Food and nutrition surveillance: an international overview1,2

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ABSTRACT Systems providing routine food and nutrition surveillance (FNS) in local and national populations are essential to the understanding of relations between nutrition and health and the implementation of appropriate actions to promote the well-being of those populations. The purpose of an FNS program is to gather, interpret, and disseminate information about nutrition. Functions of FNS systems include national and regional planning, monitoring and evaluation of food and nutrition programs, provision of timely warnings of food shortages, problem identification, advocacy support, and monitoring food and nutrition effects of structural-adjustment policies. The characteristics of an FNS system are determined by its function. Successful FNS systems are community based and action oriented. We reviewed FNS systems throughout the world, with special emphasis on those in developing countries. Am J Clin Nutr 1997;65(suppl):1198S–202S.

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INTRODUCTION

Adequate nutrition, a prerequisite for good health, depends on many factors that intervene in the relation between food and health. Accurate and relevant information generated from the periodic (routine) and systematic measurement of some of these factors—in conjunction with measures of population nutrition and health status—provides a good foundation for understanding trends in health and nutrition and taking appropriate action to promote the well-being of populations.

In 1992 the International Conference on Nutrition brought together representatives of 159 nations to strengthen the global commitment to nutrition. The delegates pledged to eliminate hunger and reduce all forms of malnutrition in this decade. The Plan of Action for Nutrition, a product of the conference, outlines an operational strategy for resolving malnutrition and promoting health in all the world’s populations. The plan includes nutrition surveillance as an important component of the strategy to achieve this goal and stated the following:

Information on the nature, extent, magnitude and severity of different types of nutritional problems, as well as their causes, resources and how they are changing over time, is essential for the development, implementation, monitoring and evaluation of effective policies and programmes to improve nutrition. Information is also needed to provide early warning of impending nutritional emergencies and for on-going programme management. The basic aim should be to provide relevant and accurate information that can be utilized efficiently. Therefore, information must be timely, relevant to the decision-makers and communicated effectively at the appropriate levels (1).

Some countries have already implemented food and nutrition monitoring systems, with various degrees of complexity and success. This paper, an overview of ongoing food and nutrition surveillance (FNS) activities around the world, discusses the functions of FNS and the design of an FNS system; reviews current FNS activities, with an emphasis on those in developing countries; and suggests ways to strengthen those activities.

OVERVIEW OF FNS

The purpose of an FNS program is to gather, interpret, and disseminate information about nutrition and its determinants periodically to facilitate action-oriented decisions that improve the nutrition of populations. FNS information must be 1) population based, 2) decision and action oriented, 3) sensitive, 4) accurate, 5) relevant, 6) timely, 7) readily accessible, and 8) communicated effectively.

Despite having these common characteristics, FNS systems vary a great deal and involve a broad range of nutrition-related issues, purposes, and contexts. Users of information obtained by FNS include governments, international donors (bilateral and multilateral), nongovernmental organizations, and communities. The data can be applied to problems of overnutrition and undernutrition and help policy and program decision-makers identify the most effective and efficient solutions for a specific area. FNS systems can monitor agricultural activities; dietary intakes of individuals, households, or populations; mortality and morbidity; or related areas such as socioeconomic indicators, demographic changes (including migration), and housing patterns. They can be established at the national, regional, or community level or based at an institution (i.e., they can rely on data from self-selected samples of populations using hospital or clinic-based services). FNS programs can focus on nutrition in all segments of a population or in specific population subgroups, such as women of reproductive age, children < 5 y old,

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or elderly people. The characteristics of an FNS system are determined by its function.

**Functions of FNS systems**

The functions of FNS systems have traditionally included national and regional planning, monitoring and evaluation of food and nutrition programs, and provision of timely warnings of food shortages (2). Recently, however, problem identification and advocacy (3) and monitoring the effects of structural-adjustment policies on food and nutrition have been added to the range of activities of FNS systems (4). An individual FNS system rarely performs all five functions, however; instead, those who will use the information provided by FNS (decision-makers and resource managers) design the system and set priorities for its activities in accordance with identified needs. Arnauld et al (4) described each function of an FNS system; their work is summarized below.

**National and sectoral planning and policy design**

National planning requires constant adjustments to reflect periodic changes in a federal government’s policy goals and objectives, and this process necessitates a multisectoral vision of food and nutrition problems. The role of an FNS system in this situation is to provide continuous analysis, integration, and interpretation of data from multiple sources, ensuring a systematic flow of sectoral information.

Sectoral planning involves development of sectoral policies and programs consistent with the government’s goals and objectives. The FNS system thus supports high-level decision-making through analysis and interpretation of sectoral data.

**Program monitoring and evaluation**

Political and managerial decision-makers are interested in the outcomes and effects of food and nutrition programs implemented at the national, regional, and community levels. Therefore, FNS systems should include an information-management system that routinely collects and analyzes program- and population-based indicators of the success of such programs.

**Timely warning of food shortages**

Timely warning systems can be powerful tools for preventing critical food shortages and suddenly decreased access to basic foods in regions of the world subject to substantial fluctuations in food production resulting from drought, pest infestation, or other agroecologic or external factors. Warming systems routinely analyze multisectoral information (e.g., crop forecasts, market prices, and food stocks) and provide periodic assessments of the risk of central and local shortages. This information must be closely linked with a decision-making process to enable a rapid response; otherwise, the information serves no purpose.

**Problem identification and advocacy**

Advocates include certain groups in the public sector, nongovernmental organizations serving poor or disadvantaged populations, and poor or disadvantaged people themselves. These advocates seek to increase the flow of resources to support food and nutrition activities that will allow them to achieve their goals. FNS information helps advocates set priorities for dealing with problems and serves as evidence to support those advocates’ claims. Policy or program proposals made by the advocates are thereby strengthened and a favorable outcome is more likely.

**Monitoring effects of structural-adjustment policies**

Simply stated, structural-adjustment policies are prescriptions to reduce government regulations and spending to increase government earnings and repayment of international debt. The value of these policies, established during the 1980s, has been debated extensively. As a result, it has become clear that the effects of such policies on food security and the nutritional status of the poor must be examined and monitored carefully so that politicians and administrators can make informed decisions that will strengthen the positive and reduce the negative aspects of such policies. An FNS system used for this purpose should also perform all of the four previously described functions and require continuous analysis and interpretation of multisectoral data.

**Planning an FNS system**

The process of planning an FNS system is integrally linked to its intended function and includes the following stages: 1) assessment of the nature, dimensions, and context of nutrition-related health problems in the country, region, or community; 2) selection of the health problem to be monitored and establishment of the institutional framework for the system; and 3) design of the surveillance system, including the methods for collecting, managing, processing, and analyzing data and disseminating findings. These stages are described below.

**Assessment of nutrition-related health problems**

The nature, dimensions, and context of nutrition-related health problems in a country are best characterized by a holistic definition of problems that is based on established etiologic hypotheses. The use of such a definition will help in specifying the types of information needed for the FNS system (socioeconomic, agricultural, or nutritional), the most appropriate level for monitoring (community, regional, or national), the possible decision points, and the decision-makers who will benefit most from the information (5). Clarification of the decision-making context, including the types and levels of decisions made and the information needed at those levels, is also important.

**Selection of problem and establishment of institutional framework**

The selection of priority areas for action should be based primarily on the prevalence of the problem, its cost to society, and the feasibility of controlling it (6). Data on the direct and indirect costs of diseases have a powerful advocacy value (6) but there is often little information available on the cost of nutrition-related health problems. The extent to which a health problem can be controlled by intervention, given the most cost-effective allocation of resources, is a key factor in establishing priority areas for an action-oriented FNS. Unfortunately, however, this aspect of the problem is also difficult to quantify or demonstrate directly.

Once the food or nutrition problem is selected, the most appropriate institutions for managing and participating in an FNS system can be identified. Institutions with adequate ca-
pacity or at least some relevant skills that could be strengthened should be chosen (5). Selecting the institution with the widest infrastructural network will facilitate organization and management of the system throughout a country (5). It has been shown that decentralized rather than centralized data processing and analysis is more efficient (5).

**Design of the surveillance system**

The purpose of an FNS system will drive decision-making on issues related to data collection (what information to collect and from whom, and how often, where, and with what methods it should be gathered), data processing and analysis, and dissemination of findings. Before the design process is begun, however, existing information systems should be examined to allow optimal use of data that are already available.

Of all the steps involved in designing a surveillance system, indicator selection and conversion of surveillance data into policy information are the most crucial. The choice of indicators depends on the established hypotheses regarding the cause of the health problem being addressed. The indicators can be measures of resources (eg, farming systems or access to services), outcomes (eg, nutritional status, morbidity, or mortality), or factors that link resources to outcomes (eg, food production, food intake, or household expenditures) (2). The indicators should be relevant, sensitive, specific, cost-effective, and appropriate for trends analysis. For action-oriented FNS systems, cut-off points and action-triggering levels must be chosen to determine how extensive the problem being assessed must be before society demands that action be taken. Available resources, cost effectiveness, and political awareness determine those levels (6).

The efficiency with which FNS data are converted into policy information for decision-makers is a principal determinant of the success of an FNS system (6). Data analysis and interpretation require a good understanding of the substantive issues, not just an ability to process data. The FNS system should provide policymakers not only with information but also with policy alternatives and their likely effect on the population, as well as an assessment of the indirect effects of intervention policies and programs (6). Community-based information systems that support local problem identification, analysis, and action are essential for identifying appropriate and sustainable food and nutrition policies and programs.

**REVIEW OF FNS SURVEILLANCE ACTIVITIES**

A wide range of FNS activities are currently under way throughout the world. Below is a brief description of two FNS systems, one in a developed country (United States) and one in a developing country (Thailand). The descriptions are provided to illustrate how country-specific nutrition-related issues, contexts, and purposes influence the design and characteristics of an FNS system.

Limited space precludes our including descriptions of FNS activities in many other countries (Australia, Canada, European nations, Botswana, Kenya, Lesotho, Malawi, Mozambique, Niger, Tanzania, China, Indonesia, The Philippines, Costa Rica, Nicaragua, and Venezuela), as well as a discussion of the international Refugee Nutrition Information System, an FNS program that is organized according to geographic region rather than country. Summaries of the activities of all these programs are available on request from the authors.

**FNS surveillance in developed countries: an illustration from the United States**

The United States has a well-developed, comprehensive FNS system. The National Nutrition Monitoring and Related Research Program (NNMRRP) encompasses >50 surveillance activities that monitor and evaluate the health and nutritional status of the US population (7). In 1988 an interagency committee was formed to coordinate the various NNMRRP activities. This group also prepares a periodically updated directory of federal nutrition-monitoring activities.

The commitment of the US government to nutrition surveillance is strong and continues to grow. In 1990 the US Congress enacted legislation requiring the development of a 10-y comprehensive plan for nutrition-monitoring and related research. The resulting plan, jointly administered by the Department of Health and Human Services (DHHS) and the US Department of Agriculture (USDA), aims to increase knowledge about nutritional status and health in the United States by means of better integration, coordination, and timing of national surveys; standardization of methods for collecting data; research to improve survey methods; and more timely dissemination of information (8).

NNMRRP activities fall into five categories: evaluations of health and nutritional status, measurements of food and nutrient consumption, assessments of dietary knowledge and attitudes, determinations of food supply, and development of food-composition and nutrient databases. All activities include a component that gathers food or nutrition information.

The two principal surveys of food consumption and nutrition in the United States are the Nationwide Food Consumption Surveys (NFCS), conducted by the USDA, and the National Health and Nutrition Examination Survey (NHANES), conducted by the DHHS. In addition, the Hispanic Health and Nutrition Examination Survey was performed in 1982.

The NFCS has been conducted about every 10 y since 1935–1936 (most recently in 1987–1988) to describe food-consumption behavior and assess the nutritional content of diets. The survey samples private households in the continental United States, as well as the members of those households, measuring food used from home food supplies during 1 wk by the entire household, along with food consumed by individuals at home and away from home for 3 consecutive days.

The Continuing Surveys of Food Intakes by Individuals are part of the NFCS. They are conducted between the larger decennial NFCSs to characterize usual diets and detect dietary changes in individuals and groups of individuals over time. The food and nutrient contents and nutritional adequacy of diets are assessed and used to monitor and predict nutritional problems that can result from, for example, changing social and economic conditions.

The first NHANES was implemented in the United States in 1971. The purpose of this survey, now in its third generation, is to collect and disseminate health and nutrition information that can be obtained optimally or only by performing physical examinations, clinical and laboratory tests, and related measurement procedures. The sample includes civilian, noninstitutionalized persons aged 1–74 y.
The national food and nutrition surveys in the United States provide information that serves many objectives: monitoring dietary intake over time, producing reference data, assessing dietary adequacy, addressing regulatory and food-safety concerns, studying diet-health relations, and evaluating marketing applications (9). Growth charts developed by the National Center for Health Statistics from nutrition-monitoring data in the United States (10) have been adopted by the World Health Organization and used extensively throughout the world as references for child growth (11).

FNS surveillance in developing countries: an illustration from Thailand

The concept of nutrition surveillance was first introduced in Thailand in 1977 in the country's first National Food and Nutrition Plan, a component of its fourth National Economic and Social Development Plan (NESDP). However, the practice of nutrition surveillance did not become well established until 1982–1986, when Thailand's fifth NESDP was implemented. Currently, six nutrition surveillance systems operate in the country (P Winichagoon, C Schuftan, unpublished observations, 1992).

The Nutrition Surveillance System of Under-Fives, a community-based system, was started by the Division of Nutrition in the Ministry of Public Health (MOPH/N) in 1982 to gather information useful for planning, targeting appropriate actions, and monitoring nutritional status. Village health communicators and volunteers weigh rural children quarterly (monthly if malnourishment is observed) and send the data to the subdistrict administrative level and then to MOPH/N for further processing. The weight-for-age index is calculated and compared with that of the Thai reference population to determine a child's nutritional status (Gomez classification). First-degree malnourished children have more frequent follow-up examinations. Second- and third-degree malnourished children receive food coupons from local MOPH/N officers for 3 mo.

Beginning in 1992, under the auspices of a UNICEF-funded program to strengthen growth monitoring, the village health communicators and volunteers also began to measure children's heights in randomly selected villages in 27 of the 73 provinces to assess the prevalence of stunting in a representative sample of rural children.

The Nutrition Surveillance System of School-Age Children was initiated by the Ministries of Education and Public Health of Thailand in 1986 to gather information for policy planning, targeting appropriate actions related to the school-lunch program, and monitoring nutritional status. Teachers in all primary schools weigh children aged 5–14 y twice yearly and send the data to provincial primary-education officers and then to the two ministries to facilitate informed decisions on the country's school-lunch program. The weight-for-age index is used to determine nutritional status. Children are classified as malnourished if their weight-for-age is < 80% of the median weight-for-age of the Thai reference population. Malnourished children are exempt from paying for their school lunch.

The National Rural Development Information System was established by the Department of Local Administration in 1984 to gather information for policy planning, targeting for appropriate interventions, monitoring trends, and advocacy in promoting development in rural communities at highest risk of nutrition problems. Village-level information is collected semi-annually on economics and agriculture, birth weight, infant and maternal mortality, the nutritional status of children < 5 y old, morbidity and mortality from infectious diseases, and availability of potable water. On the basis of five indicators (education, water, health, agricultural production, and infrastructure), communities are then classified into one of three categories that reflect their level of development. At the national level, this information is used by the National Economic and Social Development Board in soliciting more funds for rural development. The various ministries also use the information for planning and resource allocation.

The Basic Minimum Needs Surveillance, a community-based system, was implemented by rural communities in collaboration with the Department of Local Administration in 1987 to gather information for central and peripheral development planning, community mobilization, identification of appropriate targets for intervention, and trends monitoring. Village health communicators and volunteers, village committee members, and local extension officers collect data on 32 indicators, including nutritional status and birth weight, on an ongoing basis. In some communities, data analysis and interpretation are performed locally. In most, however, the data are sent to the next highest administrative level for further processing. Results are reported annually. Implementation of a nationwide system to survey basic needs in urban areas is currently being planned.

The Food and Nutrition Surveillance System was begun by the Thai National Economic and Social Development Board in 1989 to gather information for policy planning, targeting interventions, and monitoring the effects of structural-adjustment policies and trends. Village health communicators and volunteers, teachers, and village committee members collect data on weather, agriculture, economics, health, nutrition, and food-consumption data on a monthly, quarterly, or semiannual basis, depending on the type of information needed. The system, which is partly funded by UNICEF, was initially implemented in four provinces and has since expanded into ≥ 16 others. Data analysis and aggregation occur at the subdistrict and district levels and the resulting information is used by communities to prepare proposals for funding. All data and results are forwarded to provincial and national bodies for additional analyses and planning purposes.

Surveillance systems established in 1989 were designed to track and evaluate programs to eradicate iodine-deficiency disorders and iron deficiency. The program that addresses iodine deficiency covers > 50 provinces and includes iodization of salt, water, and fish sauce, as well as supplementation with iodized oil. Surveillance is carried out in health centers by teachers and health care personnel who collect urine samples at random. The information acquired is then transferred to the district, provincial, and national levels for further action. The surveillance system was implemented with support from UNICEF and the Norwegian government.

The iron-deficiency surveillance system operates at both the district and provincial levels and is based on hematocrit levels of women visiting prenatal clinics and school children attending schools near those clinics. Iron supplementation and deworming (except in pregnant women) are included in intervention programs to eliminate iron deficiency.
CONCLUSIONS

Political will to implement FNS is the key factor in establishing and maintaining an effective FNS system. Such will, however, must be strengthened by sensitizing policymakers and development officials to the importance of FNS in promoting the health and well-being of people in all nations.

There is a need for research, technical assistance, and capacity building to improve the quality of FNS information and its timely dissemination. The limitations of current methods of collecting and processing dietary data must be overcome so that the energy and nutrient consumption of individuals and households can be described more accurately.

The emergence of chronic diseases among the primarily affluent urban populations in developing countries signals a need to begin to monitor those conditions while continuing to track protein-energy malnutrition and micronutrient deficiencies.

Community-based FNS systems are essential to the design of sustainable development strategies. Communities must take control of assigning priorities to their health and nutrition problems and identifying appropriate solutions.

REFERENCES