has been paid to food intake as a determinant of nutrition and overall health, little attention has been paid to the food supply system, health risks embedded in it, and its effect on people's choices [5, 6]. Specifically, the vigorous discussions ongoing in the public health and nutrition communities over the global epidemic of overweight and obesity, particularly as risk factors for chronic diseases, have been focused on the end-users of the products and how to influence them, and have neglected the developers of the products and how to influence them. There is no doubt that understanding demand as a driving force of nutrition-related diseases is paramount in finding ways to reduce the problem, but an important piece of the puzzle is missing and should be inserted into the search for solutions. This piece is the food supply, and specifically: How can agricultural policies be directed toward making a healthful food supply available to a country's citizens?

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This paper argues for public health and agricultural policy experts to work together to find additional ways to improve the food choices available to people. It will highlight some aspects of agricultural policy that affect people's diets and, consequently, their risk of developing certain noncommunicable diseases. It will focus on a few agricultural and trade policies and how those policies could be adjusted to promote healthy diets. It will not draw conclusions about what is good or bad food, or good or bad agricultural and trade policy.

Many of the countries of the Americas are major agricultural exporters, but almost all are importers of food as well, so national governments are limited in their ability to control what is available to consumers. In addition, domestic farmers do not determine what appears on the grocery shelves. More than any other region in the world, consumers in the Americas purchase a high proportion of their food from stores and supermarkets rather than directly from producers. For Latin America this proportion is estimated at about 60%; in the Caribbean it averages about 30%; and in the United States it is about 80% [7]. Further, food distribution and marketing channels have become increasingly concentrated and provide a fairly common food-shopping experience to consumers across the region [8]. Still, even with these limitations, agroecological, geographic, and cultural conditions vary widely within the Americas, and a wide variety of dietary patterns is experienced. Policy can be used to alter those patterns in ways that reduce the risks of obesity and noncommunicable diseases but that are sensitive to regional differences.

## Holistic approaches to nutrition

Countries face multiple policy objectives within their agricultural sectors: to provide a decent livelihood for farmers, keep food prices low for consumers, raise revenue from export duties, earn foreign reserves in order to import other products, etc. Sometimes these objectives conflict with the goal of a healthful food supply and a healthy population. For instance, sugar producers may benefit from government subsidies for water and electricity, making sugar cheaper and increasing its use in manufactured products. Simultaneously, governments are seeking ways to reduce the sugar content in some manufactured foods. Such conflicts present opportunities for policy adjustments to improve the food supply.

The stakes are high. In addition to the clear connection between health and a high quality of life, there is increasing evidence that good health contributes to a growing economy [9, 10]. A healthy individual is more productive, is more educable, saves and invests more, and has a longer working life than a malnourished and

sick person [11]. In addition, healthy individuals miss work less often, incur lower medical expenses, rely less on others for support and assistance, spend less time engaged in health-seeking behavior, and create fewer health risks for others.

Aggregated to a national level, the economic impacts of poor health can be enormous. Obesity is estimated to cost the US economy \$117 billion annually in direct costs alone [12]. Economic analyses have not yet been done to estimate the costs of all nutrition-related diseases, but 6 of the top 10 risk factors for attributable disease burdens globally are related to nutrition or physical activity [13]. Measured only by lost years of productive life, these diseases together constitute a major hindrance to economic development.

Policies from the health, agricultural, and environmental sectors all affect nutrition directly, while other sectors (education, urban design, etc.) influence nutrition status indirectly [14–16]. Agricultural-sector policies have a large impact on a population's nutrition by determining what foods are produced in a country and by influencing agricultural imports and exports. Although agriculture ministries are sometimes deeply involved in the development of nutrition plans and guidelines, the primary activities of ministries relate more to maintaining production and income in the agricultural sector rather than a specific focus on the population's nutrition status.

A healthful food supply could be defined as one that provides accessible and affordable food choices that create the proper incentives for people to select a healthy diet. Along with consumer demand as influenced by culture, tradition, and tastes, many factors affect the accessibility and affordability of certain foods. Foremost are what a nation can produce from available resources and know-how and what it trades with other countries. In figure 1, the bidirectional relationship between food supply and demand shows that both producer and consumer choices are important determinants of diet. Diet is one factor in determining an individual's risk of developing a noncommunicable

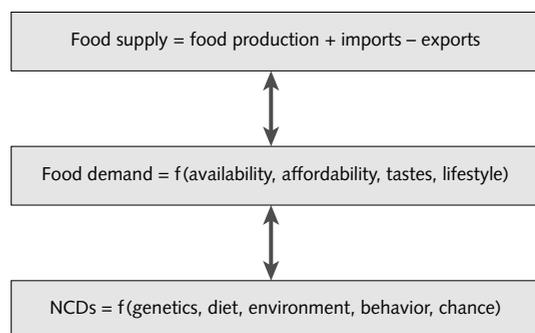


FIG. 1. Relationship between food supply and NCDs

disease, and it interacts with genetic and other factors [17]. The figure shows that attempting to reduce obesity and nutrition-related noncommunicable diseases while ignoring the influence of food supply reduces the options for dealing with the problem.

## Components of a healthful food supply

Much has been written about healthy diets and their role in preventing chronic diseases such as diabetes, cardiovascular disease, and hypertension [18, 19]. Although questions remain about the role of specific dietary risk factors, disease etiology, and other issues relating diet to noncommunicable diseases [20], some dietary recommendations can be made with confidence. Clear messages encourage consumers to choose a variety of foods, maintain low to moderate intakes of fats, sugars, salt, and alcohol, and get adequate nutrients and fiber, especially from fresh fruits and vegetables and whole grains [21].

The debates arise over the recommended sources and amounts of particular nutrients, especially those in animal products. They also arise over the nutritional needs of particular population groups and how to best deliver them. Finally, they arise over issues of behavior change and maintenance [20, 22]. This paper avoids those debates by addressing food supplies at a national level, recognizing that food intake on an individual basis can vary widely within a given country, and that not only genetic and environmental factors, but also the social, cultural, and economic conditions in each country, must ultimately determine the proper mix of food for its population. Thus, the production and consumption patterns and disease risks in each country and region should be carefully examined to identify opportunities for beneficial policy change. This paper attempts only to point in the direction of such analysis, which must be undertaken by a combination of nutrition and agricultural policy experts in each country, perhaps working with the United Nations Food and Agriculture Organization.

Policies that support a healthful food supply and potentially reduce the risk of noncommunicable diseases would therefore have the following characteristics:

- » Abundant fresh fruits and vegetables available for all income levels
- » Support of infrastructure for distribution of perishables to hard-to-reach populations
- » Choices of low-fat meat and dairy products
- » Reduction or elimination of subsidies for sugar, dairy, and meat products that promote consumption above levels that meet nutritional objectives
- » Support for smallholders producing for local markets at levels equal to or greater than those for large

producers

- » No export incentives on products in inadequate supply for the nutritional needs of domestic markets
- » Promotion of technology choices that result in more healthful processed foods, for example, less hydrogenation of oils
- » Support for research on appropriate biotechnology, including local varieties and plant protection, to serve domestic market nutrition needs

The above guidelines—and others could be added for specific health and agriculture conditions in countries—could be used as criteria in judging how well a country's agricultural policies are providing a food supply that reduces the risk of noncommunicable diseases. They will be illustrated by some examples of actual policies in the next section.

Two qualifications to the main point are important. First, reducing undernutrition is still of paramount importance in many developing countries. Dietary intake depends on what is available and affordable to people. There are many people (globally 842 million) who still do not obtain adequate quantities of nutritious food, largely because of poverty and conflict [23]. Some government programs aim to improve food security for these undernourished populations and play a critical role in antipoverty and development goals. These programs should be maintained but might be altered to achieve a better mix of foods for the beneficiaries (e.g., the US Department of Agriculture WIC program.)

Second, a factor limiting access to a healthy diet for all or part of a country's population is lack of food diversity. Although diversity has increased significantly in all regions of the world [24], climate and geography still present formidable obstacles to dietary choice, especially for those in rural areas. Most countries have large urban–rural differences in the availability of food, especially of fresh foods, and in the diversity of food supplies. Rural dwellers are more reliant on subsistence and locally produced foods, which may not provide a balanced diet. Food-distribution systems may be spotty because of inadequate infrastructure that limits refrigeration, slows transportation, and otherwise increases the costs of distribution to rural areas, thereby limiting food availability. Urban dwellers encounter far more choice of food varieties but still face obstacles of access (if they live in poor, underserved areas of cities or informal settlements) and affordability.

Some of these problems could be ameliorated by government policies, particularly those targeted to sustainable rural development and improvement of urban and periurban agriculture [25]. Nonetheless, most of the urban–rural differences in access to food cannot easily be resolved and are closely related to the still high rates of rural poverty, especially among those who depend on agriculture for their livelihoods.

## Trends in food consumption and trade

The past 20 years have shown a generally improving nutritional situation in the Americas, combined with a more trade-oriented and homogeneous food supply across the region [26]. The improvement is reflected in lower proportions and numbers of undernourished people. However, that public health problem is quickly giving way to greater risks of obesity and nutrition-related noncommunicable diseases in the region [27–29].

This section identifies recent trends determining the availability of the food commodities of most importance for noncommunicable disease risks in the Americas. These include livestock and dairy products, as well as oil and oil products, sugar and sugared products, fruits and vegetables, and the major inputs to production of those commodities. Most of the trends suggest increasing risks of overweight and nutrition-related noncommunicable diseases within the region.

As in other developing-country regions, consumption of livestock and dairy products has risen dramatically in Latin America and the Caribbean and will continue to outpace production growth [26]. Coarse grain production has increased by 20% in the past 10 years in Latin America and the Caribbean, and three-quarters of the increase is destined for animal feed use. Across the Americas, growth in grain production supports recent increases in chicken exports and continued growth in domestic chicken demand [30].

Oil and fat consumption since 1995 has risen at a fast pace in Latin America and Mexico and a slower pace in the United States and Canada due to saturation of those markets. In Latin America, the average per capita consumption of fats and oils (20 kg in some countries) is higher than that in other developing-country regions (11.3 kg overall) but is still lower than the developed-country average of 29 kg.\* Consumption of fish and fruits and vegetables has declined or grown very little in the past 20 years in much of the Americas Region, at least in part because of relative price increases for those foods [31, 32].\*\*

Government policies that alter relative food prices can have a powerful effect on consumers' choices of healthful foods. Studies support the connection between food prices and food choices, even in a high-income environment such as the United States [33]. The trend in prices of food commodities to consumers has not been in the right direction. US

data illustrate relative increases in the prices of fruits, vegetables, and fish and relative decreases in the prices of sugared products, oils and fats, and carbonated soft drinks between 1985 and 2000, as compared with the average of consumer prices over the same period [34]. The price of fresh fruits and vegetables jumped 188% between 1985 and 2000, the price of fish increased 77% in the same period, but fats and oils became only 35% more expensive and carbonated soft drinks only 20% more expensive. As would be expected, increases in the consumption of fats and oils and high-fructose corn syrup (in beverages) have easily outpaced increases in the consumption of fresh fruits and vegetables and fish [34].

The Americas Region is a net agricultural exporter, using earnings from exports to finance food and other imports. The United States and Canada are globally dominant cereal and livestock exporters. Agricultural trade surpluses are common throughout the region, notable exceptions being the Caribbean Subregion, which has been a net agricultural importer since the early 1990s, and Mexico [35].

The overall agricultural trade balance of the Latin America and the Caribbean Region has largely reflected that of its major net exporters, Argentina and Brazil, where large surpluses have tended to increase further during the past decade. Argentina and Brazil together account for about half of the region's total agricultural exports but less than one-quarter of its total imports. Cereals are the main imported commodity and are used largely to feed livestock. Dominant exports from the region are coffee, sugar products, bananas, and soy cake. Beef and veal exports have declined, despite the increases in cereals used as feed, reflecting a growing regional demand for livestock products. Raw sugar exports have declined as well, offset slightly by an increase in refined sugar exports, but also reflecting increased domestic sugar consumption [35].

In sum, the Americas are export-oriented in agriculture but also include many countries that are large importers of food. This is because many countries of the region export primary agricultural products and import niche and processed foods. Regional trends show increases in consumption of livestock and sugared products, and stagnant consumption of fish and of fruits and vegetables. These patterns are consistent with the comparative advantage and competitiveness of the farm sectors, but they may also contribute to less healthy eating patterns without commensurate benefits to other segments of society.

\* Consumption figures reported from FAO data are derived from food availability data rather than directly from household surveys of consumption.

\*\* Drewnowski A. Food price trends and relationship to obesity trends. Presented at Partnership for Healthy People Conference on Economics of Obesity, Washington, DC, April 14, 2003.

## Policies affecting the food supply in the Americas

Since the 1970s, both trade and domestic agricultural

policies in Latin America and the Caribbean have been strongly affected by market liberalization promoted by World Bank and International Monetary Fund structural adjustment, by NAFTA, and by World Trade Organization negotiations. But agricultural markets are still far from completely free, and nutritional needs may be one reason to avoid moving completely in that direction. Numerous types of agricultural and trade policies are acceptable under World Trade Organization rules, and developing countries have far lower rates of protection for their agricultural sectors than developed countries. This leaves room for certain policies that benefit nutritional needs while still complying with international trade agreements [36]. According to the US Department of Agriculture, "Because of the size and complexity of the US food system, an almost infinite combination of foods, production methods, end uses, and trade adjustments could work together to move diets toward recommended balance" [37]. This conclusion applies to all countries of the region except those most limited in production opportunities.

Numerous policies affect the types and volumes of agricultural production and trade that together determine what food is available to their populations. These range from subsidies to agricultural inputs to support for research and development of specific products to assistance to poor consumers for purchases of certain kinds of food. Most policies are intended to affect the price of a commodity to producers or consumers or both, or to affect a producer's income. This section mentions just a few examples of agricultural policies affecting food supply in countries of the Americas.

### Input policies

Governments frequently support their agricultural sectors by providing necessary inputs at low or no cost. Assuming a relatively competitive agricultural sector, these policies result in greater than normal quantities or lower than normal prices for the affected products. Inputs commonly subsidized are chemical fertilizers and pesticides and water, often through the provision of irrigation systems. The beneficiaries of these subsidized inputs tend to be large-scale farmers producing cereals and grains and fresh fruits and vegetables for export, rather than small producers of fruits and vegetables for local markets [36]. An example of this type of industry support was shown in the orange markets in Latin America between the early 1980s and the 1990s, particularly in Brazil and Mexico. Support was provided through subsidies for processing and storage infrastructure as well as credit availability that helped produce a higher-quality and stable supply of food for export [38]. This also may have had the effect of increasing the price of fruits and vegetables in the domestic market.

However, if domestically consumed fruits and veg-

etables were supported in this manner, those crops would become cheaper and more abundant and could improve nutrition. The most important policy measures are agronomic improvements, marketing assistance, scientific research in areas of pest control, agronomy, and post-harvest processing. All are needed for some of the healthful fruits and vegetables to be more price competitive and meet consumer demands [21, 30].

Agricultural-sector policy also affects the cost structure of the food-supply system through regulations of such matters as food safety, marketing rules and assistance, and financial and technical assistance, such as low-cost credit, infrastructure provision, and research and agricultural extension services. These approaches affect producers by increasing or lowering the costs of specific activities, thereby providing incentives or disincentives for certain kinds of production.

Subsidies for irrigation systems and fertilizers result in lower prices of cereals and grains, thus benefiting livestock producers, manufacturers of packaged foods, and other heavy users of water and chemical inputs, such as sugar producers. In the United States, sugar producers are supported by a combination of import limitations, price support, and irrigation subsidies. These input incentives can have a dramatic effect on farmers' choices about production, and thus what is available and affordable to consumers. According to the US Department of Agriculture, "Production is highly concentrated... [With a reduced demand for sugar] producers in these regions would likely shift production to fruits and vegetables or field crops" [37].

### Production policies

Direct price support for production of certain commodities or income support to certain farmers is also used to increase output. For instance, beef production in some African countries and in China is rising at a faster rate in recent years due to direct support policies. Because of the insufficiency of protein and fat in the diets of most Africans, this could be considered a nutrition-positive policy, especially if the support is geared toward making meat more affordable to consumers. On the other hand, increases in beef output in the United States and Canada are headed for the export market, including growing quantities to Mexico and the Caribbean [31]. The increased intake of animal protein and fat exceeds the nutritional needs of all but the region's poorest consumers.

Dairy production has grown substantially in the Latin America and the Caribbean Region over the past decade (34%), fueled by increased demand from both domestic and international markets [30]. Limits on subsidized US production have kept milk production stable in the United States, but consumer preferences have shifted from milk to higher-fat products such as

cheese. Current policies subsidize US exports of certain dairy products, including cheese and butterfat [31]. As with beef, nutritional benefits only occur in the dairy-importing countries if the products are purchased by consumers who do not already have diets excessive in animal fat.

### Trade

Trade in food and agricultural products has increased steadily over the past 20 years, and the countries of Latin America and the Caribbean trade more agricultural commodities on a per capita basis than any other developing region [35]. As a result, they are heavily dependent on export earnings from agricultural trade for macroeconomic purposes. Thus, the macroeconomic goals of engaging in agricultural trade can easily override other goals. These objectives may or may not be consistent with nutritional needs. Exporting products that are needed to meet domestic nutritional needs increases the prices of those products and reduces the amounts available to domestic populations.

An example of macroeconomic priorities driving a country's agricultural choices is shown in Chile's emergence in the 1970s as one of the world's leading exporters of off-season temperate fruits. A good climate and public-sector investment in centralized processing infrastructure combined to position Chile as a highly efficient producer of fruit at a time when global demand was rising. Production policies favoring large plantation agriculture supported the sector's development as a means of earning foreign exchange rather than providing more fruit for domestic consumption. Between the mid-1970s and the mid-1990s, almost all of the increased fruit production was exported, as domestic utilization remained flat [38]. Whether this policy was detrimental to the nutritional needs of Chile's population depends, of course, on whether the export drive reduced the adequacy of domestic consumption of fruit.

Trade policies are often used to refine the agricultural mix available within a country for a variety of purposes, including meeting consumer demands and earning revenue. From a nutritional point of view, the desired outcome is increased consumption of "healthier" foods and decreased consumption of "less healthy" foods, relative to some measure of adequacy of both. However, governments sometimes apply such policies to less healthful foods either to meet consumer demand or to support an existing production sector. This approach is used in a number of countries to ensure adequate supplies of oils in the face of rising demand. The wide variation in fat that occurs in different types of oil opens the door to policies that might encourage more "healthful" oils. For example, coconut oil is 86% fat, while flaxseed oil is 4% fat [32].

World production of oils and fats continues to

increase, with developing countries accounting for a growing share of the output (64% in 2000.) These increases are a result of increases in demand and market liberalization, as well as policies to increase investment in oil production through technical and financial support to the sector. The greatest increases globally are in palm and palm kernel oil, which are very high in saturated fats. Production in the Americas is concentrated in vegetable oils, which pose a lower health risk. Production of oil crops in Argentina and Brazil grew by 30% in the past 10 years [30].

Some of the oil-importing countries of the Latin America and the Caribbean Region have removed import tariffs or reduced nontariff barriers in order to respond to growing demand and reduce price increases. Oil exporters in the Americas (United States, Canada, Brazil, and Argentina) have also increased production and exports, in some cases by providing incentives for export [26].

### Programmatic and policy solutions

These are but a few of the examples of the specific policies that determine what food appears in markets of the Americas. As countries work to achieve a holistic approach to long-term population health, consideration of specific deficiencies in their food systems that can be corrected through modifications in agricultural and trade policies is an important endeavor. Such deficiencies might be related to overall supply problems for certain foods, to distribution issues that prevent access for some portions of their population, or to farm-level choices about the production process that affect the healthiness of foods. There will be multiple options for addressing these deficiencies, and the best policies from an efficiency perspective are those that minimize distortions of resource allocations and dislocation of existing production and trade systems. However, ultimately policies should be measured against the multiple objectives of all sectors of society, with priority placed on providing a sufficient, safe, nutritious, sustainable, and equitable food supply [39].

Other useful actions are for dietary guidelines to take into account cultural, social, agroecological, and economic realities; gathering of additional food-supply and food-composition information, especially where it is lacking in developing countries; and alternative ways to improve food supplies, such as fresh food grown in urban and periurban areas.

Development of food-based nutrition policies is one of many ways in which governments and communities may address growing obesity- and nutrition-related noncommunicable disease problems. However, this approach can only go so far toward encouraging more healthful agricultural supply for a country's population. The following factors limit the scope of agricultural policies to effect nutritional change:

- » It is difficult to target the needs of specific populations, especially in countries with a dual malnutrition situation where undernutrition and overnutrition coexist
- » World Trade Organization rules generally prohibit restrictions on the trade of food products except in public health emergencies
- » Many food products are closely related substitutes and complements in production and consumption, and restrictions on one will lead to changes in the production and consumption of others
- » The public and policy makers have time horizons that discount the long wait before the onset of chronic diseases

Agricultural policy is difficult to change because of the political and economic importance of the sector in most countries [40]. Global trade talks begun in 2000 to address agriculture have been arduous and unpromising [41]. Assuredly, serious change in existing policy regimes will take a long time. Difficulties arise because the beneficiaries of existing policies

fight change and are often in a position to influence political decisions. Those who would benefit from a change toward a healthier food system—current and future consumers—may be less aware of the existence and effects of policies that affect their health than are the producers that benefit from them, especially when the health impacts are likely to occur in the future. Finally, there are real costs to changing policies in the agricultural and trade sectors. These include the costs of altering production processes, supply sources, and formulas, as well as potential loss of export earnings. These costs must be weighed against the uncertain and future benefits of changing existing policies—a difficult tradeoff. Nonetheless, unhealthy diets do impose substantial real costs in the form of ill health and an overburdened health sector. Successful advocacy for change will involve finding the win-win possibilities for change and precisely identifying the benefits of change, including the avoided costs of increased nutrition-related noncommunicable diseases.

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# Book reviews

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**Annual Review of Nutrition. Volume 23.** Edited by Donald B. McCormack; associate editors, Dennis M. Bier and Robert J. Cousins. Annual Reviews, Palo Alto, Calif., USA, 2003. (ISBN 0-8243-2823-X; ISSN 0199-9885) 443 pages, hardcover. US\$160.

This is the 23rd volume of *Annual Reviews of Nutrition*. Like its predecessors, it consists of carefully selected reviewers and their reviews of areas of current controversy or significant advances. This one presents 18 chapters on a wide variety of topics. Those concerning selenoprotein synthesis, iron status and neural function, vitamin D and its analogues, dietary iron absorption, reducing food-borne illness, and endocrine control of body weight and bone mass will be of particular value to nutrition and food scientists working in developing countries. Readers may wish to refer to previous volumes for topics of equal interest and value. The *Food and Nutrition Bulletin* will make annual note of the publication and contents of this useful volume.

**Antioxidant vitamins and health: Cardiovascular disease, cancer, cataracts, and aging.** Claude Fernand Bourgeois. HNB Publishing, New York, 2003. (ISBN 0-9664286-6-8) 310 pages, hardcover. US\$72.

Ten chapters of this book review studies published in the international scientific literature on the role of antioxidant nutrients in chronic degenerative diseases and conditions, including cardiovascular disease, cancer, cataracts, and aging. It begins with a discussion of free radicals and the reactive oxygen species generated in vivo and goes on to describe the mechanism of antioxidation and antioxidant defense in humans. It reviews and discusses epidemiological studies carried out over the past two decades associating antioxidant vitamins and cardiovascular disease, cancer, cataracts, and aging. A final chapter presents conclusions on each of these topics. These conclusions are evidence-based and carefully guarded. Three appendices give recommended dietary allowances of antioxidation vitamins,

the structure and properties of antioxidant vitamins and lipid peroxidation, and the autoxidation chain reaction. The 1,093 references are compiled in a final chapter.

**Halal food production.** Mian N. Riaz and Muhammad M. Chaudry. CRC Press, Boca Raton, Fla., USA, 2003. (ISBN 1-58716-029-3) 379 pages, hardcover. US\$149.95.

Halal foods are those permitted or lawful for Muslims. The book is not written to guide or inform the Muslim consumer but to provide the information that the food industry needs to produce food products that meet their needs at both the national and the international levels. It provides information about Halal food laws and regulations, general guidelines for Halal food production, trade, and import requirements in different countries. It also covers specific Halal production requirements for meat, poultry, dairy products, fish, seafood, cereal, and confectionery and the role of gelatin, enzymes, alcohol, and food supplements. Guidelines for labeling, packaging, and coatings are also presented.

This book distinguishes among Halal, kosher, and vegetarian food production. Procedures are included to help food companies obtain Halal certifications. Considered also are biotechnology and genetically modified organisms within the context of Halal regulations. Its chapters provide specific and practical guidelines in the first 183 pages. These are followed by an equal number of pages devoted to 14 appendices that give relevant excerpts from the Food and Agriculture Organization/World Health Organization Codex Alimentarius, Halal industrial production standards, export requirements for various countries, recommended ritual slaughter guidelines, and acceptable ingredients. They describe related food laws for Malaysia and Singapore as well as the US states of New Jersey, Illinois, Minnesota, California, and Michigan.

In view of the growing markets for Halal foods

worldwide in both Western and Islamic countries, this information on food service, branded packaged foods, direct-marketed products, and food ingredients is timely. Nutrition and food scientists in both academia

and industry need the convenient access to it provided by this book.

—*Nevin S. Scrimshaw*

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## Micronutrient activities and research report

For more information on this report, contact Wilma B. Freire (freirewi@paho.org), Unit Chief, Nutrition Unit, or Sunny S. Kim (kimsunny@paho.org), Technical Officer, Nutrition Unit, at the Pan American Health Organization/World Health Organization (PAHO/WHO), Nutrition Unit, FCH/NU, Pan American Health Organization, 525 23rd St., NW, Washington, DC 20037, USA.

### 1. Activities related to iron, folic acid, and zinc

#### 1.1. Guidelines on iron compounds for food fortification

In the Americas, wheat and/or corn flour are commonly consumed staples and excellent vehicles for fortification with iron, folic acid, other B vitamins, and nutrients. About 22 countries are already fortifying wheat and/or corn flour with at least iron and other micronutrients. Still, there is much room for optimizing these fortified foods and reinforcing the programs, and the growing scientific evidence and lessons learned from country experiences are providing the know-how to achieve this. Despite the ongoing fortification of flour with iron, little contribution has been made to the reduction of iron-deficiency anemia in the population, and variations in terms of enforcement of regulations, types and levels of the fortificant, manufacturing techniques and standards, and quality control and assurance, as well as other components of the program, have been identified. One essential component of the process that needs to be addressed involves the type and amount of iron compounds used in food fortification. Factors to be considered in the selection of iron compounds, in terms of bioavailability, organoleptic characteristics, technological compatibility, and costs, need to be specified. Criteria to define the levels for iron fortification and discussion of the feasibility of change to current fortification programs also need to be addressed. To this end, a technical consultation sponsored by the Pan American Health Organization (PAHO), the International Life Sciences Institute (ILSI), the US Agency for

International Development (USAID), and the International Vitamin A Consultative Group (IVACG) was held in 2001, in order to develop practical guidelines for the countries of the Americas on the type and level of iron compounds for food fortification based on state-of-the-art information (Nutr Rev 2002 Jul; 60(7 Pt 2):S50–61; PAHO/ILSI/USAID/IVACG, 2002).

#### 1.2. Guidelines on recommended levels of folic acid and vitamin B<sub>12</sub> fortification

The evidence linking folate insufficiency with the occurrence of neural tube defects and the protective effect of increased folic acid intake in the prevention of neural tube defects have lent support to the recommendation of the US Institute of Medicine in the National Academy of Sciences that all women of childbearing age should consume 0.4 mg (400 µg) of folic acid daily. However, achieving this recommended level through consumption of naturally occurring folates in foods is very difficult because of their low bioavailability. Providing folic acid supplementation to the entire at-risk population is also a major logistical challenge, even in developed countries. For these reasons, fortification of food with folic acid is important for reaching a large number of the target population to increase their folate levels.

At present, of the 22 countries in the Americas that are currently fortifying wheat flour with iron, 17 are also adding folic acid at levels that vary between 1.5 and 3.4 mg per kilogram of flour. Food fortification with folic acid has been considered as a favorable intervention because of the technological compatibility in adding folic acid to the premix for food fortification; folic acid has not been shown to cause sensory changes in the final products, and the cost of adding folic acid to foods does not significantly increase the cost of the final products. Nevertheless, folic acid fortification should be promoted in countries that are currently not fortifying with folic acid, and the current level(s) of fortification should be reviewed, taking into consideration the nutritional requirement, the consumption level of the food vehicle, cost, and safety.

In addition to folate, vitamin B<sub>12</sub> has received much attention for its association with pernicious anemia and blood levels of homocysteine, which is a risk factor for heart disease and stroke when elevated. Vitamin B<sub>12</sub> deficiency can occur in individuals with dietary patterns that exclude animal or fortified foods and in adults 50 years of age and older who are unable to absorb vitamin B<sub>12</sub> in food. Given that the diet in Latin America and the Caribbean is generally based on corn, rice, wheat, beans, and potatoes, with relatively low intakes of foods of animal origin, vitamin B<sub>12</sub> deficiency is a major concern. Furthermore, there are concerns about the delay in the diagnosis of hematological and neurological impairments from vitamin B<sub>12</sub> deficiency and possible acceleration of neurological manifestations of vitamin B<sub>12</sub> deficiency in the presence of high levels of folate. Thus, vitamin B<sub>12</sub> should also be considered when fortifying with folic acid. In light of these considerations, PAHO, the March of Dimes Birth Defects Foundation (MOD), and the Centers for Disease Control and Prevention (CDC) organized a technical consultation in January 2003, on "Recommended levels of folic acid and vitamin B<sub>12</sub> fortification" (Nutr Rev 2004, in press).

### **1.3. Reviewing regional progress on flour fortification with iron, folic acid, and vitamin B<sub>12</sub>**

With the results of the previous two activities, a regional meeting was held as the next step in the process of translating current scientific and programmatic knowledge into practice, transferring the knowledge on optimizing flour fortification into the hands of policy makers and program implementers in the Americas. In October 2003, PAHO jointly sponsored a regional meeting in Santiago, Chile, with CDC, MOD, and UNICEF, hosted by the Institute of Nutrition and Food Technology, University of Chile (INTA). The meeting was specifically held in Chile, where local counterparts shared the impressive results of a recent impact evaluation of the national wheat flour fortification program with folic acid, through the support of PAHO, CDC, MOD, INTA, and the Chilean Ministry of Health (J Nutr 2003; 133(10):3166–9). Representatives of the Ministry of Health, regulatory entities, and the flour industry from 20 countries throughout the Americas actively participated in the meeting. The objectives of the two-day regional meeting were to:

- » Review the nutritional status in terms of iron, folate, and vitamin B<sub>12</sub> deficiencies in the Americas and the situation of flour fortification with iron, folic acid, and vitamin B<sub>12</sub>;
- » Review and discuss the experiences and lessons learned from national wheat flour fortification programs;
- » Review the conclusions and recommendations of the technical consultations on "Iron compounds for

food fortification" (PAHO/ILSI/USAID/INACG) and "Recommended levels of folic acid and vitamin B<sub>12</sub> fortification" (PAHO/MOD/CDC);

- » Discuss and identify programmatic solutions to optimize flour fortification in the Americas.

### **1.4. Advancing the regional agenda country-by-country**

Based on the results of the regional meeting, PAHO is currently developing a country-specific agenda to strengthen national food-fortification programs. PAHO will provide direct technical cooperation to countries to strengthen ongoing micronutrient programs in the areas of:

- » National plans of action
- » Legislation
- » Regulatory monitoring and quality control
- » Household monitoring and surveillance
- » Training and education
- » Communication and social marketing

### **1.5. Regional initiatives and country proposals**

Continuous effort at the regional level to bring food fortification and improvement of the micronutrient situation into the forefront of national agendas will be maintained through the intercountry exchange of experiences and ideas, strategic partnerships with the food industry through the Latin American Association of Industrial Millers (ALIM), alliances with other sectors (economic and finance, agriculture, education, sustainable development, etc.), and communication and advocacy among these various partners. Specific subregional activities to maximize limited resources and advance clusters of countries will also be implemented through careful planning and evaluation of existing resources and needs. Country-specific projects to strengthen national food-fortification programs will be developed and implemented. In 2003, PAHO provided direct technical assistance to Bolivia and the Dominican Republic to strengthen their national fortification alliance and elaborate project proposals requesting assistance from the Global Alliance for Improved Nutrition (GAIN). The Ministries of Health of these two countries and the Office of the First Lady of Bolivia, with the support of PAHO and other partner agencies including UNICEF, USAID, and the World Food Program (WFP), reinvigorated their national micronutrient committees and mobilized various ministries, local industries, consumer associations, universities, institutes, media, other civil societies, and nongovernmental organizations to partner together in coordinating and monitoring food and nutrition programs, including food fortification. In the Central American countries, a subregional micronutrient committee was developed with the support of the Institute for Nutrition of Central America and Panama (INCAP)/PAHO, UNICEF, and the Micronutrient Initiative, and a collective regional

project proposal was prepared and submitted to GAIN. Follow-up to these activities and in other countries will be conducted.

## 2. Experiences or lessons learned

See 1 and 6.

## 3. Partners or organizations

Partners in the aforementioned activities include the Ministries of Health of respective countries, local flour industries, ALIM, and other private enterprises, including DSM Nutritional Products, BASE, Fortitech South America, Granotec Chile, and Instituto Teletón Chile. Partner organizations and agencies include UNICEF, MOST/USAID, ILSI, INACG, MOD, CDC, INTA-Chile, WFP, and GAIN, among others.

## 4. Plans and goals

PAHO is assisting countries to strengthen their national food-fortification programs and consolidate subregional efforts in order to improve the nutritional situation of the populations and contribute to the Millennium Development Goals of reducing child mortality and improving maternal health in the region.

## 5. Assistance needed

In the area of technical cooperation, PAHO will call upon the support of experts and leading agencies and organizations in specific areas of expertise. Financial support for both the regional initiatives and country-based activities is continually being sought.

## 6. List of visual or other materials (in the order of mention above)

- » Iron compounds for food fortification: guidelines for Latin America and the Caribbean 2002. English; Nutr Rev 2002 Jul; 60(7 Pt 2):S50-61; also available at [www.paho.org](http://www.paho.org).
- » Compuestos de hierro para la fortificación de alimentos: guías para América Latina y el Caribe. Spanish; PAHO/ILSI/USAID/INACG, 2002; also available at [www.paho.org](http://www.paho.org).
- » Recommended levels of folic acid and vitamin B<sub>12</sub> Fortification: Conclusions. In press, Nutr Rev 2004.
- » Consumption of folic acid-fortified bread improves folate status in women of reproductive age in Chile. J Nutr 2003 Oct; 133(10):3166-9.
- » Chile Regional Meeting Report. In progress; PAHO/CDC/MOD/INTA, 2004; background information and presentations available at [www.paho.org](http://www.paho.org).

## FAO and IUFOST join forces to establish a global database of food science and technology research projects addressing worldwide food needs

Researchers involved in food science and technology research projects relevant to worldwide food needs, especially those of developing countries, will be invited to contribute brief key details of their projects to a new searchable database developed and operated jointly by the United Nations Food and Agriculture Organization (FAO) and the International Union of Food Science and Technology (IUFOST).

The purposes of this database are to collate information about relevant food research projects, to facilitate information-sharing among food scientists globally, and to provide a resource and contact base especially for developing countries. Access will be at [www.fao.org/INPhO](http://www.fao.org/INPhO).

The initiator of the database project, Professor J. Ralph Blanchfield, stated:

This collaboration between the two main international bodies, FAO and IUFOST, deserves the support of all food scientists and technologists worldwide. IUFOST is asking all its national adhering bodies to request and encourage their members involved in research projects in food science and technology, wherever carried out and applicable to improving food quality and availability, especially for developing countries, to contribute details of their projects to the database. We shall also be asking research institutions to facilitate entries by their staff and aid agencies to contribute details of projects that they support.

For the first time, there will be organized worldwide knowledge of what scientists and technologists have been or are doing in relation to this crucially important subject, where the work is being done, and for which developing countries. The IUFOST Task Force will monitor inputs and conduct searches and will be able to:

- » See where the gaps are and draw attention to them;
- » Put individuals who are unknowingly working on similar projects for different developing countries in touch with each other;
- » Possibly "broker" the application of projects that have been or are being successful to other developing countries where they could also be relevant.

FAO is the main international agency concerned with addressing the serious problems of food insecurity in the world. IUFOST is the United Nations-type international body in which member countries are represented by their national food science and technology societies (termed "adhering bodies"). It has been seeking new ways to give practical effect to the food-security principles embodied in its Budapest Declaration of 1995.

Out of this was born the database concept.

At a practical level, the scheme and database requirements were developed by an IUFOST Task Force led by Professor Blanchfield, and the database was constructed and implemented by the FAO Agriculture and Food Engineering Technologies Service as a module of its INPhO mega-database. For more information, contact J. Meech at [iufost@ca.inter.net](mailto:iufost@ca.inter.net). The IUFOST website is [www.iufost.org](http://www.iufost.org).

**November 15–17, 2004. XXII International Vitamin A Consultative Group (IVACG) Meeting: Vitamin A and the Common Agenda for Micronutrients. Lima, Peru**

*For information contact:* IVACG Secretariat. Tel: 202-659-9024; Fax: 202-659-3617; e-mail: [hni@ilsilsi.org](mailto:hni@ilsilsi.org); Web: <http://ivacg.ilsilsi.org>

**November 18, 2004. 2004 International Nutritional Anemia Consultative Group (INACG) Symposium. Lima, Peru**

*For information contact:* INACG Secretariat. Tel: 202-659-9024; Fax: 202-659-3617; e-mail: [hni@ilsilsi.org](mailto:hni@ilsilsi.org); Web: <http://inacg.ilsilsi.org>.

**November 19, 2004. International Zinc Nutrition Consultative Group (IZiNCG) Symposium: Moving Zinc into the Micronutrient Program Agenda. Lima, Peru**

*For information contact:* IZiNCG Secretariat. Tel: 530-752-1992; Fax: 530-752-3406; e-mail: [izincg@insp.mx](mailto:izincg@insp.mx); Web: <http://izincg.ucdavis.edu>

# Correction to Vol. 25, No. 1 (Supplement 2): International Zinc Nutrition Consultative Group (IZiNCG) Technical Document #1

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The description of the Micronutrient Initiative that appeared in the Acknowledgment section of the IZiNCG supplement (p. S95) should read as follows:

The Micronutrient Initiative (MI) is a not-for-profit organization specializing in addressing vitamin and mineral deficiencies. MI is governed by an international Board of Directors. MI supports and promotes food fortification and supplementation programs in Asia,

Africa, and Latin America and provides technical and operational support in those countries where vitamin and mineral deficiencies are most prevalent. MI carries out its work in partnership with other international agencies, governments, and industry. MI is based in Ottawa, Canada, and maintains regional offices in New Delhi, India, and Johannesburg, South Africa.

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

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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, 3rd ed. Littleton, Mass, USA: Publishing Sciences Group, 1977.

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