ARCHIVOS LATINOAMERICANOS DE NUTRICION

English edition

CONTINUACION DE
ARCHIVOS VENEZOLANOS DE NUTRICION

ORGANO OFICIAL DE LA SOCIEDAD
LATINOAMERICANA DE NUTRICION

SUPPLEMENT 1 (First part)

Archivos Latinoamericanos de Nutrición (ALAN) es editado como órgano oficial de la Sociedad Latinoamericana de Nutrición (SLAN), para la divulgación de conocimientos en el campo de la alimentación y de la nutrición, principalmente en el hemisferio americano, En sus páginas se acogerán manuscritos en español, inglés, portugués y francés, tanto de miembros como de aquellos que no sean miembros de la Sociedad, y de cualquiera de las siguientes categorías: 1. Trabajos generales (revisiones científicas críticas); 2. Trabajos de investigación (originales); 3. Trabajos de Nutrición Aplicada (resultados analíticos de programas de intervención y discusión de recomendaciones de aplicación práctica); y 4. Cartas al Editor (comentarios cortos de interés general o relacionados con resultados o conceptos científicos publicados previamente en Archivos).

El precio de la suscripción es de US$ 20.00 o Bs. 85.00 por volúmen (4 números), incluyendo correo.

Archivos Latinoamericanos de Nutrición (ALAN) is the official publication of the Sociedad Latinoamericana de Nutrición (SLAN), for the dissemination of knowledge in the fields of food and nutrition principally throughout the American Hemisphere. It accepts articles in Spanish, English, Portuguese and French, both from the society members and from nonmembers, in the following categories: 1. General Papers (critical scientific reviews); 2. Research Papers (original); 3. Papers in Applied Nutrition (analytical results from intervention programs and discussion of recommentations of practical application); and 4. Letters to the Editor (Short comments of general interest or about scientific facts and concepts previously published in the Archivos).

The subscription is US$20.00 per yearly volumen (4 numbers) including mail.

ENTIDADES PATROCINANTES

La Sociedad Latinoamericana de Nutrición y su órgano oficial de divulgación científica Archivos Latinoamericanos de Nutrición se complacen en reconocer el apoyo de las siguientes organizaciones al avance de la ciencia de la Nutrición y la Alimentación en el hemisferio Americano:

Instituto Nacional de Nutrición de Venezuela
F. Hoffmann-La Roche & Co., Brasilea, Suiza
Espalsa, Especialidades Alimenticias S.A.
Asociación Americana de Soya
C.A. Venezolana de Alimentos (Gerber)

Dirección: Archivos Latinoamericanos de Nutrición
Apartado 2049
Caracas, Venezuela

Arch. Latinoamer. Nutr. **ALAN-VE ISSN 0004-0622**

ACKNOWLEDGEMENTS

The financial aid of the United Nations Children's Fund (UNICEF) made possible the publication of the present English edition.

The technical collaboration of the Institute of Nutrition of Central America and Panama/Pan American Health Organization, was most valuable in this endeavour.

Guatemala, C. A., 1979

NUTRITIONAL EPIDEMIOLOGICAL SURVEILLANCE SYSTEMS

ARCHIVOS LATINOAMERICANOS DE NUTRICION

ORGANO OFICIAL DE LA
SOCIEDAD LATINOAMERICANA DE NUTRICION

VOL. XXVII | SUPPLEMENT 1 (First part) JUNE 1977 | No. 2

English Edition

CONTENTS

IV LATIN AMERICAN NUTRITION CONGRESS

Caracas, Venezuela, 21-27 November, 1976

Colloquium on

NUTRITIONAL EPIDEMIOLOGICAL SURVEILLANCE SYSTEMS

Participants:

J. M. Bengoa (Venezuela)
J. P. Kevany (Ireland)
C. H. Daza (PAHO/WHO, USA)
M. Martínez (SIECA, Guatemala)
M. Izaguirre (Venezuela)
M. F. Lechat (Belgium)
J. J. Urrutia (INCAP, Guatemala)
J. Aranda-Pastor (INCAP, Guatemala)
A. Llopis (Venezuela)
A. Pradilla (Colombia)
J. Toro (PIA/PNAN, Chile)

Coordinator: J. Aranda-Pastor
INCAP, Guatemala, C. A.

PREFACE

The need to count with reliable and up-to-date information susceptible of a systematic and integrated analysis for the planning of food and nutrition interventions has been increasingly felt in recent years, particularly in the developing countries. This applies to actions, both in the development process as well as in emergency cases.

In Latin America nutritional injuries constitute not only a serious health problem but also an obstacle for the development of the countries. For this reason, a group of scientists and technologists in various disciplines met in Caracas in November, 1976, to study the most practical way of facing the difficult problem related to the availability of adequate statistical-epidemiological information in the food and nutrition field. Concretely, the purpose was to examine this important subject approaching it from all of its angles, with the objective of finding feasible means of maintaining a continuous flow of data to build a series of indicators. It was felt that interpretation of the behavior of these indicators would permit early detection of certain situations at any given moment and predict deterioration or improvement of those situations.

The support and partial financial aid of the United Nations University (World Hunger Program), provided through INCAP as Associated Institution of this University, made possible this Colloquium on "Nutritional Epidemiological Surveillance Systems". The Colloquium was held as part of the IV Latin American Nutrition Congress organized by the Latin American Nutrition Society, the Government of Venezuela through its National Institute of Nutrition and the Venezuelan Nutrition Society. Partial financial help was also received from the Research Corporation. Special mention of the Ex-President of SLAN, Dr. Guillermo Arroyave, should also be made, since during his service period he promoted and took the necessary steps for the celebration of the Colloquium and coordinated with great enthusiasm this important event.

This Supplement of the well-known Journal of the Society, *Archivos Latinoamericanos de Nutrición*, compiles all the papers and comments presented during the Colloquium, where specialists in diverse disciplines approached the different components of a food and nutrition multisectoral surveillance system. This, of course, was imperative, since as is generally accepted, nutrition problems are of a multifactorial causality. The system is considered as an essential, integrated, early and timely instrument of multisectoral planning, and of coordination of the needed strategies for an effective action.

We wish to acknowledge our most sincere appreciation to the Latin American Nutrition Society and to its present President, Dr. Werner G. Jaffé. The collaboration and valuable support of the Society made possible the publication of the Proceedings of the Colloquium on "Nutritional Epidemiological Surveillance Systems". The assistance rendered by Mrs. Amalia G. de Ramírez, Chief of the Editorial and Publications Office of *Archivos Latinoamericanos de Nutrición*, who translated and edited the papers presented, was most helpful in the publication of this English version of the Colloquium.

José Aranda-Pastor
Division of Applied Nutrition
Institute of Nutrition of Central America and Panama (INCAP),
Guatemala, C. A.

PAPERS PRESENTED

INTRODUCTION*

PREVENTIVE NUTRITIONAL SURVEILLANCE

*José María Bengoa***

National Scientific and Technological Research Council (CONICIT), Caracas, Venezuela

1. The Concept

It would appear that, as happens with any living being, interest and concern for nutritional problems are born, develop and die. In the decade of the 50's the major worry to which great efforts were dedicated was the development of new protein sources, mainly for the weaning period. In the decade of the 60's, attention was directed to the organization of pilot projects of the so-called "applied nutrition programs", whose philosophy entails coordination at a community level of the nutrition activities in the health, agriculture and education sectors. In the decade of the 70's, concern in regard to the nutrition of population groups has been centered on the national food and nutrition policies and, among them, on the "Nutritional Surveillance" or "Nutritional Epidemiological Surveillance" or "Preventive Nutritional Surveillance", whichever name may be used.

This aspect of the naming of the program could well be the subject of discussion and adoption of a decision at the SLAN level.

The "Preventive Nutritional Surveillance" emphasizes the collection and analysis of indicators that can *predict* the possible deterioration of the nutritional status of the populations, and not only on the indicators that mark the *history* on the actual situation.

In the field of malaria the concept could be illustrated by pointing out that the splenomegaly index in a given population indicates the *history* of its chronic endemicity; the parasite index shows us the actual malarial infection, and the population index of anopheles mosquitoes in the area, permits *prediction* of an eventual epidemic.

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Coordinator of the Nutrition Policy of the National Scientific and Technological Research Council (CONICIT), Caracas, Venezuela.

In the nutrition field, we have been dedicated for a long period of time to detecting nutritional problems that were past *history* and very little to identifying warning signs which permit prediction of a *future* deterioration of the nutritional status.

2. Definition

The FAO/UNICEF/WHO Committee of Experts which met in Geneva in October, 1975, defined surveillance as follows:

"To watch over with attention, authority and, often, with suspicion."

This obviously is a dictionary definition of the word.

For our purpose, we consider more suitable the definition of Jaime Ariza. This reads:

"By food and nutritional surveillance is understood the permanent and regular process of compiling, analyzing and distributing the necessary information to maintain an up-to-date knowledge of the production, provision, distribution and consumption of foods, as well as of the nutritional status of the population; to identify its changes, causes and tendencies and predict its possible variations, in order to decide in time on the preventive or corrective actions according to the case" (PIA/PNAN -1, No. 2, 1976).

This definition might be subject of discussion during the meeting.

It is important not to confuse surveillance with evaluation. One evaluates the success or failure of an operation but surveillance of a given situation is independent of whether or not there exist courses of action to modify or correct the situation.

Of course, many indicators might be used in surveillance as well as in evaluation, but the selection criterium of the indicators may vary. In the evaluation process only those indicators that measure changes of the planned objectives will be useful. In the surveillance process the spectrum of indicators is much wider.

3. Evaluation of the Indicators to be Used

There are a great number of indicators, many of which have not been evaluated in regard to their sensitivity, specificity, coverage, cost and, above all, their "threshold of alarm". This criterium of "threshold of alarm" is absolutely indispensable to interpret the indicators that would permit prediction of possible future deterioration of the nutritional status. At what level would an increase of unemployment lead to a worsening in the nutritional situation? How many months of drought would allow us to point out the "threshold of alarm"? Other examples could be given, but we believe that these are enough to illustrate the phenomenon.

For the above-mentioned reasons, in the Research Center of the Postgraduate Food and Nutrition Planning Course of the Universidad Central of Venezuela, and with the financial aid of the National Scientific and Technological Research Council (CONICIT) of Venezuela, a research project has been programmed.

Its fundamental purpose is to evaluate the indicators that have been used and to determine, for each one of them, its sensitivity to changes, its objectivity, specificity, coverage, its cost and, finally, to establish certain criteria for identifying the "threshold of alarm".

4. The Single Indicator

For some time, economists, planners and politicians have been calling on workers in nutrition for the integration in one single indicator, of the nutritional situation of a given country. The subject is of great interest, but the task will be difficult.

The Research Institute for Social Development of the United Nations with headquarters in Geneva, already tried to weigh a series of standard of living indices, in order to achieve a single indicator for "quality of life". This effort was very useful and served to point out the great difference existing between the Gross National Product, as an economic indicator, and the weighted Index of Social Development.

As for a single indicator which would permit us to show the nutritional history of a given community, this author suggested some years ago at the Conference on Nutrition and Development held at the Massachusetts Institute of Technology (MIT), that the height of a 7-year-old child chould be an idea worthy of consideration. The most interesting aspect of this indicator is that it is closely correlated with the Social Development Index of the Geneva Institute to which I have already referred. Arguments in favor of such an indicator appeared in the paper presented by this author at the MIT Conference (which has now been published) and it is not necessary to repeat them here.

It would be more difficult to imagine a single indicator for the present status and, still more difficult, a single indicator as the "threshold of alarm". Any way, it is a subject that merits research.

5. Steps Taken in Venezuela for the Organization of a Surveillance System

Four important steps in this direction have been taken in Venezuela:

First: By Presidential Decree, a Biological Development Foundation for Venezuelan has been created. This Foundation has already planned a national survey which will cover the physical, functional and biochemical examination as well as other parameters of around 80,000 subjects. This will make available basic information of great importance, and it is to be hoped that the same Foundation would carry out periodic surveys in the future.

NUTRITIONAL INDICATORS (Cont)

Indicators	Cover-age	Period-icity	Easiness to obtain	Cost	Object-ivity	Speci-ficity	Sensiti-vity
6.3 Infant mortality by social strata			Difficult				
6.4 Mortality of children 1-4 years of age							

Second: The Planning Organization of the country, CORDIPLAN, has prepared a catalog of social indices, among them the nutrition indicators. The latter will form part of what is known as "social accounts", which will complement the "economic accounts".

Third: The Venezuelan National Institute of Nutrition has planned the organization of a Preventive Nutritional Surveillance Unit, which would deal with the centralization of all the data received from different sources.

Fourth: With the collaboration of CONICIT, the Interdisciplinary Postgraduate Course in Food and Nutrition Planning of the Universidad Central of Venezuela has established a research group to evaluate the selection criteria of the nutritional indicators. It is hoped that these research lines will be useful for the National Nutrition Institute, CORDIPLAN, and other organizations.

6. Notes for a Bibliography on Surveillance

It would be useful for SLAN to collect the existing information about Preventive Nutritional Surveillance. In the coming years the number of publications will considerably increase.

This bibliography would have to be separated in two groups: that related to *indicators*, and in another group, that related to *Surveillance Systems.*

With respect to the first list, this could be initiated with the bibliography that appears in the INCAP paper entitled "Indicadores Mínimos del Estado Nutricional" (INCAP Publication E-827). Although incomplete, it would be a good start.

As for the second bibliography, same of the important papers on the subject are:

1. Center for Disease Control. *Nutrition Surveillance.* Atlanta, Georgia, CDC (DHEW Publication No. (CDC) 75-8295) (Periodic publication).

2. Mason, J. B. Vigilancia de la nutrición. *Aliment. Nutr. (FAO), 1* (4):24-27, 1975.

3. *Methodology of Nutritional Surveillance.* Report of a Joint FAO/UNICEF/WHO Expert Committee, Geneva, 1-10 October, 1975. Geneva, World Health Organization, 1976, 66 p. (Technical Report Series No. 593).

4. Ariza Macías, J. La necesidad de establecer un sistema de vigilancia alimentaria y nutricional. Presented at: *V Congreso Brasileiro de Nutrición y VIII Congreso Brasileiro de Nutricionistas, Porto Alegre, September, 1976.* (Mimeographed document).

5. Burgess, H.J.L. Surveillance of the population at risk: the community. (Chapter 18). In: *Nutrition in Preventive Medicine. The major deficiency syndromes: epidemiology and approaches to control.* G. H. Beaton and J. M. Bengoa (Eds.). Vol. II. Geneva, World Health Organization, 1976. (WHO Monograph Series No. 62).

6. International Union of Nutritional Sciences. *Proceedings of I.U.N.S. Committee on Nutrition Surveys and Surveillance held 11-15 March in New Delhi, India.* Kashmere Gate, New Delhi, Cambridge Printing Works, 1974, 38 p.

7. Symposium on Epidemiological Surveillance of National Nutrition Problems. *IX International Nutrition Congress, Mexico, September 3-9, 1972.*

HEALTH SECTOR INFORMATION IN A NUTRITIONAL SURVEILLANCE SYSTEM*

*John P. Kevany***

University of Dublin, Ireland

SUMMARY

The contribution of the health sector to nutrition surveillance systems is fundamental as it measures the final impact of change in causal and contributory factors of malnutrition. Operational as well as statistical criteria must be considered in the process of selecting appropriate indicators for surveillance. In practice, choice is dependent on the range and quality of health data currently collected, as well as on the structure and efficiency of existing information systems. Training and motivation of health personnel, especially at the periphery of the system are basic components of effective surveillance, while the development of simple instruments and defined procedures are essential for adequate data quality. There is need for extensive investment in these areas for a successful surveillance program to be developed in Latin America.

INTRODUCTION

The basic objective of a nutritional surveillance system is the improvement of the nutritional status of the community; consequently, the contribution of the health sector is of fundamental importance. This sector is responsible for generating precise and reliable information on the final impact, in human terms, of the changes that occur in the chain of causal and contributing factors of inadequate nutrition. Thus, it has the unique responsibility of evaluating any deterioration or improvement of a given situation due to spontaneous change or to planned intervention.

In the past, non-health sectors took independent decisions in accordance with

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Senior Lecturer in Social Medicine, Department of Social Medicine, Trinity College Medical School.

their own objectives which affected the responsibilities of the health sector, almost always in a negative form.[1] With an effective nutritional surveillance system, the health sector can influence these decisions in such a way as to avoid the negative impact and, more importantly, to contribute to improvement of nutritional status. Even though surveillance systems can be developed in the context of specific types of nutritional deficiencies, this presentation is limited to situations where malnutrition is a problem that affects the population in a more generalized and severe way, and where health services operate with very limited resources.

The contribution of the health sector is expressed in terms of information based on the technical interpretation of a series of indicators. The selection of these indicators will depend on certain statistical requirements such as validity, sensitivity and specificity, and also on a series of operational demands such as the precision, reliability and availability of the data from which they are derived.[2]

In theory, there is a great variety of health indicators that can be used in a surveillance system. In practice, their selection is limited by two important restrictions: a) the necessary experience to determine their statistical characteristics and b) the range and quality of the available data. To a certain degree, the first depends on the experience which may exist at national and international levels on the statistical quality of the indicators, and on the availability of resources to carry out validity studies in those cases where experience is lacking. The second, of a fundamental nature, usually determines the final selection of indicators in those countries where the health services resources are limited. In view of the importance of the latter restriction, it may be more appropriate to initiate this analysis by examining the conditions in the peripheral areas of the surveillance system where direct measurements and observations generate the primary data.

GENERATION OF DATA

In the peripheral area it is important to consider not only the range, quality and availability of data but also the category, training and experience of the personnel who collect them and the facilities and equipment available for their use.

The range of data generated in the health sector which can be used in a surveillance system, are arbitrarily grouped in three broad categories:

A. Pathology: mortality and morbidity

B. Physiology: anthropometry, dietary consumption and biochemistry

C. Intervention: Immunizations, environmental sanitation and food supplementation.

A. Pathology

1. Mortality

The level of death registration in a community varies from country to country and within the different areas of the same country.[3] In general, the under-registration tends to be greater in those areas where the health and nutrition problems are the most severe; the lack of an adequate infrastructure simultaneously affects both variables. Furthermore, under-registration can be selective in terms of age, and consequently, of the cause of death.[4]

The level of under-registration also depends on the notification system used for surveillance purposes. Frequently, in rural areas of dispersed population, one finds high levels of under-registration in the civil system due to a variety of administrative and socio-cultural reasons. On the other hand, where there is full extension of services, the level of registration, through health promoters or primary care workers in the community, can be high.

The diagnosis of the cause of death is another restriction in the use of mortality data. The level of medical certification of the deaths registered is relatively low in many countries, particularly in the rural areas. On the other hand, where there is an ample coverage of the services by means of primary health care workers, the diagnosis rate of the cause of death in the community can reach a high level. In simplified primary health care systems, the health workers are capable of identifying with precision a limited number of causes of death, among which malnutrition may be included.

The variation in the level of under-registration and of diagnosis, constitutes a problem difficult to solve. Where health services exist, it is probable that this level is maintained relatively constant, while, where there is a progressive improvement of the services and of the infrastructure in general, it is very difficult to evaluate trends in the registration level. The only way of solving this problem is through periodic surveys for verification of mortality reporting.

2. Morbidity

Data on morbidity represent an important information source in the surveillance systems. These offer a more sensitive base for the construction of indicators than those derived from mortality; however, they do have serious limitations in regard to coverage, precision and reliability. At the hospital level, diagnosis of malnutrition is relatively easy and precise, and the problems arise more frequently in the process of recording of the data. The undernourished child is rarely taken to the hospital free of complications such as infectious processes and these are usually registered as the reason for their admission. This situation results in a substantial under-recording of malnutrition and the only source of precise data is the clinical history. Any study that attempts to evaluate morbidity at the hospital level will have to consider a system that permits identification of the contributing causes through a direct review of clinical histories. As an additional source of data at this level, it is feasible to utilize other

diagnosis, such as diarrheal diseases and common infectious processes, as indirect indicators of morbidity caused by malnutrition. In these cases, the precision of the diagnosis is more acceptable for surveillance purposes, although specificity may be lower.

At the primary care level, the recording problem is less complicated if adequately trained personnel are establishing the diagnosis. Here the problem is more one of coverage and representativeness of the population which uses the service. Where coverage is limited, malnutrition may progress until it becomes severe, before it reaches the health services and, if the case is very severe, it will probably go directly to the hospital. In situations where there is full coverage based on simplified health care, morbidity data may have considerable value when assessing the nutritional status of the population. The value of the physical signs of specific deficiencies is yet to be demonstrated in terms of nutritional surveillance. The specificity and sensitivity of many of them are doubtful, and their identification requires the services of a physician who, in general, is not available in areas where these signs might be useful.

B. Physiology

The data on the physiological status of an apparently healthy population serves as the basis for a series of sensitive and specific indicators. Nevertheless, in practice only a very limited variety of data within this category are collected or utilized. Anthropometric data are more frequently used and have been described in some detail by Jelliffe.[5] In spite of their technical simplicity, in surveillance systems they are liable to present problems relating to precision and reliability. The lack of standardized equipment, the omission of regular calibration, and the absence of detailed instructions on procedures are common sources of error.

Biochemical measurements generate data on which more specific and sensitive indicators of nutritional status can be based. However, the lack of laboratory facilities and simple, low-cost equipment greatly limits their use in practice. Data on hemoglobin during pregnancy are the most frequently available but even these are relatively scarce outside of health centers in urban areas.

Observations on dietary consumption represent a useful source of data to measure the nutritional status in a relatively direct way. While the use of the large-scale dietary survey has been abandoned, the potential for utilizing simple questionnaires by auxiliary personnel is considerable. In the case of programs with extended coverage, health care personnel can be trained to use simple but precise questionnaires concerning dietary consumption, comparing the answers with specified standards. In this way, they can evaluate the diet in general terms, using categories such as good, adequate or poor. If this type of observation is well developed and carefully standardized during the training period, it can generate very useful data for surveillance purposes.

C. Interventions

Preventive measures represent a substantial contribution to changes in health

status, mainly in reference to the control of infectious diseases. In almost all circumstances, data on inmunizations and environmental sanitation are collected by the health services and are usually transmitted to the central level. Data on inmunization against whooping cough and measles are specifically useful even though natural inmunity levels can not be taken into account.

Finally, food distribution or dietary supplementation programs also generate useful data at local level which can serve as a basis for the construction of intervention indicators.

RECORDING AND TRANSMISSION OF DATA

In the health sector, the aggregation of data from the periphery and its transmission to the central level depends on the organization of the services themselves, which in turn depends on the political-administrative characteristics of the country. The degree of decentralization of services will determine the intermediate levels, whether these are departmental or regional, where data can be summarized and analyzed in one way or another. The nature of the data itself will also determine the frequency of transmission and the level to which they are transmitted. In general, data on mortality and hospital morbidity are transmitted to the central level, through the intermediate stages, while, for example, data on growth and development or birth weight are often neither analyzed nor transmitted, and remain in individual or family records at local level. Other operational data such as the frequency and type of assistance given are usually transmitted to an intermediate level for supervision and evaluation purposes. These include important information on diagnoses that may be utilized for surveillance purposes. Data on preventive activities such as inmunizations and environmental health are usually summarized and transmitted to intermediate and central levels so that they are accessible at any stage of the system.

The level to which data are transmitted determines the method to be used for obtaining them for surveillance purposes. In general, those transmitted to a more central level can be obtained in a progressively aggregated form, utilizing the same records used for their transmission. However, it must be recognized that each aggregation normally implies a progressive loss of detail, which gradually reduces its usefulness for surveillance.

For surveillance purposes, detailed information frequently is not transmitted routinely from the local level, and methods must be used to obtain it directly. For example, it is feasible to consider the use of periodic surveys of records used at the local level by auxiliary nursing or nutrition personnel. This can be done by making a complete review of all records accumulated during a certain period of time or, if there are many, through systematic sampling.[6] In this way, useful anthropometric, clinical, and sometimes dietary data can be obtained for surveillance purposes. This approach does not consider the quality or coverage of the data, but if it is regularly utilized, it can indirectly stimulate the health personnel to pay more attention to the observation, measurement and recording processes.

In summary, the collection and flow of data will be mainly determined by the existing procedures for the transmission of data within the health sector. In order to have access to these data, the possibility of using special surveillance forms must be considered, although this implies additional work. In the case of data that are not transmitted in any way, it is necessary to consider the use of file surveys carried out at local level.

As indicated previously, the training, experience and motivation of personnel in charge of recording and transmitting data is important in determining the effectiveness of the system. In rural areas much data utilized for nutritional surveillance are not recorded by the physician or the nurses, but by auxiliary personnel at the level of small communities. While the physician and nurse receive a long training in the principles of the "scientific method", the auxiliary personnel do not have this philosophy. Consequently, more attention should be given to the quality and content of their in-service training and to the use of simplified technical guidelines. The questions of calibration of equipment, standardization of measurement procedures, and the degree of precision of measurement should be considered within this context. Perhaps the most important factor of all is motivation. It is fundamental that personnel know *why* a determination or measurement is done, *how* the data are used at other levels and, above all, that they receive regularly and in an understandable form the information derived from the analysis.

INDICATORS

With regard to indicators of nutritional status of the population, a great variety have been developed in different parts of the world, and many of them are published in the scientific literature.[7-9]

For the purposes of this presentation it is convenient to consider some basic concepts concerning these indicators. First, it is necessary to distinguish between direct and indirect indicators because the category determines their usefulness for surveillance purposes. In regard to the direct indicators there is no major doubt as to their validity: malnutrition is measured directly. On the other hand, indirect indicators such as morbidity for diarrheas or measles or the ratio between mortality in children 1-4 years old and general mortality, are based on assumptions of variable validity. Thus, assumptions that justify the use of an indirect indicator in a specific part of the world under given circumstances, are not necessarily justified in another situation. The only manner of verifying the validity of these indicators in a definite way is through direct experience obtained in each area. In this sense, the present world interest in nutritional surveillance systems, recently expressed at a WHO/UNICEF/FAO[9] interagency meeting, will stimulate the accumulation of information or experience which may help to evaluate the quality of indicators already in use.

While our knowledge on the value of indirect indicators improves, it is appropriate to look for ways of improving the quality and availability of data based on direct

observations such as weight-gain during pregnancy, birth weight, duration of breast-feeding and, most important of all, the weight/height ratio in preschool children. There is also a need to study new simplified methods on which an auxiliary nurse or trained birth-attendant may classify maternal diet in simple terms.

In conclusion, if the health sector is expected to contribute actively to nutritional surveillance systems, it will be necessary to dedicate an adequate level of resources to the training of personnel, not only in terms of technical content, but also in the concepts of scientific methodology and the principles of epidemiology. On the other hand, the directors of services have the obligation to ensure the continued use of the collected data by means of regular analysis and feedback to the level of origin.

As far as research is concerned, there are two evident priorities. On the one hand, there is need to carry out and compare epidemiological studies in order to verify the validity and reliability of indirect indicators and, on the other, there is a need to develop simple methods and instruments to measure nutritional status. In relation to epidemiology studies, there is great scarcity of retrospective investigations of exceptional situations and natural disasters where marked changes in regard to causal and conditioning factors have occurred and, in consequence, in the status of affected populations. Even accepting the fact that nowadays emergency interventions will complicate analysis, a greater investment of resources in this type of study is justified. Furthermore, in the same way, good quality retrospective studies can offer equal or greater benefits than prospective studies, due to the difficulty of reproducing in controlled studies the complexity of causal factors that occur in natural situations.

In regard to research on instruments, there is an increasing need to develop simple measurement and observation methods that can be utilized by auxiliary personnel working with few resources and without constant supervision. The definition of simple procedures, the preparation of reference tables and the availability of low-cost and simple equipment are essentials to obtaining greater precision in the nutritional surveillance process. Both in anthropometry as well as in biochemical and dietary studies, there is an urgent need to organize a coordinated research program for this purpose. It is evident that this objective is easily achieved from the point of view of the existing technology; what is lacking is an adequate investment of resources.

RESUMEN

INFORMACION DEL SECTOR SALUD EN UN SISTEMA DE VIGILANCIA NUTRICIONAL

Se consideran los aspectos técnicos y operacionales de los sistemas de información en el sector salud que contribuyen al proceso de la vigilancia nutricional. Se discuten los datos e indicadores sobre la patología, la fisiología y las intervenciones que se pueden utilizar en la práctica. Se ofrecen recomendaciones sobre prioridades de adiestramiento de personal e investigación aplicada para el desarrollo futuro de estas actividades en América Latina.

BIBLIOGRAPHY

1. *Food and Nutrition Strategies in National Development.* Ninth Report of the Joint FAO/WHO Expert Committee on Nutrition. Rome, Italy, Food and Agriculture Organization of the United Nations, 1976, p. 14-15. (FAO Nutrition Meetings Report Series No. 56).

2. *Statistical Indicators for the Planning and Evaluation of Public Health Programmes.* Fourteenth Report of the WHO Expert Committee on Health Statistics. Geneva, World Health Organization, 1971, 40 p. (WHO Technical Report Series No. 472).

3. Puffer, R.R. & C.V. Serrano. *Patterns of Mortality in Childhood.* Report of the Inter-American Investigation of Mortality in Childhood. Washington, D.C., Pan American Health Organization, 1973, 492 p. (PAHO Scientific Publication No. 262).

4. Scrimshaw, N.S., C.E. Taylor & J.E. Gordon. *Interactions of Nutrition and Infection.* Geneva, World Health Organization, 1968, 329 p. (WHO Monograph Series No. 57).

5. Jelliffe, D.B. *The Assessment of the Nutritional Status of the Community (With special reference to field surveys in developing regions of the world).* Geneva, World Health Organization, 1966, 271 p. (WHO Monograph Series No. 53).

6. *Sampling Methods in Morbidity Surveys and Public Health Investigations.* Tenth Report of the WHO Expert Committee on Health Statistics. Geneva, World Health Organization, 1966, 29 p. (WHO Technical Report Series No. 336).

7. *Elementos de una Política de Alimentación y Nutrición en América Latina* (Sección III). Washington, D.C., Organización Panamericana de la Salud, 1969, 32 p. (Publicación Científica No. 194).

8. Aranda-Pastor, J., G. Arroyave, M. Flores, M.A. Guzmán & R. Martorell. Indicadores mínimos del estado nutricional. *Rev. Col. Méd. (Guatemala), 26*:5-27, 1975.

9. *Methodology of Nutritional Surveillance.* Report of a Joint FAO/UNICEF/WHO Expert Committee, Geneva, 1-10 October, 1975. Geneva, World Health Organization, 1976, 66 p. (WHO Technical Report Series No. 593).

Comments on the paper

HEALTH SECTOR INFORMATION IN A NUTRITIONAL SURVEILLANCE SYSTEM

The epidemiological surveillance of the nutritional status and its incorporation into regular health information systems*

*Carlos Hernán Daza***

Pan American Health Organization, Pan American Sanitary Bureau, Regional Office of the World Health Organization

SUMMARY

It is recognized that the epidemiological surveillance of the nutritional status of the population should form part of the regular statistical information of the health services, so that it may be a prioritary component of the health information system. At the same time, it would be an aggregation and complementary element for the establishment of global surveillance systems on the food and nutritional situation of the most susceptible population groups.

It is proposed that the surveillance of nutritional status be carried out using systems already existing in the majority of health services of the countries for the epidemiological surveillance of communicable diseases. These systems offer favorable conditions and experience which can be utilized for the collection, analysis and diffusion of information on nutrition, for the purpose of applying opportune actions from the preventive, curative and rehabilitation points of view.

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** PAHO/WHO Regional Adviser in Nutrition, Washington, D.C., USA.

INTRODUCTION

Dr. John Kevany's presentation on "Health Sector Information in a Nutritional Surveillance System" permits to identify the constitutive elements of the system, its scope and possible restrictions, given the actual characteristics of the health services and of the available statistical information.

Our comments are directed to emphasize those aspects that, in accordance to our experience, must receive special consideration for the establishment and operation of these systems if the goal is that surveillance of the nutritional status be a prioritary component of the regular activities of the health services. This applies particularly to the attention of the mother and child in health and welfare family programs.

It is a true and recognized fact to the health and nutrition planners that information on the nutritional status and food situation of the population is not only insufficient and fragmentary, but also quite unreliable and not representative of the situation prevailing in the countries and even in regions or areas of same.[1]

This is partly due to the fact that the health services do not count with adequate mechanisms for the regular collection of basic data on food and nutritional status to undertake their systematic analysis at local level and use them as a diagnosis and prognosis element for action, both from the preventive and curative angles, as well as from the viewpoint of rehabilitation of the nutritional diseases of greater prevalence.

It is necessary therefore to establish simple information mechanisms on nutritional and food status, with emphasis on those groups more susceptible to nutritional deficiencies. These mechanisms must be functionally integrated into the health information systems available in each country.

As an alternative we propose the utilization of the epidemiological surveillance system of communicable diseases, so as to maintain a regular flow of information on the nature and magnitude of nutritional problems, their causes, localization, social trascendence and interrelations with other health problems. Thus, action may be taken opportunely both at the local level itself, which is the source of origin of the data, as well as in the higher levels of the health structure where data would serve for the planning and evaluation of the programs and for the analysis of the tendencies and changes produced in the problem.

Practically all the countries of the Region are operating epidemiological surveillance systems for communicable diseases which may well serve to collect, analyze, transmit and feedback data on the nutritional status of the population. Obviously, in those countries where maternal and child health programs of more tradition and greater development exist, information on nutritional status will be more easily incorporated.

What is evident is that whatever the system used to undertake a surveillance of

the nutritional status, this must be the whole of the activities oriented to achieve an adequate, opportune and permanent knowledge on the nutritional status of the population. This may be obtained through the collection, analysis and diffusion of information, for the purpose of acting on due time and thus correct the problems encountered.

In other words, surveillance of the nutritional status must not be an end in itself, but the information mechanism for action as part of the food and nutrition programs carried out by each development sector. In the case of the health services, primary generators and consumers of said information, surveillance of the nutritional status must be an intrinsic element for the nutrition activities in the local health services, since they are the door of entrance of the community to the formal health system. A conceptual element of importance when approaching the epidemiological surveillance of the nutritional status is to recognize that the community itself must act directly on the diagnosis of its problems, through the search of easily identified symptoms and signs which alert it to detect and report each circumstance to the primary health services. In our opinion, this is the more elemental and representative source of the informative data that integrate the nutritional surveillance system. On the other hand, it will contribute to make the population more conscious of their health and nutrition problems, motivating it to participate more actively in their solution.

Likewise, the fact that the community itself and its formal and informal health elements are the ones to initiate the information process on the nutritional status, gives the necessary dynamism to the system in recognizing the malnutrition cases, to identify the more-at-risk groups, and adopt the immediate actions for control, treatment and prevention.

ORGANIZATION OF THE SYSTEM

It is worthwhile pointing out that the efficiency of a system for the epidemiological surveillance of nutritional status will fundamentally depend upon the organization and logistics to which it is subjected, in order to convert the collection, analysis and presentation of the data into a priority element of the health information process.

Thus, the nutritional status surveillance system must integrate three mechanisms or essential components:

1. *Collection* of the information through the gathering, transmission, processing and presentation of data such as anthropometric measurements (e.g. weight, height, brachial circumference), morbidity and mortality (e.g. infants under 1 year of age, from 1-4 years), etc.

2. *Analysis* and epidemiological *interpretation* of the information obtained by comparing these values with existing norms (e.g. classification of nutritional status by weight/age, weight/height) and indicators constructed on the basis of the secular

tendencies observed (e.g. percentage of malnutrition grades II and III in children under 5 years of age, according to the place or the season of the year), and the analysis of the discrepancies encountered, establishing their possible causes and consequences.

3. *Feedback* or return of the information to the source where the datum originated (primary health service) which requires agile mechanisms for the distribution of reports or bulletins, including recommendations as to the measures to be adopted for its prevention or control.

Obviously, as the level in the health structure ascends, the components and attributes of the nutritional surveillance system acquire greater complexity as to their analysis and interpretation capacity. But the essential factor in the initiation of the process is the community itself, which must be sufficiently motivated and organized to detect those signs or symptoms indicative of a possible nutritional problem (e.g. diarrhea, dehydration, thinness, edema), that forces it to recur to the primary health service.

The primary health services must be adequately integrated into the general health structure, so as to facilitate reference of patients when necessary (e.g. child with advanced protein-energy malnutrition and concomitant infectious process) and due notification of the datum is made at the levels with responsibility of accumulative registry and interpretation.

According to the peculiar health structure prevailing in each country the central levels should establish a minimum surveillance record for the collection and subsequent analysis of the information corresponding to a determined geographic area. The other levels of the system must support and complement each other to correct or improve the nutritional surveillance system. The usual supervision teams should include among their regular functions, the revision of the information mechanisms acting at the same time as support and in-service training elements for the local health personnel.

The training and supervision of the personnel responsible for operating the nutritional surveillance system must receive particular attention to ensure that they clearly understand its objectives, and especially realize the immediate usefulness derived from the system for the adequate management of the health and nutrition problems. If this is not established as an intrinsic element for its development, obtaining the voluntary participation of the health personnel would present difficulties; rather, it could give rise to negative attitudes in considering that this information is one of the many demanded by the superior levels of the health structure to control the performance of the local personnel.

In a schematic way and as example, training of professional health personnel in relation to the nutritional status surveillance must contribute to their acquiring the necessary ability to interpret epidemiologic variables such as the following:

- Nutritional status according to location, time and population group;
- Identification of the more-at-risk groups for suffering from nutritional deficiencies (e.g. protein-energy malnutrition);
- Associated factors in terms of geographic areas and social, ethnic, cultural or economic characteristics;
- Hypothesis on the causal or predisposing factors;
- Comparison of data on incidence and prevalence of specific deficiences (e.g. excessive morbidity caused by nutritional anemias and alarm limits);
- Control measures;
- Evaluation of short and mid-term corrective actions.

As far as actions of nutritional surveillance are concerned, these will depend – as previously stated – on the health structure level. For illustration purposes those activities indispensable to carry out in a primary health system which counts with a permanent auxiliary staff (e.g. nurse auxiliary or health promoter) are identified:

Surveillance of the pregnant woman:

- Early detection and registration of the pregnant woman;
- Periodic control and recording of weight;
- Identification of malnutrition signs (e.g. conjuntival pallor).

Surveillance of the newborn:

- Early detection and registration of the newborn;
- Periodic control and recording of weight and height;
- Identification of malnutrition signs (e.g. weight under 2,500 g).

Surveillance of the preschool child:

- Detection and registration of preschool children;
- Periodic control and recording of their weight and height;
- Classification of nutritional status according to norms (e.g. weight/age or weight/height curves).
- Identification of malnutrition signs (e.g. conjunctival pallor, edema, emaciation).

This series of actions to control the nutritional status of the mother and child should be accompanied in each case by:

- Transmission of information to the superior level in the health structure (e.g. condensation of data in simple numeric accummulation tables, by age groups);
- Reference of the case (mother or child) to the superior level of attention according to the country's norms;
- Simple analysis of the information with community leaders to adopt preventive or control actions;
- Recording of data in the epidemiological surveillance system;
- First analysis and interpretation of the information.

Finally, the superior levels of the nutritional status surveillance system must count with the necessary facilities to compute, should this be the case, to consolidate the information received from the local levels, analyze it, feedback it in accordance to the established mechanism, and transmit it to other sectors or units where a single global nutritional system will be eventually established.[2]

POSSIBLE RESTRICTIONS

In theory, it is possible to establish a nutritional status surveillance system as stated. In practice, difficulties will be encountered which, if overcome, will permit the establishment of all or part of the system. What is feasible is to carry out at the local level of the health structures (e.g. primary health services) minimal activities as those previously described in the control of the nutritional status of mothers and children, with ample participation of the community.

Restrictions of technical type related to measurements and indicators of nutritional status could be identified and corrected, fundamentally depending on the situation prevailing in each country, the development of its health structures, the existing information systems, the availability of trained personnel to establish and supervise the surveillance activities, the quality of the existing equipment (e.g. scales for weight collection, infantometers or height scales, etc.), the standardization achieved in the taking of measurements and, above all, on the motivation, at all levels, of the health personnel.[3]

In accordance with our experience, a permanent effort of the nutrition specialist will be required (physician and nutritionist-dietitian) to demonstrate the feasibility of establishing nutritional status surveillance systems.

FUTURE ACTIONS

The countries who so wish it, will receive technical cooperation from international organizations such as PAHO/WHO and its specialized centers INCAP and CFNI to develop collaborative programs on nutritional surveillance systems. Concrete steps have already been taken in this direction by some countries (Honduras, El Salvador, Colombia and St. Kitts) for the development of nutritional surveillance models and their verification in experimental areas, a procedure which will eventually permit their incorporation into regional or national coverage systems.

We are sure that as a result of this Colloquium held as part of the IV Latin American Nutrition Congress, there will be many SLAN colleagues who will assume decided leadership in promoting the establishment of epidemiological and nutritional surveillance systems in various countries of the Region.

RESUMEN

INFORMACION DEL SECTOR SALUD EN UN SISTEMA DE VIGILANCIA NUTRICIONAL

Se reconoce que la vigilancia epidemiológica del estado nutricional debe formar parte de los sistemas usuales de información estadística de los Servicios de Salud, a fin de que sea componente prioritario de la informática en salud y a la vez, elemento de agregación y complementaridad para el establecimiento de sistemas globales de vigilancia sobre la situación alimentaria y nutricional de los grupos más susceptibles de la población.

Se propone realizar la vigilancia del estado nutricional, utilizando los sistemas que existen en la mayoría de los servicios de salud de los países, para la vigilancia epidemiológica de las enfermedades transmisibles. Estos sistemas tienen condiciones favorables y experiencia utilizable para la recolección, el análisis y la difusión de la información en nutrición, con el propósito de actuar oportunamente, desde el punto de vista preventivo, curativo y de rehabilitación.

BIBLIOGRAPHY

1. Metodología para la formulación de políticas nacionales de alimentación y nutrición y su ejecución intersectorial. Informe final de las Discusiones Técnicas de la XXIII Reunión del Consejo Directivo de la OPS. *Bol. Of. San Pan., 80:* 478-497, 1976.

2. *Normas Generales para Establecer un Sistema de Datos en la Evaluación del Estado Nutricional.* OPS/OMS. Documento FNU. 76.1, enero de 1976. (Mimeographed document).

3. *Methodology of Nutritional Surveillance.* Report of a Joint FAO/UNICEF/ WHO Expert Committee, Geneva, 1-10 October, 1975. Geneva, World Health Organization, 1976, 66 p. (WHO Technical Report Series No. 593).

AGRICULTURAL, LIVESTOCK, METEOROLOGICAL AND SOCIOECONOMIC INDICATORS, SOURCES, COLLECTION AND FLOW OF INFORMATION*

*Manuel Martínez y Martínez***

**Permanent Secretariat of the General
Central American Economic Integration Treaty (SIECA),
Guatemala, C.A.**

SUMMARY

The paper presented herein pursues to characterize the agricultural, livestock, metereological and socioeconomic indicators. The purpose is to consider their use in nutritional epidemiological surveillance, based on the hypothesis that they are relevant in those variables affecting food supply and demand to satisfy the nutritional requirements of the low-income populations in Central America. First, the physical framework of the region is characterized as well as the structure and dynamic conditions of the economy, bearing in consideration those variables that affect the development process, especially that of the agricultural sector. Generalization is made in a summarized form on the evolulution of the agronomic production, on the situation prevailing in the agrarian structures, and on some aspects related to the social components which in one way or another affect the nutritional aspects and the quality and living conditions of the population. Among them, the following are cited: income, unemployment, education, food, health, and housing conditions. The presentation ends with a series of recommendations as to the need of unifying criteria in regard to the selection, study and presentation of the above-mentioned indicators, so that they may have a periodic, truthful, opportune, up-to-date and comparable diffusion for further use in the Latin American environment.

I. GENERAL DESCRIPTION OF CENTRAL AMERICA

Central America is composed of five countries, Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica in a narrow band extending North-East to South-East

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Director of the Agricultural Department of SIECA.

between the Atlantic and Pacific Oceans, limiting on the North with Mexico and on the South with Panama; its position between the Equator and the Tropic of Cancer imparts it the character of a torrid zone, a factor which is determinant of its climate.

Its territorial area measures 441,070 km^2 with a population which in 1970 totalled 15.0 million inhabitants. In 1975 this reached 17.6 million inhabitants, registering in 1970-75 a growth rate of 3.2%, wich means that its demographic growth is one of the highest in the world.

A great migration from the rural to the urban areas is registered in the region. Thus in 1960 the urban population constituted 28.5% of the total population and in 1970 that relation was of the order of 33.5% with an increase index of 25.5%. Another important aspect is that around 60% of the Central American population is dedicated to agricultural activities.

Considered as one of the factors of the economic development process, the Central American population presents favorable characteristics. Among these it is worthwhile mentioning a rather elastic social stratification that permits its mobility – which is basic for economic growth – as well as its prompt adaptation to sudden changes and an adequate response to economic motivations.

On the negative side one should mention the very high demographic growth, a fact that merits great attention in view of the problems posed by housing, services and, mainly, the creation of new working opportunities. Furthermore, the present age structure overloads the economic activity to a relatively minor population together with a very low educational level.

Independently of the previous observations, Central America as a whole counts with great extensions of agricultural and forest land not utilized, which represent more or less twice the surface actually under any form of tenure.

II. INDICATORS ON THE EVOLUTION OF PRODUCTION *

A. Evolution of Agronomic Production

During the 1960-70 decade the agricultural and animal production grew at an annual rate of 4.4% influencing on such growth both the increment of the cultivated area as well as the improvements in land productivity.

Seventy-five percent of the Central American livestock production originates from net agricultural crops, whose growth during the decade was of 4.2%, although in the second quinquenium the rhythm of said production was only of 2.2 per year, due to the problems faced in regard to export crops, mainly that of cotton.

* See Tables 1 and 2.

TABLE 1

SOCIAL INDICATORS OF THE CENTRAL AMERICAN ECONOMY

	CONCEPT	CENTRAL AMERICA	GUATEMALA	EL SALVADOR	HONDURAS	NICARAGUA	COSTA RICA
1	*Agrarian Structure*						
	1.1 Territorial area (thousands of hectares)	42 311	10 889	2 114	11 173	13 055	5 080
	1.1.1 *Territorial area distributed in per cent according to its potential productive capacity*	100.0	100.0	100.0	100.0	100.0	100.0
	i Intensive use	12.0	14.7	31.4	7.8	6.0	22.7
	ii Extensive use	23.0	27.0	3.1	9.2	32.1	29.7
	iii Forest use	36.6	29.3	8.2	55.1	31.3	37.1
	iv Combined forestry and agricultural use	5.7	–	–	0.9	17.5	–
	v Very extensive use	22.7	29.0	57.3	27.0	13.0	10.5
	1.2 Farm area (thousands of hectares)	14 542	3 752	1 646	2 462	3 939	2 743
	1.2.1 Per cent utilization of farm surface	100.0	100.0	100.0	100.0	100.0	100.0
	i Annual crops	14.0	18.2	18.5	14.9	10.8	9.3
	ii Permanent crops	8.3	9.7	11.5	8.9	4.8	8.9
	iii Pastures	43.2	29.8	42.5	50.4	51.8	43.0
	iv Resting	7.5	8.3	9.0	7.9	7.1	5.7
	v Wood and forest area	23.6	29.9	10.5	15.0	22.5	32.4
	vi Other lands	3.4	4.1	8.0	2.9	3.0	0.7
	1.3 Per cent distribution of land in farms *by strata, 1970*	100.0	100.0	100.0	100.0	100.0	100.0
	1.3.1 From 0 to 4 hectares	6.6	12.3	13.6	6.3	1.6	1.8
	1.3.2 From 4 to 35 hectares	20.2	21.4	21.9	33.5	13.1	15.7
	1.3.3 From 35 to 350 hectares	35.2	23.9	33.6	32.7	44.1	41.1
	1.3.4 From 350 hectares and more	38.0	42.4	30.9	27.5	41.2	41.4
2	*Income Structure*						
	2.1 National income in 1960 (millions of $CA)	2 350.6	912.2	489.7	311.7	290.0	347.0
	National income in 1972 (millions of $CA)	5 305.1	1 866.9	984.1	683.5	832.1	938.5
	2.2 Mean income *per capita* in 1960 ($CA)	214.4	235.8	195.0	168.6	193.2	281.4
	Mean income *per capita* in 1972 ($CA)	331.0	336.4	267.1	247.0	386.7	511.2
	2.3 Estimation of per cent distribution of global income by strata, 1970	100.0	100.0	100.0	100.0	100.0	100.0
	2.3.1 Low strata = 50% of the population	13.0	13.0	16.0	13.0	15.0	18.0
	2.3.2 Middle strata = 30% of the population	26.0	24.0	24.0	24.0	25.0	26.0
	2.3.3 High strata = 15% of the population	30.0	28.0	33.0	30.0	32.0	27.0
	2.3.4 Very high strata = 5% of the population	31.0	35.0	27.0	33.0	28.0	29.0
3	*Food and Nutrition*						
	3.1 Number of daily calories adequate for an adult person	2 500	2 500	2 500	2 500	2 500	2 500
	3.2 Adequate daily proteins per person, g	65.0	65.0	65.0	65.0	65.0	65.0
	3.3 Number of calories consumed daily per person, g (1970)	2 132	2 021	1 001	2 250	2 380	2 457
	3.4 Proteins consumed daily per person, g (1970)	53.5	50.3	45.1	55.8	64.2	63.6
4	*Professional Health Services in 1970*						
	4.1 Physicians per 10,000 inhabitants		2.5	2.3	2.7	5.1	5.5
	4.2 Dentists per 10,000 inhabitants		0.6	0.8	0.6	1.2	1.4
	4.3 Nurses per 10,000 inhabitants		1.5	2.4	1.3	2.3	5.7
5	*Education*						
	5.1 Illiteracy rates in 1970	42.2	55.0	42.0	43.0	62.0	11.0
	5.2 Absorption capacity rates of the educational system						
	5.2.1 Primary level	53.9	35.2	54.0	65.5	47.3	67.4
	5.2.2 Secondary level	23.7	19.4	24.0	13.9	20.7	40.6
	5.2.3 High level	2.6	3.0	2.0	0.9	2.2	5.0
	5.3 School desertion rates 1962-1967	13.7	16.2	9.4	24.0	24.5	6.0
	5.4 School retention rates 1962-1967	24.3	18.1	29.6	18.5	14.0	43.3
	5.5 School retention rates 1967-1970						
	5.6 Per cent rate of passing students attending school 1962-1967	21.4	16.7	20.0	16.0	10.3	40.7
	5.7 Evolution index of enrollment 1962 (based on 1960)	6.8	6.8	4.9	7.7	11.8	6.7
	Evolution index of enrollment 1970 (based on 1960)	6.1	6.2	5.2	6.4	7.5	5.8
	5.8 School-age population growth rate 1960-1970	3.8	4.5	3.4	2.9	3.2	4.4
6	*Estimation of Housing Deficit*						
	6.1 Thousands of units in 1965 per 10,000 inhabitants	1 710.2	557.1	445.1	280.0	212.6	115.4
	6.2 Thousands of units in 1970 per 10,000 inhabitants	2 115.8	764.2	520.2	368.5	269.9	193.0
	6.3 Thousands of units in 1975 per 10,000 inhabitants	2 577.8	888.4	603.8	468.2	335.7	281.7

SOURCE: CEPAL. *Situación y perspectivas del empleo juvenil en el Istmo Centroamericano*, abril de 1972.
CELADE. Boletín demográfico 1968, 1969, 1970.
NACIONES UNIDAS. El Cambio Social y Política de Desarrollo Social en América Latina, 1969.
GAFICA. Datos de Población. *Volumen II*. Marco Cuantitativo. Diciembre de 1972.
SIECA. 5o. Compendio Estadístico Centroamericano.
CEPAL. Consideraciones sobre la situación del empleo en Centroamérica.
UNICEF, SIECA, ODECA. Las Sociedades Centroamericanas Actuales.
NACIONES UNIDAS. Los recursos humanos en Centroamérica, Panamá, México y sus relaciones con algunos aspectos del desarrollo.

TABLE 2

STRUCTURAL AND DYNAMIC CHARACTERISTICS OF THE ECONOMY

	CHARACTERISTICS	CENTRO-AMERICA	GUATE-MALA	EL SAL-VADOR	HONDU-RAS	NICA-RAGUA	COSTA RICA
1.	*Population Indicators*						
1.1	Total population in 1960 (thousands of inhab. at mid-year)	10 963	3 868	2 512	1 849	1 501	1 233
	Total population in 1973	16 561	5 642	3 814	2 864	2 222	2 019
	Total population in 1980	20 946	6 913	4 904	3 661	2 818	2 650
1.2	Mean annual pop. growth rates 1960-1970	3.2	3.0	3.2	3.4	3.0	3.8
	Mean annual pop. growth rates 1970-1975	3.3	2.9	3.5	3.5	3.3	3.8
	Mean annual pop. growth rates 1975-1980	3.4	2.9	3.7	3.6	3.5	3.8
1.3	Annual birth rates per 1,000 inhab. 1970-1975	45.0	41.6	46.5	48.5	46.8	44.5
	Annual birth rates per 1,000 inhab. 1975-1980	44.5	40.4	46.3	47.7	47.4	44.1
1.4	Annual death rates per 1,000 inhab. 1970-1975	12.3	13.0	11.0	15.2	14.7	6.0
	Annual death rates per 1,000 inhab. 1975-1980	10.8	11.3	9.4	13.6	13.1	5.4
1.5	Mean annual fertility rates 1970-1975	6.6	6.0	6.9	6.9	6.7	6.8
	Mean annual fertility rates 1975-1980	6.4	5.7	6.9	6.7	6.7	6.6
1.6	Percentage of population under 14 years 1970	46.6	45.7	47.1	46.7	47.1	47.9
	Percentage of population under 14 years 1980	46.0	43.4	48.3	47.0	46.1	47.5
1.7	Percentage of population over 65 years 1970	3.0	3.0	3.0	2.4	3.1	3.2
	Percentage of population over 65 years 1980	3.0	3.0	3.0	2.4	3.0	3.3
1.8	Population density per km² in 1960	26.2	35.5	119.9	16.5	12.7	24.2
	Population density per km² in 1970	36.1	47.7	164.4	23.0	17.1	35.3
	Population density per km² in 1980	50.3	63.5	234.2	32.7	23.8	52.1
1.9	Percentage of rural population in 1960	71.3	72.1	68.6	79.2	66.2	68.8
	Percentage of rural population in 1970	66.4	68.9	62.1	72.3	60.0	66.0
	Percentage of rural population in 1980	60.2	64.8	53.9	65.0	52.5	61.7
1.10	Life expectancy at birth 1965-70 (No. years)	54	51	55	49	50	67
2.	*Production Structure*						
	Total NGP 1972 (Millions of $CA)	6 303.7	2 182.8	1 156.2	808.5	989.9	1 166.3
2.1	Agriculture, forestry, game and fishery	1 694.8	614.9	296.2	279.4	252.1	252.2
2.2	Mines and quarries	25.3	2.0	1.8	17.9	2.6	1.0
2.3	Manufacturing industry	1 104.8	351.0	220.1	120.6	187.7	225.4
2.4	Construction	211.8	41.7	39.7	40.0	30.1	60.3
2.5	Electricity, gas, water	95.5	24.4	17.7	12.0	19.6	21.8
2.6	Transportation	306.3	99.7	55.7	51.3	51.0	48.6
2.7	Commerce	1 369.8	613.6	259.1	101.4	200.4	195.3
2.8	Finances	155.6	36.5	28.1	23.7	25.7	41.6
2.9	Housing	381.2	143.6	43.9	63.9	58.6	71.2
2.10	Public and Defense Administration	444.2	117.9	95.3	29.4	61.2	40.4
2.11	Other Services	514.4	137.5	98.6	68.9	100.9	108.5
3.	*Total Balance of International Exchange Commerce, 1972 (Millions $CA)*	(183.8)	(53.2)	(5.6)	(22.3)	(7.6)	(106.3)
3.1	Imports in real estate and Services (Millions $CA)	1 767.3	451.6	331.8	241.0	298.6	444.3
3.2	Exports in real estate and Services (Millions $CA)	1 583.5	398.4	337.4	218.7	291.0	338.0
4.	*Balance of Commerce with Central America, 1972 (Millions $CA)*	-	37.7	10.7	(15.3)	(4.1)	(29.0)
4.1	Imports	305.7	68.8	74.4	22.4	60.8	79.3
4.2	Exports	305.7	106.5	85.1	7.1	56.7	50.3
5.	*NGP Growth Rate 1960-1972*	7.3	6.3	6.1	7.1	9.4	8.9
6.	*Distribution of NGP by inhabitant 1960 ($CA)*	248	270	226	192	224	339
6.1	Distribution of NGP by inhabitant 1972 ($CA)	393	398	314	292	460	601
7.	*Growth Rate of Agricultural NGP 1960-1972*	6.4	6.3	4.3	5.4	10.1	7.9
8.	*Growth Rate of Industrial NGP 1960-1972*	9.3	8.4	8.5	9.7	11.0	10.0

NGP = National gross product.

SOURCE: CEPAL. [illegible]ión y perspectivas del empleo juvenil en el Istmo Centroamericano, abril de 1972.
CELADE. Boletín demográfico 1968, 1969, 1970.
NACIONES UNIDAS. El Cambio Social y Política de Desarrollo Social en América Latina, 1969.
GAFICA. Datos de Población. Volumen II. Marco Cuantitativo. Diciembre de 1972.
SIECA. 5o. Compendio Estadístico Centroamericano.
CEPAL. Consideraciones sobre la situación del empleo en Centroamérica.
UNICEF, SIECA, ODECA. Las Sociedades Centroamericanas Actuales.
NACIONES UNIDAS. Los recursos humanos en Centroamérica, Panamá, México y sus relaciones con algunos aspectos del desarrollo.

In regard to the agricultural production value, the exportation articles represent more than 50% of the production. Of these, sugar cane registers a greater index of internal consumption, since 70% of the sugar production was destined to internal consumption, while in regard to coffee, banana and cotton, the internal consumption was les than 15% of the total production.

In 1970 the main products of domestic consumption such as cereals, roots and tubers, and fruits and legumes, occupied more than 60% of the cultivated area, but represented 25% of the gross value of the total crops in general.

On the other hand, export products occupied less than 30% of the cultivated area and generated more than 50% of the gross production value; this fact is not attributable only to the price structure but also to the land quality and to the technology employed in their production.

Among the basic grains, rice had a greater percentage increment during the 1960-70 decade (46.8%) and corn had the lesser increase (2.8%). Within the export crops, banana was the highest, with a yield increment of 93%, while that of cotton was only of 8.1%.

B. *Indicators on the Use of Physical and Mechanical Inputs*

The use of fertilizers is observed mainly in plantations whose surface surpasses 35 hectares, which absorb more than 80% of the total input employed. Although the use of tractors in agriculture is low in a proportional relation to its employment in other Latin American countries, it has notably increased during the last years.

C. *Evolution of Animal Production*

During the 1960-70 decade the animal production value registered an annual growth rate of 5%. The main factor for this growth was the expansion of beef production which, in turn, represented two-thirds of the animal production in 1970, with an annual growth rate of 5.2% in the above-mentioned decade. In contrast, the avicultural and porcine production registered growth rates of 4.7% and 4.1%, respectively.

The birth index of bovine cattle is below that registered in Latin America, varying between 21.5 to 27.2 per cent.

In physical terms, with the exception of Costa Rica, bovine growth rate was lower than the population growth rate, and the pasturing index remains under one head per hectare in a clearly pasturage-feeding system.

D. *Indicators of the Agrarian Structure*

Because in the prevailing agricultural and animal census of Central America

there are no farms (fincas) coinciding insofar as their tenure characteristics are concerned, with regard to the classification defined by the Inter-American Agricultural Development System (CIDA), the following designations that homogenize the size structure of the exploitations have been adopted:

1. Minifarms: very small units, the extension of which is below that of a block, and which in general cannot be classified as fincas. This is the case of small farms and orchards that frequently are dedicated to the cultivation of vegetables for personal autosupply.

2. Subfamily Units: land surfaces that are not sufficient to satisfy the minimal needs of a family with regard to utilization of labor and income.

3. Family Units: land surfaces whose extension is sufficient for labor and family sustenance, in accordance to predominating techniques.

4. Medium and large Multifamily Units: land surfaces which require the employment of paid labor in addition to family labor.

In agreement to available censal information, representations of the number and occupied surface areas were obtained following the previous classification, as cited herein:

1. Minifarms: represent 24.1% of the total of fincas (plantations), and occupy 0.7% of the total surface area.

2. Subfamily Units: represent 54.8% of the total, and occupy 9.1% of the surface.

3. Family Farms: represent 15.0% of the total, and occupy 16.2% of the surface.

4. Multifamily Units: represent 6.1% of the total, and occupy 74.0% of the surface.

From the above statements, one can see that 93.9% of the farms occupied 26.0% of the land surface, while 6.1% of the farms occupied 74.0% of the land. In addition, it has been observed that the subfamily farms dedicate 81.0% of the surface mainly to transitory crops, while in the multifamily units only 9.4% is utilized. The latter is indicative of the fact that even in the case of lands under certain tenure forms, in Central America there is sufficient surface which is being used with a marginal advantage, or simply is not under economic exploitation.

For complementary purposes, it is necessary to point out that food production is concentrated in more than 80.0% in the smallest farms – less than 7 hectares – while the larger ones are dedicated to pasture and export crops.

The most common form of land tenure in the region is as follows:

a) Private property: represents 44.8% of the total;

b) Land rented: represents 36.0% of the total; and

c) Mixed forms (include common land): represent the remaining 19.2 per cent.

E. Source, Collection and Flow of Information

The basic information source of the agricultural and animal production in Central America is obtained from the agricultural and animal census, which supposedly should be carried out every 5 years; however, as of 1950 to date, only four census have been carried out in Costa Rica and three in the remaining countries of the region.

In a complementary way, the Directions of Statistics and decentralized organizations carry out annual production surveys of the basic food products and of export products, which, as in the case of the census, are published rather late.

In the field of research and publication of indicators at national level, universities, central and fomentation banks, as well as private institutions play a very important role.

At the regional level there exist a series of agencies that carry out research in this area and the results of which constitute a valuable information source. Among these, the following should be cited: the Permanent Secretariat of the General Central American Economic Integration Treaty (SIECA), The Central American Bank for Economic Integration (CABEI), the Inter-American Institute for Agricultural Sciences (IIAS); the Institute of Nutrition of Central America and Panama (INCAP) and other international organizations such as the Food and Agriculture Organization of the United Nations (FAO) which, in one way or another, are linked or assess the integration process and are related to the agricultural field.

Finally, during the present year the Agricultural and Animal Information Program of the Central American Isthmus (PIADIC) of the IIAS, with headquarters in San José, Costa Rica, initiated its work. Its objectives are to strengthen the national agricultural and animal information systems and create a regional data bank for the purpose of generating a permanent and dynamic flow of information of agricultural socioeconomic character.

III. SOCIOECONOMIC INDICATORS OF CENTRAL AMERICA*

The indicators presented further on are those considered as compatible with the

* See Table 2.

economic goals of the strategy of integrated social development of Central America.

The economic situation of Central America has reached a developmental degree influenced mainly by the great effort made within the economic integration process, which has turned the situation towards a take-off position, overcoming obstacles and solving problems that 10 years ago were considered as unsolvable.

*A. Social Matters**

At the initiation of the integrationist scheme, the socio-political aspects were handled by the Organization of Central American States (ODECA), which published technical menographs containing very valuable social indicators which should be updated. INCAP has dedicated great efforts to research in nutrition and health, achieving important discoveries that could well be the basis to correct the maladjustments in such subject matters today.

*B. Income Distribution**

According to SIECA/GAFICA estimates, in 1970, 50% of the Central American population perceived 13.0% of the general total income for economy, which means an annual *per capita* income of $CA 74.00 while 5.0% of the population perceived 31.0% of the income with a *per capita* income of $CA 1,760.00. It is possible that this situation has been modified during the last years as a consecuence of the reduction of the real income of the majority of the population due to the effect of the world inflationary process.

C. Unemployment and Underemployment

In 1970 the estimated unemployment index was of 8.5% of the economically active population, which in absolute terms represent around 445 thousand unoccupied persons. This situation is still more severe if one realizes that the demographic expansion is greater than the absorption capacity that is being generated in the production system. For example, in the agricultural sector the real working offer covers 1.7 million persons, while the working force is of 3.2 millions, a figure which indicates that 1.5 million are in underemployment conditions.

D. Education

The primary school index was of 53.9% in 1970, which means that, for several reasons, 46% of the school-age children did not inscribe in the primary school. Among the several responsible causes one must cite the lack of capacity of the system and the fact that within the agricultural population, a greater number of children work in field activities, even as paid laborers instead of attending school.

---

* See Figure 1.

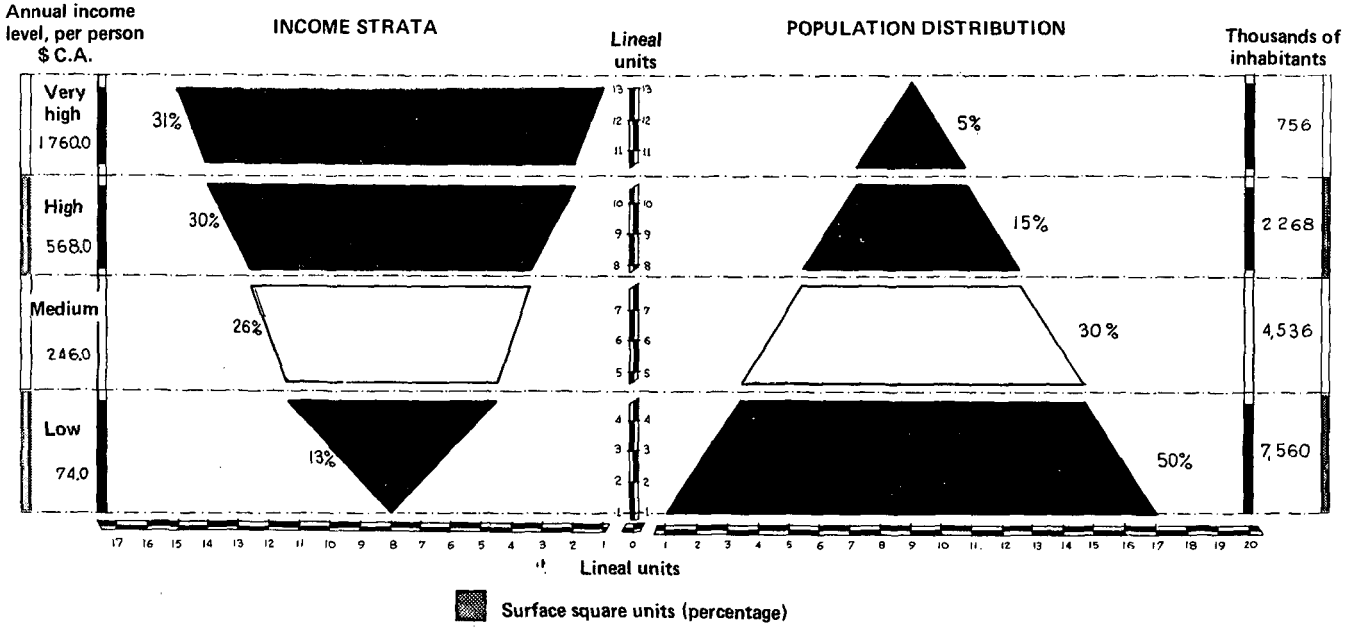

Fig. 1. Central America: per cent distribution of income in relation to the population, 1970.

This situation is aggravated if one considers that of the 100% population registered for primary education, only 21.4% finishes the sixth grade, facts from which a desertion of great proportions can be determined. On the other hand, of the 100% registered in the medium and superior-level schools, only 23.7% and 2.6%, respectively, finish their schooling.

Illiteracy in 1970 reached 43%, and of the economically active populations two-thirds of it do not have any school instruction.

E. Food, Nutrition and Housing

Studies carried out by INCAP determine that the nutritional status of the Central American population is considered highly deficient, since according to average estimates of minimal calorie and protein consumption, as compared with those reached in 1970, so demonstrate it:

Consumption	Minimum of adequacy	Actual degree reached
Daily calories	2,500	2,132
Daily proteins	65 grams	53.5 grams

It has been recognized that if no extreme measures are taken, the situation tends to drastically increase, if one takes into account the fact that the prices of products of popular consumption have raised in a more than out of proportion form with regard to that registered in the actual income of the majority of the population.

F. Housing

In agreement with available censal information and with the projections carried out, in 1970 it was estimated that the housing deficit in the region reached 1.5 million dwellings. This situation has been ostensibly aggravated by the disasters that occurred during the past five years, such as the earthquakes in Nicaragua and Guatemala, and the hurricane in Honduras.

G. Flow and Sources of Socioeconomic Information

The source and flow of information of the socioeconomic indicators are very similar to those detailed for agricultural and animal production. In addition, periodic research is carried out also on these subjects, among which one should state, at national level, those carried out by the economic and social research institutes of the respective autonomous and private universities.

In the field of its competence, the Institute of Nutrition of Central America and Panama has carried out a research task of immensurable value achieving discoveries that are known and put into practice not only in the Central American Isthmus but in the whole world. These constitute one of the most valuable information sources, both in the field of nutrition as well as in other social areas.

Finally, it is worthwhile pointing out that at present an integral study is being conducted in Central America on the situation of the peasants in the rural area that trascends the establishment of simple indicators. This obeys to the fact that in its realization, the socioeconomic structures and their behavior in the development process will be identified, as well as those research studies that determine the behavior of the field workers, among others, their aspirations, their attitudes towards the change processes and their degree of social participation. In this manner it is pretended to give form to the factors that contribute to define the quality and conditions of their respective interrelations in the Central American agro.

IV. METEOROLOGICAL INDICATORS OF CENTRAL AMERICA

With the assistance of the United Nations Development Program, as of March 1972 the Central American hydrometeorological service which includes Panama, was established. This constitutes the fundamental structure to coordinate the research work of the program at area level in this field.

With the above-mentioned program 282 main hydrologic basins, 121 of which are located in the watersheds of the Atlantic Ocean and 166 in the Pacific have been detected.

In accordance to the importance of the watersheds and the own needs of each region, numerous climatologic stations have been established. These are classified as Main, Ordinary and of Precipitation observation, where observations of elements such as precipitation, humidity, cloudness, temperatures, time characteristics, duration and velocity of winds, etc. are carried out.

In addition, Central America counts with 219 stations for measuring the water volume of the rivers, where they determine the quality of the waters, the maximum, medium and minimal volume per hours, days, etc., as well as measurements of sediments in suspension, conductibility, acidity (pH) etc. Furthermore, measurements of the levels of all lakes and lagoons existing in Central America are also taken.

All the reference information is published in Meteorological and Hydrologic Yearbooks where monthly tables are presented informing as to the daily situation concerning each of the elements observed. Nevertheless, its printing is made quite tardily and for this reason it constitutes a historic account for the researcher.

V. RECOMMENDATIONS

In accordance with the concepts expressed in the present document, it is evident that there are, on the one hand, subnumbering and disparities in the agricultural and livestock census of Central America, in order to measure in a comparable form those aspects related to *agricultural and animal production* indicators.

Likewise, the lack of compliance with the agreement to carry out every five years an agricultural census at each country's level is evident, searching the means of increasing its content and coordinating it in its highest expression. On the contrary, some of the more recent census have in essence unequal and different contents and even limitations in regard to the information they supply.

In this manner, it is timely to point out that in order to reach the determined degrees of development achieved by the five countries, which have different advancement levels, for the purpose of attacking in each one of them the problems they face, and that in some way constitute barriers to initiate their take-off, it is necessary that research, especially the agricultural and livestock census, have the greatest degree of comparability and content.

In this context, it would be desirable that such census permit determination of the following aspects in a comparable form:

—Comparable tenure characteristics, detailing their prevalence in those cases such as leasing and mixed forms.

—Degree and characteristics of the utilization of family labor according to the size of the exploitations.

—Characteristics of production according to the farm area and land tenure.

—Availability of agricultural land according to the tenure forms of the exploitation unit.

—Availability of agricultural tractors, equipment, production implements and quality of storage facilities, according to the exploitation size.

—Use of input and credits according to the products and size of the exploitation.

—Degree of agricultural investment and capital according to the size and form of land tenure, a[illegible]

—Destination of the products according to the size and tenure of the exploitations — human and animal consumption, destined for sale and for seed.

Of no lesser importance, it would also be convenient to carry out every five years family income and expenditure surveys, for reasons of residence, in order to determine the degree of consumption improvement or deterioration and of the actual income of the population, as well as on the relevant characteristics of conditions and quality of life, especially in the rural sector.

In view of the fact that, as already mentioned, the information on indicators is provided at a rather late date, it would be convenient to recommend that the flow of same be more dynamic and permanent, as well as periodic, reliable, up to date and comparable. Hence, the suggestion of supporting regional institutionalization in all its magnitude, formulated by the Agricultural and Animal Production Information Program of the Central American Isthmus – PIADIC – once the external financial aid has fulfilled its period of assistance, which has been determined to be of 3 years.

It would also be convenient to carry out the updating of the document "Statistics on Food and Agriculture in Central America" whose actual content comprises the 1960-1970 decade. This constitutes a valuable and wide-detailed statistical information source on the production and consumption of a considerable number of primary food products and their byproducts.

Finally, it would be convenient to perform meteorological studies to determine, if possible, states of alarm in regard to droughts or in the case of the excessive rains which frequently affect the Central American agricultural production. On the basis of these studies, it would be feasible to determine the establishment of contingency inventories of the main foods of popular consumption, in particular the basic grains – corn, beans, rice and sorghum – in order to face the emergency situations that in the past years have been a prevalent factor in the Central American area.

RESUMEN

INDICADORES AGROPECUARIOS, METEOROLOGICOS Y SOCIOECONOMICOS, FUENTES, RECOLECCION Y FLUJO DE LA INFORMACION

La ponencia persigue caracterizar los indicadores agropecuarios, meteorológicos y socioeconómicos, con el fin de considerar el uso de los mismos en la vigilancia epidemiológica nutricional, partiendo del supuesto que son relevantes en aquellas variables que afectan la oferta y la demanda de alimentos, para satisfacer los requerimientos nutricionales de la población de bajos ingresos en Centro América. Inicialmente se caracteriza el marco físico de la región y las condiciones estructurales y dinámicas de la economía, teniendo en cuenta aquellas variables que inciden en el proceso de desarrollo, en forma especial del sector agrícola. Se generaliza en forma resumida, sobre la evolución de la producción agropecuaria, la situación que prevalece en las estructuras agrarias, así como en algunos aspectos relacionados con los componentes sociales que de alguna manera inciden en los aspectos nutricionales y en la calidad y condiciones de vida de la población, tales como el ingreso, el desempleo, la educación,

la alimentación, la salud y la vivienda. Se concluye haciendo una serie de recomendaciones sobre la necesidad de unificar criterios en cuanto a la selección, el estudio y presentación de los indicadores señalados, a efecto de que los mismos tengan una divulgación periódica, veraz, oportuna, actualizada y comparable para usos ulteriores en el ámbito latinoamericano.

BIBLIOGRAPHY

1. Secretaría Permanente del Tratado General de Integración Económica Centroamericana (SIECA). *El Desarrollo Integrado de Centro América en la Presente Década.* Guatemala, C.A., Desarrollo Agrícola, Tomo 5, Política Social, Tomo 7, 1974.

2. SIECA. *Cuarto Compendio Estadístico Centroamericano.* Guatemala, C.A., 1975.

3. SIECA. *Estadísticas sobre la Alimentación y la Agricultura en Centro América.* Guatemala, C.A., 1973.

4. SIECA-FAO (Grupo Asesor de la FAO para la Integración Centroamericana —GAFICA—). *Perspectivas para el Desarrollo y la Integración en Centro América.* Guatemala, C.A., mayo de 1974.

5. SIECA. *Estadísticas Sociales.* Guatemala, C.A., mayo de 1973.

6. SIECA. *Consideraciones sobre el Crecimiento y Estructura de la Producción Agrícola Centroamericana.* Guatemala, C.A., agosto de 1976.

7. SIECA. *La Política del Desarrollo Social dentro de la Integración Económica Centroamericana.* Guatemala, C.A., 1975.

8. Naciones Unidas. *Proyecto de Ampliación y Mejoramiento de los Servicios Hidrometeorológicos e Hidrológicos en el Istmo Centroamericano.* Anuario Hidrológico, 1972.

9. Grupo de Tenencia de la Tierra y Desarrollo Rural (GTT). *Tenencia de la Tierra y Desarrollo Rural en Centro América,* enero de 1971. (Mimeographed document).

10. Martínez y Martínez M. *Apuntes sobre la Estructura Agraria en Centro América y Panamá.* Guatemala, C.A., 1974 (Mimeographed document).

Comments on the paper

AGRICULTURAL, LIVESTOCK, METEREOLOGICAL AND SOCIOECONOMIC INDICATORS' SOURCES, COLLECTION AND FLOW OF INFORMATION*

*Maritza Izaguirre Porras***

Catholic Unlversity "Andrés Bello", Caracas Venezuela

INTRODUCTION

In the present document the indicator is defined as the empiric representation of a given variable. Therefore, the definition of an indicator supposedly requires at least two steps:

1) The theoretical definition of the concept

2) The operational definition of the variable

The first implies the selection of analytic categories derived from the concept to be defined, and the second, the identification of the measurable components of the variables or attributes of the subject.[1]

In this case, indicators refer to those variables which affect the supply and demand of foods destined to satisfy the nutritional needs of a given population. In his paper, Engineer Martínez exemplifies this situation for the Central American population.

The purpose of this presentation is to offer an explanation of the use of such indicators in the nutritional epidemiological surveillance. The following assumptions are the basis to achieve this objective:

1. That indicators represent the operational definition of the variables.

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems, IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Planner Sociologist, Universidad Católica "Andrés Bello", Caracas, Venezuela.

2. That the variables herein studied may be classified within four analytical categories:

   a) the ecosystem

   b) the food production subsystem[2]

   c) the food processing and distribution subsystem[2], and

   d) the food consumption subsystem[2].

3. That knowledge of these variables is necessary for the adequate instrumentation of the planning process, especially in:

   a) the identification and quantification of the problem in the diagnosis phase

   b) the quantification of objectives in terms of goals and the design of concrete programs and projects

   c) the subsequent evaluation of the execution of plans, programs and projects.

4. That the real understanding of the problem requires the analysis of the interrelationship among the four analytical categories identified, since they influence the interplay of food supply and demand.

The paper herein commented deals first with the indicators as referred to the ecosystem, since behavior of climate and other variables decisively affects the production factors. Subsequently, the variables intervening in the food production, distribution and commercialization phases are identified, and ends with those elements that contribute to determine food demand, herein identified as the consumption subsystem.

THE INDICATORS OF THE ECOSYSTEM

By indicators of the ecosystem we should understand those related with climatic variables that allow to define:

1. Climate typologies, and
2. Climate influence on
   a) soils
   b) forest and vegetation

c) agriculture

d) health

e) work capacity, and

f) physical capital.

Gunnar Myrdal[3] in his well-known work on the underdevelopment problem in South-East Asia examines their impact as conditioning factors of development, and warns that their interrelationships have not been sufficiently studied. For example, he cites the fact that in spite of the luxuriant vegetation of the humid tropical forests, in the majority of the cases the soil is not apt for agriculture. He also states that the rainy and dry seasons imply the development of systems for the control of floods and irrigation, but that the latter two are plagued with problems such as the frequent cleaning of ducts because the climate favors the rapid growth of underbrush that obstructs the flow of water in the dry season. On the other hand, the humid climates not only affect the health and productivity of the laborer but also the herds and other animals are affected by parasitic diseases and fungus. Finally, some inputs necessary for the commercial agricultural production such as tractors and collection and storage equipment, deteriorate more rapidly than in temperate climates. This example serves to illustrate the importance of the climatic factors in food production, since supply will be basically constituted by the availability of products of vegetable and animal origin which form an important part of the daily diet.

Hence the need to establish procedures which permit the systematic collection of information, to favor the interdisciplinary work of ecologists, biologists, geographers and other experts, in the analysis and interpretation of data to supply planners with coherent and reliable information on the subject. Thus, the planner will be able to design feasible strategies aimed to overcome some of the above-mentioned problems, a fact that, on the other hand, should be closely related to the development of suitable technologies.

INDICATORS OF THE FOOD PRODUCTION SUBSYSTEM

The paper we are commenting on identifies the following indicators as representative of the subsystem, considering:

1. Agriculture production specified by products, by geographic origin and by destination (internal or export consumption).

2. Inputs utilized in the production, such as fertilizers, manure and use of machinery and equipment.

3. Land tenure and other indicators on the agrarian structure

4. Technology used

5. Labor or employment generated by the sector

6. Price of the factors

The information supplied by these indicators must be sufficiently specified so that the planner may clearly understand which is the situation of the supply, that is, of the actual availability of foods at a given moment and, more important still, how and in what manner the different factors will interrelate to explain the availability.

In his paper, Engineer Martínez demonstrates how these factors are interrelated to explain the production volume of some products in case they are a limiting factor for the growth of certain given crops, and points out how abandonment of traditional crops, especially of legumes, finds itself related to land tenure. On the other hand, he indicates that prices play a fundamental role as incentive or lack of stimulus for the cultivation of certain crops in a market economy. This information must be analyzed by the food and nutrition planner, so that he may be able to prepare clear strategies directed towards the increase of agricultural production.

INDICATORS OF THE FOOD PROCESSING AND DISTRIBUTION SUBSYSTEM

In this case the variables intervening imply the handling of products originating from the agricultural sector, which on the one hand require certain transformation and, on the other, their commercialization. Therefore, the indicators refer to:

1. Processing of foods

2. Specialized enterprises

3. Technologies used

4. Aggregated value

5. Commercialization

6. Transportation and storage facilities

7. Distribution

8. Existence of intermediaries

9. Profit margins, among others.

According to the available literature, one of the basic problems faced in the developing countries by supply, concerns the functioning of this subsystem, which is strongly limited by the transportation and storage difficulties in the development of adequate technologies for the conservation and transformation of local products, in the existence of intermediaries who substantially raise the price of the products, and in the excessive profit margins in the commercialization of certain products, etc. For these reasons, the careful recording of information in reliable and valid statistical series as well as the weight of the institutional factors of socio-political order which definitely affect their development, deserve careful consideration.

The combination of the data provided by the subsystems herein considered will allow the planner to have an inventory which, according to Perissé,[4] shall be based on the analysis of food balance sheets and on the estimation of the physiological needs prepared by the nutrition specialists. This procedure will permit the planner to estimate future demands based both on the historical behavior of the indicators as well as on their analytic capacity to adequately interpret the combination of variables which explain the availability of foods.

THE FOOD CONSUMPTION SUBSYSTEM

Some of the socioeconomic indicators identified in the proposal may be classified under this category. The majority of these indicators, on the other hand, intervene more in the food demand than in its supply. Among them, the following should be mentioned:

1) Demographic indicators such as the rate of population growth, the rates of birth and mortality, their distribution by age and sex, their spatial distribution by regions and by rural-urban areas, among others.

2) Characteristics of the labor force, the economically active population, the employed, unemployed and underemployed.

3) Distribution of income and structure of remuneration of the production factors.

4) The educational level of the population, the number of graduates from primary school, rates of illiteracy, rates of desertion, number of persons with university degrees and how many of them are dedicated, for example, to research.

5) Other indicators of life level such as housing, recreation and social infrastructure.

6) Habits and values of the population in regard to food consumption, consumption patterns, diet composition, etc.

Some of the above-mentioned indicators determine the food demand; hence the need to identify them. On the other hand, some of them are obtained directly through official statistical sources such as population census, statistical yearbooks, epidemiologic yearbooks, etc. However, in the case of other indicators their registry is not so easy, since they may require direct research. As Engineer Martínez mentions, in this aspect the role of research institutes, universities and other superior education centers is fundamental, since well-oriented research strategies would permit in a given number of years, the availability of valuable information concerning consumption patterns, as well as of habits and of values. This procedure would also allow to measure the impact of the social communication media on these patterns, elements which are necessary to increase the viability of instrumentation, whichever the food and nutrition plan.

SUMMARY AND CONCLUSIONS

These brief comments on the use of indicators in nutritional epidemiological surveillance, intend to underline the importance of the systematic analysis in the collection and interpretation of information. Hence the convenience for the food and nutrition planner to consider the multiple variables which intervene in determining the food supply and demand within a given socio-historical context.

In order to plan, on the other hand, the use of the methodology forces a measurement process of the variables, and hence the need for the operationalization of same in different types of indicators. These indicators must be systematically collected and with similar methodologies in order to permit their comparison in time and in space.

This paper proposes the organization of indicators in four analytical categories: variables of the ecosystem which intervene in the supply and demand of food products; variables which intervene in the production of foods; variables which intervene in the processing and distribution of foods, the two latter adjusting to the availability or food supply which, for planning purposes, must transform themselves into physiological needs, and finally, those variables which define the consumption subsystem, which includes both individuals and family groups needing those foods for their subsistence. Furthermore, emphasis is made on the fact that analysis must cover the interrelation existing among all categories. Emphasis must therefore be placed on the interdisciplinary teams who are to carry out the multivariable analysis.

The performance of better diagnoses, the quantification of problems and the identification of key variables will allow the planner to improve substantially the application of the methodology. The existence of better plans, however, will not ensure the success of instrumentation, since without the political will to carry it out, and without the overcoming of the cited institutional obstacles, the plan will continue to be a nice academic exercise but will not solve the problems revealed by it.

BIBLIOGRAPHY

1. Korn, F., P. Lazarsfeld, A. Barton & M. Menzel. *Conceptos y Variables en la Investigación Social.* (Capítulo I), Buenos Aires, Ediciones Nueva Visión, 1969.

2. Berg, A. & R. Muscat. Nutrition program planning: an approach. (Chapter 26). In: *Nutrition, National Development, and Planning.* Alan Berg, Nevin S. Scrimshaw and David L. Call (Eds.). Cambridge, Mass., The MIT Press, 1973, p. 258.

3. Myrdal, G. Climate and its economic consequences. In: *Asian Drama, an Inquiry into the Poverty of Nations* (Vol. III, Appendix 10). New York, Pantheon Books, 1968.

4. Perissé, J. La planificación alimentaria desde el punto de vista nutricional (Capítulo XIII). Cited in: Fabian Recalde, *Política Alimentaria y Nutricional.* México, D.F., Fondo de Cultura Económica, 1970.

ADMINISTRATIVE AND OPERATIONAL STRUCTURE OF A NUTRITIONAL EPIDEMIOLOGICAL SURVEILLANCE SYSTEM*

*José Aranda-Pastor***

Institute of Nutrition of Central America and Panama (INCAP), Guatemala, C.A.

SUMMARY

Data on the food and nutritional situation of our populations do not permit to obtain a coherent picture in this respect, nor do they allow to evaluate their relation with the nutritional problem and, least of all, to determine the effectiveness of intervention programs. This creates the need of establishing a Nutritional Surveillance System of a multisectoral nature to detect changes, forecast the deterioration of a given situation, and recommend action measures, not only in the development process but in emergency periods as well.

The responsibility of a Central Unit System in the organization of a data-receptor mechanism based on the existing information channels, and in the processing and interpretation of the data is also discussed. This Unit would be in charge of the planning, organization and coordination of the System's activities, and its execution would be carried out jointly with the involved sectors: national planning, health, agriculture, education, economy and social. In addition, the Unit would have hierarchy and direct access to the high-decision levels so as to be able to propose appropriate recommendations. The advantages of a horizontal structure for the development of the Surveillance System and the participation of each level, are commented upon. Inofar as to the operational structure of the System, the convenience of establishing an initial assessment of the nutritional problem is also discussed, as is the undeniable need of an initial assessment of the information subsystems of each participant sector, prior to starting the Surveillance System design. The planning steps of the Nutritional Surveillance System are briefly discussed, as well as the

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Chief of the Division of Applied Nutrition of INCAP.

elaboration of forms, data collection, their transit, processing and interpretation, and the diffusion and feedback of the information, the training of personnel and the supervision and evaluation of the Nutritional Surveillance System. A series of conclusions and recommendations is included.

THE PROBLEM

In a great number of countries, including those of Latin America, information on the food situation and nutritional status of the population is tardy, incomplete and not always reliable. The data collected in regard to food and nutrition and their conditioning socioeconomic, health, agricultural and livestock, meteorological and other factors, are not systematically analyzed in function of the at-risk population groups,[1] a procedure which would provide a coherent picture and allow an evaluation of its relation with the nutritional problem. Furthermore, although many involved sectors are carrying out separate actions tending to their solution, the data available at present do not permit a regional characterization of the problem in the countries, and less still, to know the effectiveness of the intervention programs. This obviously makes it impossible to analyze the changes which occur in the nutritional status and in the social welfare of their inhabitants. Consequently, it also hinders the planning and the convenient programming of future actions.

Therefore, the previous panoramic view supports the convenience of establishing adequate information subsystems - which at first can be simplified - both of the food situation as well as of the nutritional status and their conditioning factors, already cited, utilizing a continuous surveillance system,[2] capable of detecting at a given moment, certain situations, and predict deterioration of same. The system must limit itself to the available knowledge on the epidemiology of the nutritional problem,[3] and must also take into account the characteristics and resources of the country.

INTRODUCTION

A Nutritional Epidemiological Surveillance System constitutes an information subsystem of the information-decision-control system of the food and nutritional situation and of its conditioning factors. Its purpose is to formulate recommendations at the decision levels, evaluate actions, and provide elements for the planning process.[4] Thus, the information subsystem must be based on the collection, transmission, processing, analysis, and interpretation of data.

On this occasion we shall focus our attention essentially on the administrative and operational structure needed for the processing of data and their interpretation in a National Nutritional Epidemiological Surveillance System. Some general considerations on the organization and functioning of the System will also be presented.

In the establishment of a Nutritional Surveillance System, the need to maintain a constant transmission of data that serve to construct indicators,[5-7] wich at any given moment reflect the food and nutritional situation of the population covered and of their conditioning factors, should be kept in mind. The administrative and operational structure of the System - of a multisectoral nature - must allow presentation in a continuous and permanent form in time terms, of a coherent picture of the nutritional situation and its causes; provide information on several aspects of the development of the program; detect and predict changes in the availability and consumption of foods and on the nutritional condition of the populations; recommend measures to prevent deterioration and even to improve said situation, and lastly, to determine the efficacy of said measures. In other words, the System would be an essential instrument in the formulation, planning, evaluation and readjustment of the food and nutrition policies, programs and projects both in the development process as in emergency periods.[8,9]

ORGANIZATION AND FUNCTIONING OF THE SYSTEM

The Nutritional Surveillance System should have a coordinating unit at the central level,[5] responsible for organizing a receptor mechanism of data pertinent to the food and nutritional situation and their conditioning socioeconomic, health, agricultural and livestock,meteorological and other factors. These would be sent by the local and regional levels which, for this purpose, would integrate the involved institutions, for the subsequent processing and interpretation of the data. With the information thus generated, it would prepare strategies to promote specific actions in each one of the sectors. The formal information systems already existent within the participating institutions must be respected and utilized, since they would be the basis for the above-mentioned receptor mechanism whose coordination would be in charge of the Central Unit of the System. In its turn, the latter would be responsible for the administration and functioning of the System. Therefore, this Unit would be entrusted with the planning, organization and coordination of activities of the System, whose execution would be carried out jointly with the integrating sectors, which would also benefit from same. This applies to national planning and to the health, agricultural and livestock, education, economy and social sectors. This is why the Central Unit would be responsible for motivating and providing to the authorities of the involved institutions, information as to the objectives, resources and scope of the System, the importance of their participation and the benefits that in terms of timely actions would each one of the sectors derive. The same strategy would be followed with the regional and local surveillance groups, so as to encase their responsibilities in the System.

In addition, the Central Unit would have to define and organize the necessary resources, both in human and in material and financial terms, in order to establish the technical facilities that permit the processing and analysis of the data and interpret the information derived from them in terms of sectoral recommendations.

Thus, the Unit must have sufficient hierarchy to have direct access to the high-decision levels for the purpose of formulating timely reccomendations for the adoption of the respective immediate actions in each sector at the appropriate levels and at the adequate moment. The information supplied by the Unit would constitute the primary basis of support for decisions judged as pertinent by those responsible of the policy, planning and administration of the food and nutrition plans, programs and projects. If this procedure is not observed, the setting-up of a Nutritional Surveillance System would not be justified.

On the other hand, the planning process of food and nutrition would utilize the information derived from the System which, unless used for this purpose, would be of little value. Both would mutually complement each other: the Unit would make available to the nutrition planning mechanisms the required data, and in its turn, the planning sector would utilize the information provided by the Unit.[10]

A. Specific Functions of the Central Unit of the System

Aside from being responsible for promoting and collaborating in the organization of nutritional surveillance activities at regional and local level, jointly with the sectors involved in the System, the Unit would have the following specific functions:

1. Organize the systematic collection of pertinent data originated from the institutions participating in the System, respecting and utilizing the information systems accustomed by each one of them.

2. Carry out the integration, processing, multisectoral analysis and interpretation of the data that, at definite intervals, are received from the regional and local levels of the System.

3. Prepare unified action strategies, both in normal and emergency situations,[8,9] that signal the measures which each sector should apply.

4. Diffusion of information on the actual situation and priority action areas through bulletins and periodic meetings and, when deemed necessary, through urgent communications. At the same time, feedback the different levels of the System.

5. Carry out periodic evaluations of the effectiveness of the Nutritional Surveillance System in regard to its capability for maintaining a permanent diagnosis of the food and nutritional situation; forecast changes and emergency situations; generate the corresponding actions, and obtain in the community the expected results.

6. Undertake studies on the characteristics of the indicators used, for the purpose of verifying their real value in the System.

B. Specific Functions at Regional and Local Levels

Aside from the functions proper of the local level, which are the systematic, precise and timely collection of data, and of the corresponding grouping of same on the part of the regional level, both levels should be responsible for the following activities:

1. Carry out a preliminary analysis of the situation on the basis of the recommended indicators and any other pertinent information.

2. Develop a data transmission mechanism of grouped and integrated data, from the periphery to the next level.

3. Establish a mechanism for the revision and analysis of the integrated data, for the purpose of obtaining information useful for each level.

4. Establish communication channels so that the accumulated information be transmitted to the periphery in such a way as to permit the adoption of decisions and the application of opportune measures.

These decentralized activities would allow a better quality and transit of the data. They would also help to improve the feedback process in making it more agile and fast, and thus achieve the expected results.

ADMINISTRATIVE STRUCTURE OF THE SYSTEM

Although the structure of the sectors and their degree of development vary from one country to another, there is a marked tendency towards decentralization and regionalization of same. In our criterion, this type of horizontal structure would be the most convenient for the development of a Nutritional Surveillance System, since it implies active participation of each administrative level. In this way, each one of them becomes the subject and the object of the System itself: the local or action level collects the data generated by the community; the regional or operative decision level supports, collaborates and supervises the local level; the central or technical and normative decision level carries out a periodic verification of the data pertinent to the sector, and transmits them to the Central Unit. Furthermore, it supervises the inferior levels (See Figure 1).

A. The Local Level and the Local Surveillance Groups

At local level and according to the plans outlined at the regional level, the personnel from each participating institution in charge of the collection and transmission of data should be structured into local surveillance groups. In view of the fact that at this level technical resources for the analysis of data are not available, the

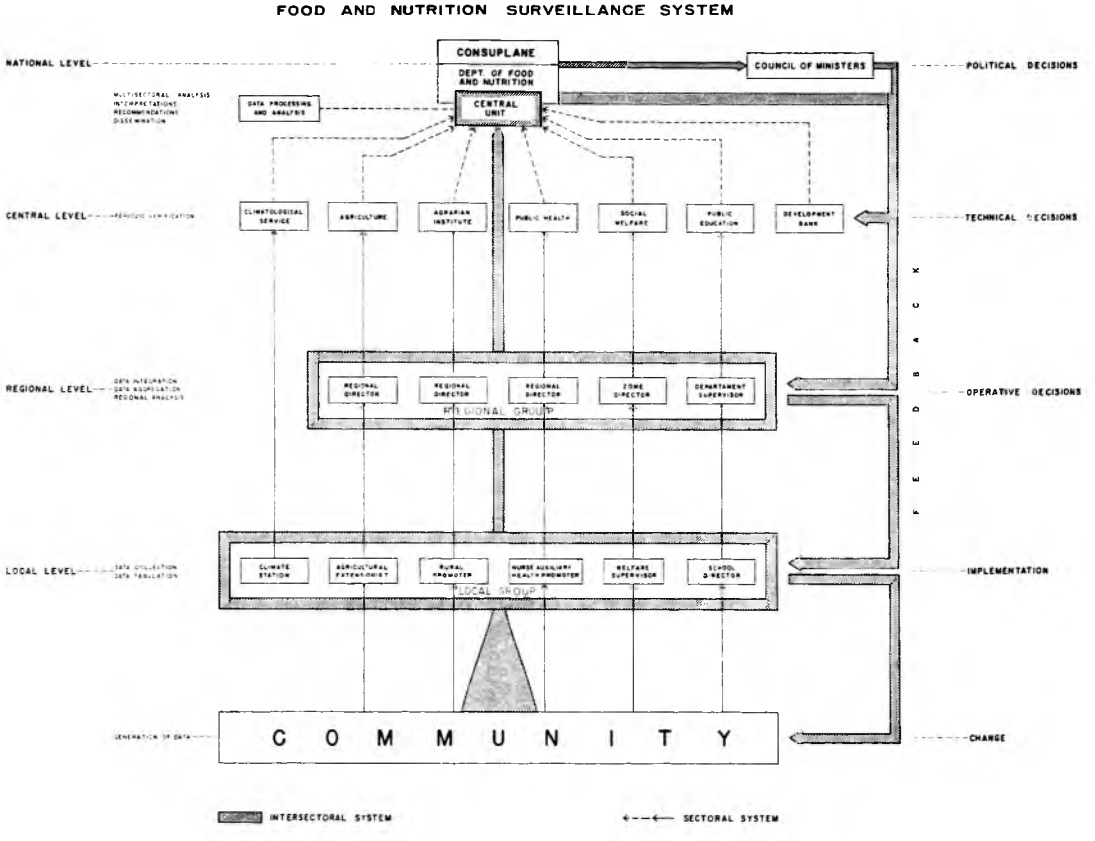

Fig. 1. *Nutritional Surveillance System.*

greatest part of the work would consist in revising and correcting them. Another aspect would be a very simple analysis of the changes that occur in the different data categories and then feedback the community. These would make possible the adoption of some basic decisions and put into practice opportune acions pertinent to this level and, at the same time, would serve as the basis for requesting advice and resources at the immediately superior (regional) level, when these prove to be necessary.

B. The Regional Level and the Regional Surveillance Groups

At the regional level and with the support of the Central Unit, regional surveillance groups should also be structured, formed by representatives of each of the institutions participating in the System. In many countries sufficiently trained personnel is available at this level in each one of the sectors to gather together and integrate data derived from the local level, to carry out an integral simplified regional analysis of the available data, to transmit them to the Unit, to recommend sectoral actions proper of this level, and to feedback the local level.

C The Central Level and the Central Unit of the System

At the central level the System would be represented by the Unit, which would count with its own specialized personnel and with the necessary national technical guidance. It would also have the direct and effective collaboration of the central units corresponding to each one of the sectors (Planning and Statistics Offices of each of the participating Institutions in the System, Departments of Nutrition and of Epidemiology of the Health Ministry, etc.). In addition, it would have processing and computation facilities, if possible through the use of computers. The Unit would be responsible not only for integrating the data, their multisectoral analysis and interpretation, but also for the presentation of results - in terms of recommendations - in a clear and comprehensive way, so that these results may be useful for the decision levels and for those responsible of the food and nutrition planning.

Likewise, in conjunction with the central authorities in each one of the institutions involved in the Nutritional Surveillance System, the Unit should establish the nature and extension of their participation. The definition of communication channels and the coordination mechanisms with the planning and statistics units of each institution, as well as with the local and regional surveillance groups should also be one of its functions.

In summary, in a horizontal structure the information of the System, which could be denominated an informal system, covers from the local level through the regional and up to the central level, with the data being analyzed with different degrees of depth and used in each level. In contrast, in a vertical structure, as some of those still existing at the present moment, and which corresponds to what we call formal information systems, the data go from the local directly to the central level. Thus, almost all of the responsibility falls in this level which is the one in charge of taking decisions and giving orders and indications to the local level so that this

translates them into actions. In this vertical structure, participation of the local level is rather passive.

On the other hand, the administrative location of the Unit is an important aspect worthy of consideration. It would be most advisable that it did not depend from any special ministry, except in those countries that have a Planning Ministry. If this were not the case, the most convenient action would be to locate it in the Government national planning units or offices, or else in such a way that it functions in close association with the latter. As we already commented, it should also count with all the necessary technical support to cover the multisectoral nature of the activity and have direct access to the high governmental levels. Its budget would have to be adequate so as to cover operational expenses, computer time, and diffusion of information.

Lastly, it would be convenient to try out the Surveillance System in a limited geographic area for the purpose of obtaining some practical experience in activities such as the training of personnel, the integration and functioning of the local and regional surveillance groups, and the design of instruments for the collection, transmission and processing of data and analysis and interpretation subsystems. This would ensure an adequate development of the System and its regular supervision during the try-out period of its functioning. Later, it could be gradually expanded until it reaches national coverage. The selection of this area of implementation for an initial normalization of the System should be undertaken on the basis of certain technical-administrative criteria. These shall be dealt with, when planning of the System is discussed (See numeral 4 of the following Section).

OPERATIONAL STRUCTURE OF THE SYSTEM

With the information already at hand in each of the sectors and if this were possible, counting with additional data, in very necessary cases it would be advisable that before implementing the System an initial assessment of the nutritional problem be undertaken.[11] This would include identification of location (areas) and how many and who are at risk (population groups) as well as the causes of why the problem exists (variables feasible of measuring).[10] Not always do the countries have the human, economic and time resources required to carry out the initial assessment. If this were the case, it is always convenient that prior to designing the System, an initial assessment of the information subsystems of each one of the sectors involved be made. This implies the identification and analysis of the sources of data, especially their collection and transmission mechanisms to verify which are de data collected, with what frequency, how reliable are they, which of them are useful for the System, the transit channels they follow, etc., and thus be able to determine the needs, in case they exist. In a great number of countries many data are actually collected which can serve the Nutritional Surveillance System and the most convenient action is to utilize the sources of data which already exist. If necessary, the quality of same should be improved and, as the System is developed, new data could be collected to permit the building-up of new indicators and perfectioning of the System.

A. Planning of the System

This phase of the planning process implies the following steps:

1. Design of the System

2. Presentation and reviewal of the design jointly with the participating institutions.

3. Selection of indicators taking as a basis the findings of the initial assessment already discussed.

4. Selection of the geographic area for the normalization or implementation to initiate the System, for which purpose it would be necessary to consider, among others, the following minimal criteria:

a) representation, in the area, of the institutions participating in the System;

b) presence of expansion of primary health care programs:

c) presence of the agricultural extension agencies;

d) easy access;

e) facilities for continuous supervision;

f) high prevalence of malnutrition, and

g) high mortality in the 1-4 year-old group.

5. Definition of functions and responsibilities of the institutions participating at the different levels.

6. Preparation of norms[1 2] for all of the operative levels of the System, taking into account those already existing in each one of the sectors, where the training aspect is also included, and even that of preparation of the necessary teaching materials, above all, for use at the local level.

7. Definition of the advisory services and equipment and material facilities at each operational level in order to ensure the effective participation of the institutions involved in the System and, hence, the adequate functioning of same.

B Preparation of Forms and Instructions

The design, testing and readjustment of the forms and instructions needed in each level for the collection and transmission of the data required by the System

would be necessary. This would be done in collaboration with each institution in order to transmit the pertinent data to the Central Unit, with the required periodicity. The forms should be designed in such a way that, if necessary, data could be interpreted without processing by computer. The final objective is to obtain general immediate impressions and, inclusive, to be able to make manual calculations.

C. Design of the Subsystem for the Collection and Transmission of Data

In regard to this matter, it implies the preparation of guidelines that form part of the norms established for the System, that define at each level the type of data to collect and their presentation form as well as the mechanism and periodicity of their transmission, utilizing for this purpose previously prepared forms. We consider that the mechanism for transmission of data is of utmost importance in the functioning of the System. This is why it should be designed so that interpretation of such data at the level of the Central Unit is available as early as possible from the moment the data were collected.

D. Design of the Subsystem for the Processing, Analysis and Interpretation of Data

Although the local and regional surveillance groups should carry out a first analysis of the data, in a very simple way as we already commented, the Unit would be the main responsible for the processing, analysis and interpretation of the System's data. This requires the development of a subsystem for the processing of data and the design of a computer program so that the analysis of the data received from the diverse sectors permits the rapid obtainment of information through the selected indicators. Interpretation of such data should be done on the basis of the existing knowledge, starting from comparisons and through the quantitative relations to be constructed as the System is developed. One of the priorities of this interpretation would be the construction of tendencies and predictions.[2] It would be necessary to plan an objective multidisciplinary method of interpretation to apply to the information produced by the System in terms of the definition of the food and nutritional situation of the population, and of the interventions recommended for each sector. In other words, interpretation should pursue, first, immediate initial actions, and second, determination of the relations between the variables for high-level programming.

E. Dissemination and Feedback of Information

In order to maintain a two-way information transit, it would be necessary to structure operative mechanisms through which information is disseminated to the different levels of the sectors participating in the System. In this sense, the design of adequate mechanisms so that the information returns to the source where the data originated, and to keep the regional and local personnel duly informed of the more significant results is of particular importance. This would not only facilitate the adoption of decisions proper of the level itself, but it would also ensure and compromise its active participation in the System.

The community would have to be kept informed so that it participates actively both in the identification of the problems and in the analysis of new situations, as well as in the measures adopted for their solution. If the community is aware and conscious of its food and nutrition situation, as is its duty and right, its active involvement will be achieved.

F. In-Service Training of Personnel

The training of personnel must be done in accordance to the level of location and to the activity it develops within the System. Thus, it would have to be programmed jointly with the regional groups, taking into consideration the needs and type of in-service training required for the functioning of the System, both at regional and local level. In the course of this training - which would be carried out in the local or regional level - besides contemplating a strong motivation component and of placing emphasis on the importance of the contribution of the System's personnel, it is necessary to submit to discussion the organization and general functioning of the Nutritional Surveillance System. The same would have to be done with each of the chain links and their interrelation, underlining the fact that any interruption compromises or endangers its objectives and results.

It would be convenient to impart the in-service training in a joint and integrated way to all the field personnel of the involved sectors, in order to make them realize from the very beginning, the multisectoral nature of the System. In addition, training must be provided at the different operative levels and be imparted on the basis of the norms prepared for the System, by means of short courses and seminars. Insofar as personnel from the Central Unit, the training they receive must be of a high level, with particular emphasis on the processing, analysis and interpretation of data.

On the other hand, it would also be advisable to impart continued education to personnel participating in the System, utilizing the supervision visits as an additional and permanent means of in-service training.

G. Supervision and Evaluation

Considering that the supervision and evaluation activities should in great part support the good functioning of the System, it would be necessary to design and develop a mechanism for the periodic and permanent supervision of the System as well as to evaluate its effectiveness.

If there already exists a decentralized horizontal structure as the one proposed herein, most of the supervision and evaluation activities should logically fall on the Central Unit and in the regional level. Only through direct contact with the operative levels that permit reinforcement of the training component which should accompany every supervision activity, besides the control,[13] can the quality of the actions and instruments of the System and the System itself improve.

CONCLUSIONS AND RECOMMENDATIONS

1. Information on food and nutrition available in our countries presents an ample range of variation. On the other hand, it is not often opportune or reliable, and neither is it analyzed in an integral form which may give way to offering a coherent framework of the situation, on the basis of which, policies, planning, and evaluation interventions could be formulated.

2. For the purpose of detecting changes, predict deterioration of the situation and to know the effectiveness of the actions, the establishment of a Nutritional Surveillance System of a multisectoral nature, based on indicators and their interpretation, is recommended.

3. For the development of a System like the one proposed herein, the horizontal structure would be the most convenient, given the active participation that each administrative level would have (local, regional, central). These would serve to integrate the multidisciplinary surveillance groups which would gather and analyze jointly and in a very simple way, the data from the different sectors, therefore allowing the adoption of some actions of the level itself, and the feedback to the immediate, inferior level.

4. It is recommended that the System be organized on the basis of the data and channels of information already available, and that its development be in charge of a Central Unit of the System. The latter would process and interpret the data received from the multisectoral regional and local surveillance groups, integrated by the participating health, agricultural, education, economy and social sectors.

5. The Unit should have sufficient hierarchy for obtaining data from each of the involved sectors, and also have direct access to the high-decision levels to formulate well-timed recommendations in regard to the adoption of actions corresponding to each sector. The information provided by the Central Unit in terms of recommendations would be the basis for these decision levels, and for those responsible of the food and nutrition planning.

6. The Nutritional Surveillance System should be started in a selected geographic area that adjusts to certain stipulated criteria for its first normalization. In the light of the experience gathered, its development and gradual expansion could then be ensured in an adequate way until it reaches national coverage.

7. If facilities are available, it would be recommendable that prior to implementing the System, a multisectoral initial assessment of the nutritional problem be undertaken on the basis of information already available in the sectors. Nevertheless, an initial assessment of the information subsystems in each one of the involved sectors should be undertaken in order to determine the needs.

8. Finally, it is recommended that the Central Unit dedicate particular attention to the selection of indicators, preparation of norms for all the operative levels, and to the training of personnel as well as to the supervision and evaluation of the System.

RESUMEN

ESTRUCTURACION ADMINISTRATIVA Y OPERACIONAL DE UN SISTEMA DE VIGILANCIA EPIDEMIOLOGICA NUTRICIONAL

Los datos referentes a la situación alimentaria y nutricional de nuestras poblaciones no permiten obtener un cuadro coherente ni evaluar su relación con el problema nutricional y, menos aún, conocer la efectividad de los programas de intervención. Esto plantea la necesidad de establecer un Sistema de Vigilancia Epidemiológica Nutricional de naturaleza multisectorial por cuyo medio se pueda detectar cambios, predecir el deterioro de la situación, y recomendar medidas de acción, tanto en el proceso de desarrollo como en períodos de emergencia.

Se aborda el tema de la responsabilidad de una Unidad Central del Sistema en la organización de un mecanismo receptor de datos, basado en los canales de información ya existentes, y en el procesamiento e interpretación de los mismos. Esta Unidad tendría a su cargo planear, organizar y coordinar las actividades del Sistema, cuya ejecución se realizaría juntamente con los sectores involucrados: el de planificación nacional, de salud, el agropecuario, el de educación, de economía y el social. Además, tendría la jerarquía suficiente y acceso directo a los altos niveles de decisión para emitir las recomendaciones oportunas. Se comentan las ventajas de una estructura horizontal en el desarrollo de un Sistema de Vigilancia Nutricional, y la participación de cada nivel. En cuanto a la estructura operacional del Sistema, se plantea la conveniencia de efectuar una valoración inicial del problema nutricional y la necesidad insalvable, antes de iniciar el diseño del Sistema de Vigilancia, de una valoración inicial de los subsistemas de información de cada sector participante. Se contempla también brevemente las etapas de planeamiento del Sistema, de elaboración de formularios, recolección, transmisión, procesamiento e interpretación de los datos, así como de su difusión y retroalimentación, al igual que el adiestramiento del personal y la supervisión y evaluación del Sistema de Vigilancia Nutricional. Por último, se esbozan algunas conclusiones y recomendaciones.

BIBLIOGRAPHY

1. Organización Panamericana de la Salud. Utilización de los Sistemas de Vigilancia de Enfermedades Transmisibles en la Vigilancia del Estado Nutricional. Washington, D.C., OPS, 1975, 21 p. (Mimeographed document).

2. Burgess, H.J.L. Surveillance of the population at risk: the community (Chapter 18). In: *Nutrition in Preventive Medicine. The major deficiency syndromes: epidemiology and approaches to control.* G.H. Beaton and J.M. Bengoa (Eds.), Vol. II. Geneva, World Health Organization, 1976, p. 256-267. (WHO Monograph Series No. 62).

3. Aranda-Pastor, J. Enfoque epidemiológico de los problemas nutricionales. Unidad IV. In: *Epidemiología General.* (Tomo II). Mérida, Venezuela, Universidad de los Andes, 1971, p. 651-753.

4. Fossaert, H., A. Llopis & C.H. Tigre. Sistemas de vigilancia epidemiológica. *Bol. Of. San Pan., 76:* 512-528, 1974.

5. *Methodology of Nutritional Surveillance.* Report of a Joint FAO/UNICEF/WHO Expert Committee, Geneva, 1-10 October, 1975. Geneva, World Health Organization, 1976, 66 p. (WHO Technical Report Series No. 593).

6. Aranda-Pastor, J., G. Arroyave, M. Flores, M. A. Guzmán & R. Martorell. Indicadores mínimos del estado nutricional. *Rev. Col. Méd. (Guatemala), 26:* 5-27, 1975.

7. Departamento de Política Económica y Social de la FAO. Examen de los indicadores del desarrollo general y agrícola. *Boletín del GAP, 4*(4): 6-17, 1974.

8. Bengoa, J. M. & G. H. Beaton. Nutritional aspects in disasters (Chapter 28). In: *Nutrition in Preventive Medicine. The major deficiency syndromes: epidemiology and approaches to control.* G. H. Beaton and M. Bengoa (Eds.). Vol. III. Geneva, World Health Organization, 1976, p. 552-570. (WHO Monograph Series No. 62).

9. *Seminario sobre la Ecología de los Desastres Naturales, Bruselas, Bélgica, 7 a 10 de diciembre de 1971.* M.F. Lechat (Ed.). Published by the School of Public Health of the Catholic University of Louvain, Belgium, 1972. (Translated into Spanish by the Division of Applied Nutrition of INCAP, 1974, 32 p.).

10. Mason, J. B. Vigilancia de la nutrición. *Aliment. Nutr. (FAO), 1* (4): 24-27, 1975.

11. Menchú, M. T., N. García, A. Pradilla, I. Beghin & J. del Canto. Información base y modelo conceptual previos al establecimiento de un sistema de vigilancia nutricional en Honduras. Presented at: *IV Congreso Latinoamericano de Nutrición, Caracas, Venezuela, del 21 al 27 de noviembre de 1976.*

12. Beghin, I. D., J. Aranda-Pastor & M. C. Baez. Normas de nutrición. *Bol. Of. San Pan., 78:* 52-57, 1975.

13. Baez, M. C., I. D. Behin & J. Aranda-Pastor. Supervisión de programas de nutrición. *Arch. Latinoamer. Nutr., 25:* 251-258, 1975.

Comments on the paper

ADMINISTRATIVE AND OPERATIONAL STRUCTURE OF A NUTRITIONAL EPIDEMIOLOGICAL SURVEILLANCE SYSTEM*

*Alvaro Llopis***

The paper presented by Dr. Aranda-Pastor settles the bases for the administrative and operational structure of a food and nutritional surveillance system. The systematic and exhaustive treatment which he has applied to the development of the subject could only be complemented with a model to implement its practical functioning in a given country or area. And leaving aside the fact that this would mean our departing from the purposes of the central subject, its design could only be made in each particular case taking into account the different structures and infrastructures existing in the place where it is to be applied.

Hence, I shall limit myself to formulate some general comments for underlining the objectives that the speaker has assigned to the system presented, and the concepts and elements used by him for its administrative and operational structure.

1. Objectives and Aims of an Epidemiological Surveillance System

My experience in the epidemiological surveillance activities in other fields and in the development and perfectioning of the systems to comply with them, has led me to the following conviction. Unless consensus is obtained as to the purpose of the surveillance, and the great majority of those integrating the surveillance subsystem and the health system - including the high decision levels - have a clear view of their objectives and potential use, it is not possible to achieve an effective surveillance.

The previous considerations lead me to state that as pointed out by the document we are commenting on, the nutritional epidemiological surveillance should have the following objectives:

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Ministry of Health and Social Welfare of Venezuela.

1. Make a permanent and dynamic diagnosis of the food and nutritional situation of the community and of its conditioning factors.

2. Forecast changes at short, medium and long range, both of the food and nutritional situation and of their conditioning factors.

3. Assess the effect of programs already under way to improve the system and to modify the conditioning factors.

All of the above-mentioned points lead to one purpose: provide timely information and not "historical" data and formulate recommendations at the decision levels which serve for the planning process and for the adoption of immediate measures capable of correcting or controlling special situations detected or predictable by means of the permanent and dynamic surveillance process.

2. Surveillance as an Information System

These objectives and purposes characterize the epidemiological surveillance as an information subsystem which in the context of this Colloquium, and as pointed out by Dr. Aranda-Pastor, constitutes the information subsystem of the information system, decision, control of the food and nutritional situation, and of their conditioning factors.

They also imply that surveillance must promote actions. This is why the epidemiologists of the Center for Disease Control of the United States, in particular Michel Greg, define epidemiological surveillance as the information for action.

Maybe I have extended somewhat on these comments, running the risk of repeating concepts already expressed in the same form or with different words by the speakers and commentators who preceeded me. However, this is only because, as I indicated previously, from the understanding and active acceptance of the objectives and purposes of the surveillance, and the need of information to take decisions and execute actions, shall depend the decision for structuring administratively and operationally the food and nutritional surveillance systems and their use in the adoption of decisions, planning, programming and execution of preventive and control measures.

3. Importance of the Surveillance of Conditioning Factors

In emphasizing the objectives of epidemiological surveillance, we pointed out the diagnosis and prognosis of the situation and of its conditioning factors. I wish now to stress the primary importance that the diagnosis and prognosis of the conditioning factors have. This tailor's drawer that the semantics of programming in health calls conditioning factors, comprises all of the possible causal and contributing agents that, whatever the causal relation, constitute a more or less structured constellation better or worse known according to the complexity of the phenomenon, its natural

history, and our own knowledge. Nevertheless, their variations and modifications will determine immediate or variable term changes in the situation of the phenomenon which, in the present case, is the food and nutritional situation. To detect these variables and foresee their effect on the situation is the essence of the epidemiological surveillance and the scientific basis for deciding and executing timely actions and programs aimed to prevent undersirable consequences.

4. Determinant Effect of the Multisectoral Origin of the Conditioning Factors of the Food and Nutritional Situation for Structuring the Surveillance System

The information systems conform and operate through an aggregate of activities which are grouped together in the following subaggregates: 1) production of data; 2) collection and transmission; 3) processing; 4) analysis and interpretation. The inputs of the system are the data and previous knowledge, and the product is the information which must be divulged for its use. This brief analysis of an information system, together with the obvious fact that, due to the multiplicty of conditioning factors, production of pertinent and relevant data for the food and nutritional surveillance has its origin in all the social and economic sectors, demonstrate the need for the surveillance system to be of a multisectoral nature.

Given the characteristics of the problem, it would be impossible to talk of a real surveillance if, in the analysis or interpretation of the data, all of them and each of the involved sectors were not taken into account.

This fundamental aspect of the problem has been highly taken into consideration by the speaker. It is precisely because of this that he proposes a multisectoral system with a Central Unit with sufficient hierarchy to achieve the obtainance of data from all of the involved sectors, so that the recommendations are of direct access to the high decision levels of each one of them.

At no moment does the multisectoral character of the system mean the structuring of a superimposed super-system. On the contrary, as Dr. Aranda-Pastor pointed out, it rather is the equivalent of the utilization of the data and information systems of each one of the sectors.

At this point it seems important to call attention to the fact that whatever the information subsystem, all of the sectors integrating the system participate, whether this be the health, agriculture or other sector, and that motivation of their participation is vital to achieve an effective surveillance. In particular, the more generalized participation is that related to the production of data, and this will only improve in the measure in which the data producers see their usefulness and are satisfied with the use made of them.

5. Control of the Functioning of the System

In recommendation No. 8 the speaker attributes to the Central Unit the evaluation and supervision of the system, which means the same as saying that it is necessary

that at such level there exists control for the functioning of the system. This is a fundamental point to consider in the administative and operational structure of a surveillance system. I shall now end my comments by pointing out that experience in other fields has demonstrated that surveillance units, no matter what their level is, have to add to their specific activities, others that guarantee the production of data of acceptable quality, their timely transmission, their adequate processing to convert them in interrelated and comparable indicators, and be presented for their analysis and interpretation.

Lastly I wish to mention that it will be necessary to evaluate at all moments if the recommendations formulated by the surveillance system are taken into account by the decision levels. Also, it should be ascertained that they originate actions, since the fundamental justification of surveillance and the reason for its being, is that the information it generates gives way to the adoption of preventive or control measures.

EARLY WARNING ALARM SYSTEMS OF NUTRITIONAL DETERIORATION IN EMERGENCY PERIODS*

*Michel F. Lechat and C. de Ville de Goyet***

SUMMARY

The food and nutritional situation in many countries is worrysome and at the same time little known. A constant surveillance of the food and nutritional situation with the help of proven epidemiological techniques is imperative.

Surveillance, in the context of catastrophes or disasters, involves certain particular aspects, different from surveillance in normal times. The selected indicators must be not only sensitive and related to vulnerable groups, but it is also essential that they be accepted and recognized by government officials. Its prediction value, therefore, must rest not only in the technical field but must also be recognized as such by the corresponding authorities.

On the one hand, meteorological and agricultural indicators are the most popular in regard to their predictive value, but they are not so well recognized by the authorities. Unfortunately, very often indicators which refer to the medical-nutritional status of the population are the only ones that have stimulated and permitted decisions and actions that have been undertaken during past emergencies.

The establishment of an interministerial and intersectoral structure that may have access to data collected in the field has proven to be more indispensable for further data collection and their interpretation. In the absence of such a structure, epidemiological surveillance runs the risk of remaining theoretical without practical repercussions.

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", VI Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Centre de Recherches sur l'Epidémiologie des Désastres, Université Catholique de Louvain, Brussels, Belgium.

INTRODUCTION

The food situation in many of the developing countries is considered as alarming by international experts. Alarming because many signs truthfully indicate, although they are difficult to quantify, that food production does not follow the corresponding pace with the demographic growth rhythm, but rather at a distance. The appearance of acute food scarcity and of sudden protein-calorie malnutrition epidemic breakouts in the last five years are a confirmation, unfortunately late, of the seriousness of the situation.

If experts are in agreement on this point, the same unanimity occurs in regard to the need of collecting quantitative comparable data, reliable and sensitive in order to measure objectively the food and nutritional situation of the population. Even though there exist numerous food data at country level, and in less scale, also nutritional data, their representative value is mediocre. Average figures of demand or of production can mask important disparities that exist and will continue to exist between the different regions of a given country and, above all, among the different socioeconomic groups. Tables 1, 2 and 3 illustrate the extrapolated tendencies of food production and demographic growth, as well as data on food demand which are bound to appear in the coming years. The fact that in a given country the food production and demand are comparable or equal at national level, does not mean in any way that the malnutrition phenomenon cannot acquire an epidemic dimension in certain less privileged sectors. Table 1 shows the apparent growth evolution of the food production and the demographic projections for the years 1969 to 1985. It is clearly observed that for many developing countries with a market economy, demographic growth is greater than the increase in food production. This is confirmed by the analysis of Table 2 which illustrates the appreciable numer of countries that show a food deficit. The margin of error of this type of statistics is considerable, especially in those countries lacking means to undertake representative and well-structured surveys. Statistics concerning countries where a great part of the agricultural production is directly consumed by the peasant families, must be taken with caution.

In many countries the food and nutritional situation is equally quite vulnerable to the ominous effects of emergency situations or of natural disasters. A moderate change in rainfall or in sunlight hours may have incalculable consequences in the nutritional status of the population. The case of Sahel, in Western Africa, is an example that perfectly illustrates the dramatic repercussions of a capricious rainfall in a poor country. The emergency situations are generally classified in two main categories:

1. Emergency Situations of Short Duration

These are caused, for example, by earthquakes, floods of regular importance or hurricanes. Their effects on food production and nutritional status may be minor. On the contrary, the distribution and commercialization systems are especially

TABLE 1

EXTRAPOLATION OF THE GROWTH RATES OF FOOD PRODUCTION, AND PROJECTION OF DEMOGRAPHIC GROWTH, 1969-1971 to 1985

	Food production	Population
	Annual percentage	
Developed countries:	2.8	0.9
Market economies	2.4	0.9
USSR and Eastern Europe	3.5	0.9
Developing countries	2.6	2.4
Developing countries with a market economy	2.6	2.7
Africa	2.5	2.9
Far East	2.4	2.6
Latin America	2.9	3.1
Near East	3.1	2.9
Asian countries with centrally-planned economies	2.6	1.6
WORLD	2.7	2.0

FAO estimates.

TABLE 2

NUMER OF COUNTRIES WHICH HAVE REGISTERED SURPLUSES AND DEFICITS OF ENERGETIC AVAILABILITIES IN THE DIFFERENT REGIONS

	1961				Average 1969-1971			
	Surplus		Deficit		Surplus		Deficit	
	More than 10%	Less than 10%	More than 10%	Less than 10%	Less than 10%	Less than 10%	More than 10%	Less than 10%
Western Europe	14	5	–	–	17	2	–	–
North America	2	–	–	–	2	–	–	–
Oceania	2	–	–	–	2	–	–	–
Eastern Europe and USSR	4	3	–	1	7	–	–	1
Other developed countries	1	2	–	–	2	1	–	–
Developed regions (total)	23	10	–	1	30	3	–	1
Latin America	5	4	8	8	8	6	4	7
Fas East	–	4	7	5	4	4	3	5
Near East	1	1	10	2	1	3	4	6
Africa	–	5	18	14	3	8	12	14
Asian countries with centrally-planned economies	–	2	2	–	1	1	1	1
Regions in the developing process (total)	6	16	45	29	18	22	24	33
WORLD TOTAL	29	26	45	30	48	25	24	34

FAO estimates.

TABLE 3

ESTIMATED NUMBER, BY REGION, OF PERSONS RECEIVING AN INSUFFICIENT PROTEIN-ENERGY SUPPLY, 1970

Region	Population	Percentage receiving a below-the-limit supply	Number of persons receiving a below-the-limit supply
	Thousands of millions	%	Millions
Developed regions	1.07	3	28
Developing regions, not comprising Asian countries with centrally-planned economies	1.75	25	435
Latin America	0.28	13	36
Far East	1.02	30	301
Near East	0.17	18	30
Africa	0.28	25	67
WORLD (not comprising those Asian countries with centrally-planned economies)	2.83	16	462

According to FAO.

affected. This kind of disasters have as a common peculiarity their oftenly sudden appearance, and in the majority of cases, they affect a rather limited geographic zone. In Latin America, earthquakes, floods and hurricanes are among the most frequent causes.

2. Emergency Situations of Medium or Long Duration

These are caused by a poor crop resulting, for example, from droughts or from uncontrollable climatic factors. The existence of precursive signs is particularly important for the establishment of a surveillance system and an effective forecast of these disasters which affect directly the nutritional status of great population groups. We can affirm, for example, that the drought that caused so much havoc in Nicaragua in 1972 had considerably more important nutritional effects than the earthquake that destroyed the city of Managua. However, the publicity this drought received is not comparable with that given to the earthquake, although it may be that in the long range the former caused more deaths than the latter.

The two types of situation have numerous common points. The food and nutrition situation does not deteriorate in such a marked way as the medical situation in a population. In general, it can be predicted and foreseen at a certain term thanks to the surveillance of precursive signs of progressive deterioration of the situation. This surveillance is indispensable both to integrate this information in the long-range planning and to decide with sufficient time as to the provision of *emergency help* to the populations subjected to an *increasing* risk of malnutrition. This should have been the case for the last famine periods.

Therefore, the primary objective of this paper will be that of critically reviewing the predictive value of the different indicators, parameters and existing or proposed systems for the nutritional surveillance of the population. This does not apply to long-range planning, but rather is directed to the establishment of an early alarm and an adequate adoption of corrective measures at medium range.

INITIAL EVALUATION

Initial evaluation must provide as far as possible, information concerning the following areas:

1. Extensiveness of the nutritional problems.

2. Identification and description of groups, particularly of those at risk (vulnerable groups).

3. Causal factors more susceptible of measurement.

4. Information sources that the surveillance system may use to its advantage.

The goal of a surveillance system is to contribute to a satisfactory nutritional status of all the population. Therefore, it will be necessary to evaluate said nutritional status. The types of malnutrition or of nutritional deficiencies are equally important to know. The nutritional survey carried out by the Institute of Nutrition of Central America and Panama (INCAP) in the Central American Isthmus illustrates this point. For example, it is very important to learn if protein-calorie deficiencies are very widespread, and to establish their severity and type of prevalence. Vitamin deficiencies concern vitamins A, C, D or other trace elements. These evaluations or assessments are important and essential for national planning as well as for eventual actions of food aid in case of acute situations.

Identification and description of the more vulnerable groups is equally essential, a fact that we have already underlined in different occasions. It is impossible to adopt a practical and applicable operational decision based on the global statistics of food production, compared to its demand. In effect, a disastrous food situation may appear to be excellent according to the national statistics. A production excedent and the exportation of very rich-protein products, for example beef or fish meal, does not in any way mean that part of the population does not suffer from severe protein-calorie malnutrition. The point, therefore, is to establish the most important data concerning the population groups who are more susceptible of suffering from malnutrition. This classification must take into account the following factors:

1. *The Biological Situation:* age group, sex, and physiological status (in this respect the vulnerable groups appear to be the same in the majority of the world countries).

2. *The Physical Situation:* rural zone or urban zone, type of ecology, zones of savanna or rain forests. Particularly illustrative of this point is the case of Sahel. Drought has especially devastated the northern part of the Sahelian countries, that is, the southern desertic part between the 250 and 300 isohyetas. The neighboring zones, with a rainfall of approximately 1,000 mm and a completely different agriculture and ecology have suffered little with the drought. Therefore, the geographic situation is very important. Of course, the sanitary environment, the prevalence of different communicable diseases and the type of food sources, will also play an important role. However, these indicators must not be included in the initial evaluation, since they are susceptible of being modified and of indicating a deterioration of the nutritional status. In contrast, said information will define with precision the vulnerable groups.

3. Perhaps more important is the information on the sociocultural situation. For example, in certain regions of the Sahel, the nomads have particularly suffered with the drought because of their way of living, both from the ecological and cultural viewpoints. In the same manner, more deprived socioeconomic groups tend to be the most vulnerable and the more susceptible to suffer from an aggravation or deterioration of the food production. The importance of sociocultural control must never be underestimated.

Identification of the causal factors is also very important. For example, besides the sociocultural context, associated factors such as the socioeconomic and the ecological factors, certain knowledge must be obtained on causal metereological, climatic, demographic or agricultural factors.

In summary, the information sources vary from country to country, but it is evident that (this point will be discussed further on) they must go beyond the purely medical or nutritional domain. Thus, this requires a multisectoral approach both in the forecasting of an acute deterioration domain, which is the one of our interest at the moment, such as in the domain of long-range planning.

LEVEL OF INDICATORS

The World Health Organization has grouped the different types of information in four levels:

1. *Level A* which groups the indicators of an ecologic nature: meteorology, soil, water, vegetation, demography and infrastructure. All of these indicators are mildly susceptible to sudden changes, except for the meteorological factor which is extremely important.

2. *Level B* comprises resources and production. These cover agricultural production, cattle, import and export of foods, and the stores existing in the country.

3. *Level C* is of an economic nature, both of home economics as of community economy. This comprises sales, the way profits are used, data on prices, availabilities at the local market, and data on food consumption at family level and at individual level.

4. *Level D* is the resultant of the action of the three preceding levels, that is, of the physical and nutritional health status of the population, and of each group of individuals. The health status of the population is better appreciated by the health status of the more vulnerable groups.

Figure 1 schematically illustrates the influence of these causal factors and, of course, the importance that indicators derived from them have on the health status of a given population. It is important to emphasize here that quite often nutritional status does not change but tardily after the appearance of the causal factors. It is evident that a drought can in the first place, be predicted, and afterwards confirmed a long time before the nutritional effects are felt and become detectable by anthropometric measurements. The chain of events or of causal factors is illustrated in Figure 2. This graph clearly indicates the chain of events that finally leads to nutritional situation (WHO).

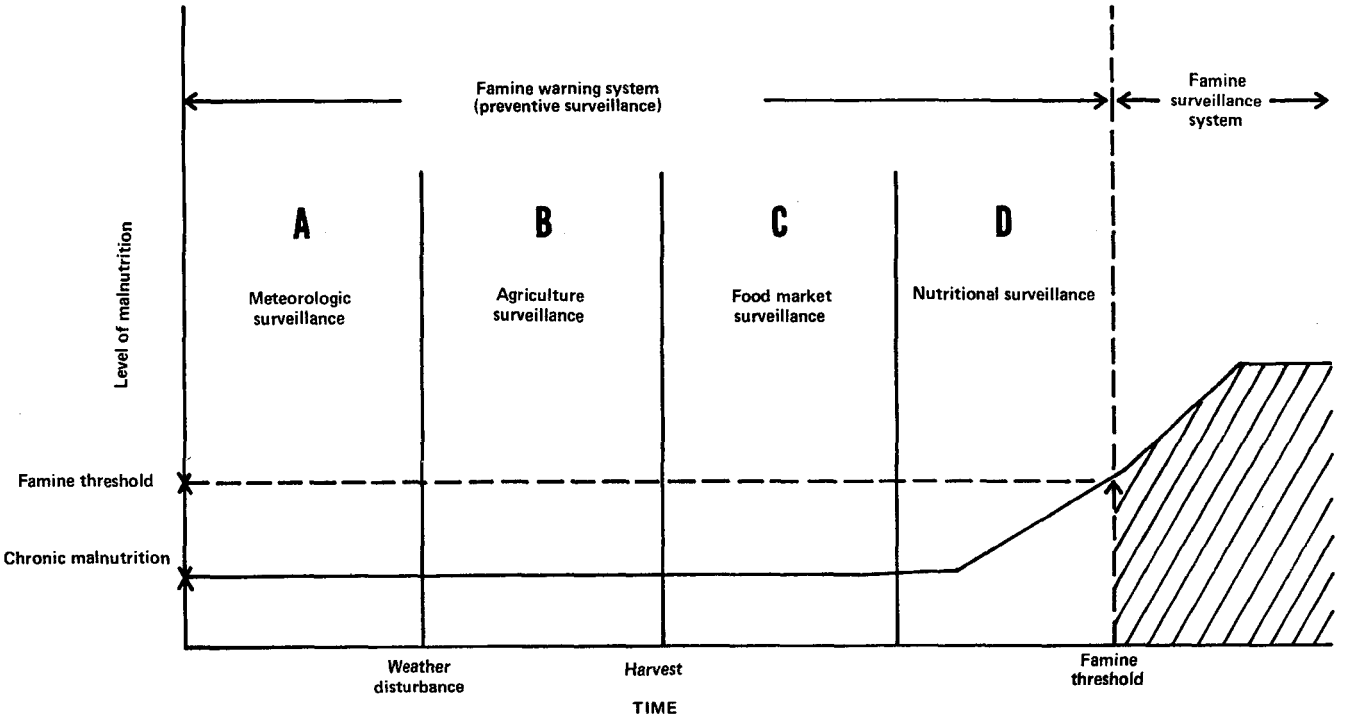

Fig. 1. *Relevance of various surveillance systems according to nutritional situation.*

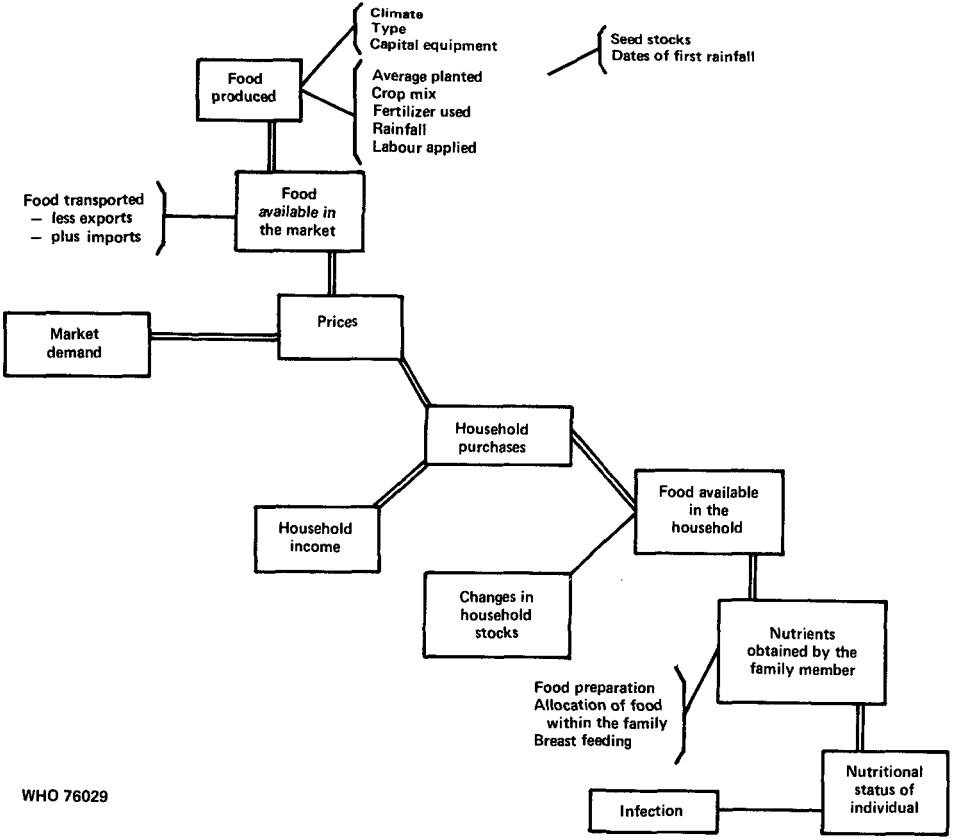

Fig. 2. *Chain of determinants with regard to nutritional status.*

PRECOCITY AND RELIABILITY OF THE INDICATORS

In general, medical nutritionists and other experts in public health are not concerned but with the final result of a long process which culminates either in a satisfactory nutritional status or in the presence of nutritional deficiencies in the population. It cannot be excessively repeated that the analysis or the measurement of the nutritional situation of a population, or even of its evolution in time, has little predictive value. This does nothing but confirm in an irrefutable manner, a status already consummated.

The more one goes back in time or approaches level A, the more the predictive value of the indicator also increases. The prediction or confirmation of a drought status constitutes a very early alarm sign of a dangerous food situation.

If the predictive value of the indicators increases when approaching level A, the reliability of these data also diminishes in the same way. Prediction of a drought is an early indicator, but rather unreliable, since it is very difficult to determine in a valid form, which will be the impact of said drought on the nutritional status of the vulnerable population groups. On the opposite, the anthropometric measures and the increasing prevalence of malnutrition have little predictive value, since they reflect a consummated fact, but undoubtedly constitute an extremely reliable indicator of deterioration. Between the two extremes, the agricultural production indicators (prediction or confirmation of a deficit, economic indicators such as availability in the market, prices not controlled by the central authority) have a lower predictive value but are more reliable from the technical point of view.

ACCCEPTABILITY OF THE INDICATORS AND THEIR IMPACT ON DECISIONS

It is oftenly confirmed that the predictive value and reliability of an indicator are inversely proportional. Now, the reliability is a quality indispensable for the political level, that is, the level where important decisions are taken both at long and at short-term range. The statement of an emergency status and the organization of food distributions in practice are not decided upon deficitary production previsions. It is opportune in this plane, to insist on the acceptability of different indicators and of the conclusions attributed to them. To again cite the example of Sahel, numerous indicators, not quantified but concordant and relatively reliable, attracted the attention of national and international experts long before the international community was mobilized. Although technically unquestionable, conclusions did not receive the political attention they deserved. Therefore, it is indispensable to count with consensus not only on the predictive value and reliability of the indicator, but also on its acceptability by the persons in charge of taking a decision. It is a well-known fact that, particularly in the domain of natural disasters, the admonition or warning of an imminent disaster oftenly results fruitless due to the lack of acceptability and understanding of the message. It is not enough to announce with precision the

imminence of a cyclone: it is necessary that the message be transmitted and accepted by the population. Finally, it is indispensable that a certain number of measures be pre-established and translated into actions the day the message of alarm is received. The cyclone that in 1973 caused more than 1,800 deaths in India is a classical example. The admonition, thanks to the metereological world-wide surveillance of cyclones permitted to foretell national authorities with more than 8 hours of anticipation. However, the lack of transmission and of understanding prevented the arrival of this message to the local authorities and to the affected population.

We can therefore summarize these statements by saying that the earlier the indicator, more will be the time available for an intervention, but that on the other hand, the less reliable this is, the less susceptible will it be of impressing the responsible authorities so that they take immediate action. Now, it cannot be greatly overemphasized that a technical information, a precise sign of alarm, is not valid but in the measure this is understood, accepted and transformed into actions and decisions.

QUALITIES OF THE INDICATOR

Here we can summarize the preceding considerations by citing only the indispensable qualities of an indicator of food deterioration in case of catastrophe:

1. The indicator must be *sensible* to every critical change of the nutritional or food condition. Two criteria can be adopted:

   a) that the indicator reaches a critical value or "cut-off point" considered as an alarm sign;

   b) that the dynamic evolution of the indicator manifest a downward or upward tendency. The existence of a threshold or of a well-defined tendency in a given direction can represent a reliable signal that will generate action.

In the developing countries quite a number of factors which are responsible of malnutrition do not present sufficient sensitivity to determine the future nutritional status. For example, several climatic factors are not sufficiently known with the required precision to permit attributing them a responsibility calculated on the basis of certain food productions and, of course, on the food status.

2. The second quality lies on the *predictive value.* Therefore, more dedication is necessary in regard to the measurement of the causality factors than to discover early signs of changes in the process of being established.

3. Lastly, the indicator must be acceptable and susceptible of generating an action on the part of the responsible authorities. Perception of the relation cause-

effect by the authorities is at least as important as its real existence. The responsible authorities are more susceptible to act on the basis of a true diagnosis of a food scarcity than on the basis of technically valid indices, but whose possible effects on malnutrition cannot be clearly perceived by them.

4. The indicator should cover the especially vulnerable groups and thus permit to identify the population strata that will be affected by the food scarcity.

PREDICTIVE VALUE OF DIFFERENT LEVELS OF INDICATORS

It is important to keep in mind the fact that we are not dealing with a surveillance system for the purpose of establishing a long-term plan, but rather to detect early a serious abnormal situation. Table 4 indicates the value of the main indicators which pin-point alarm signs.

Level A, or the causality factors of ecologic type, have a great precocity, but their acceptability or reliability, that is, the relation of cause to effect is often debatable. With the exception of demography its value insofar as alarm signs, is also generally minimal. The galloping demography in certain countries acquires, nevertheless, a character which at the same time is early, reliable, and acceptable of a dangerous tendency in the coming years. The level B indicators concern resources and production. We must here distinguish among the different types of economy:

In the pastoral-type economies (the Sahel nomads, for example), the key indicator is the inventory of their herds. This is a less precocious sign but a relatively reliable and acceptable one. Its value, as far as alarm sign is concerned, is considerable. The populations whose subsistence is based on the health status of their herds, are in effect directly and rapidly affected as soon as the herds diminish in number due to droughts or epidemics. This has been clearly illustrated in the last droughts that have affected Africa.

In the economies of agricultural type the predictive data concerning the importance of crops are, of course, an earlier sign than what statistics indicate once the harvest has taken place. However, it often happens that what has been gained in earliness is lost in acceptability and reliability. Furthermore, the international estimations (FAO) many a time are incomplete and those originating in the governments are frequently to be taken with certain caution. On this occasion I consider appropriate to mention FAO's publication entitled *Food Crops and Shortages.* This monthly journal, unfortunately of very restricted diffusion, provides global data on the state of the crops, or on the crop predictions of the majority of the world countries. Nevertheless, its value is considerably limited, once again, by the disputable quality of the data received by this Organization, but it definitely is a praise-worthy tentative of an early alarm system of international level.

Data concerning food stores equally constitute a precious information, but a deterioration or a considerable diminution of food stores quite often is very rapidly

TABLE 4

LEVEL OF INDICATORS

	Precocity	Reliability/ acceptability	Value as alarm sign
Level A (ecology)			
Meteorology	+ + +	−	−
Soil capacity (pastures, crops)	+ + +	+	−
Demography	+ + +	+ +	+ (Very early alertness)
Level B (resources and production)			
Livestock (pastoral economy)	+ + +	+ +	+ +
Prediction of crops	+ + +	+	+ +
Estimates of crops	+ +	+ +	+ +
Food stores	+	+ +	+ +
Level C			
Revenues (in a market economy)	+	+ +	+ +
Price of products			
Availability at family level	+	+ + +	+ +
Way of distribution of foods in the family	+ +	+ (Does not change sufficiently)	None
Unemployment, cost of life (market economy)	+	+	+
Level D		Very tardy but undisputable ALARM	
Anthropometric measurements (weight/height)	+	+ + +	+
(moderate malnutrition forms)	−		
Prevalence of PCM and specific deficiencies	−	+ + + +	Tardy
Mortality < 1 year	−	+ + +	Tardy
Specific mortality	−	+ +	Tardy
MCH consultations	−	+ +	Tardy

followed by a nutritional deficiency in the families. In general, indicators concerning level B are among those which present the more favorable compromise of precocity, reliability, and acceptability.

Equally important to consider are indicators of level C. In a market economy the combined study of profits and price of the products is particularly valuable. In the measure acquisition power diminishes considerably, this represents an alarm sign that should not be overlooked. A marked reduction of availabilities at the family level precedes nutritional signs by a small margin. Therefore, it is of a lower predictive value, but the reliability of such informations and their causality relationship are, again, evident.

The value of the way of distributing foods in the family is of negligible value as alarm sign, due to the lack of sensitivity of this variable. Its analysis, however, is essential at the moment of practicing the initial evaluation. The state of unemployment and the cost of life are of minor practical interest.

Level D is constituted by alarm indicators absolutely undisputable but unfortunately tardy, excepting perhaps the anthropometrical measurements which, being far from early, permit nevertheless to discern between a moderate evolution or a progressive deterioration of the nutritional status of the population. This indicator is more precocious than the appearance of a high protein-caloric severe malnutrition or of specific clinical deficiencies prior to the increase of specific mortality. In regard to anthropometric measurements, the difference existing between the comparable weight and height and weight compared with age, could be underlined. In an emergency situation, the height/weight parameter is, in general, preferred to that of weight/age. The reasons are very simple. Growth retardation accumulated in the course of several years represents a form of chronic malnutrition, but it may well be that it does not correspond to an actual acute malnutrition status. A very small child for his age, in effect (weight/age $< 80\%$) can have, however, a present acceptable nutritional status (weight/height $> 90\%$). It is generally considered that the indicator weight/height permits an easier discernment of the recent fusion of muscular and fatty tissues from the permanent growth deficit.

CONCLUSION

It is essential to stimulate an effective and decisive action on the part of the authorities, based on the evolution of indicators of high predictive value (level A). However, we must ascertain that level D is more or less the only criterium which generates a decision and an action. In the majority of the cases these come too tardy. In practice, priority in the domain of early prediction of emergency situations must be given to the causality factors, measured by indicators in level B: food production, rentability and consumption levels. This cannot be done within the framework of a health ministry nor within the framework of an only ministry. Hence, it is essential to establish an interministerial and intersectoral structure that, on the one hand, can

count with data collected in the field or which are available in the different departments and that, on the other hand, has access to the highest decision levels of the country in order to generate effective actions, whether these are of planning at medium range or of adopting palliative relief measures.

RESUMEN

SISTEMAS DE ALARMA PRECOZ DE DETERIORO NUTRICIONAL EN PERIODOS DE EMERGENCIA

La situación alimentaria y nutricional es a la vez preocupante y poco conocida en numerosos países. Una vigilancia regular de la situación alimentaria y nutricional con la ayuda de técnicas epidemiológicas comprobadas es, por lo tanto, imperativa.

La vigilancia en un contexto de catástrofes o de desastres reviste ciertos aspectos particulares que la distingue de la vigilancia en tiempos normales. Los indicadores seleccionados no sólo deben ser sensibles y concernientes a los grupos vulnerables sino que además es esencial que ellos sean aceptados y reconocidos por los responsables nacionales. Su valor de predicción debe, pues, ubicarse no sólo en el plano técnico sino que, de igual manera, debe ser reconocido como tal por las autoridades correspondientes.

Los indicadores de tipo meteorológico y agrícola son los que gozan de mayor valor predictivo, pero éstos no son del todo reconocidos por las autoridades. Desafortunadamente muy a menudo los indicadores referentes al estado médico-nutricional de la población son los únicos que han estimulado y permitido tomar una decisión y una acción durante emergencias pasadas.

El establecimiento de una estructura interministerial e intersectorial, que pueda disponer de datos recogidos en el terreno se hace más y más indispensable para su recolección e interpretación. En ausencia de tal estructura formal, la vigilancia epidemiológica corre el riesgo de permanecer como un hecho teórico sin repercusión práctica.

BIBLIOGRAPHY

1. Aranda-Pastor, J., G. Arroyave, M. Flores, M.A. Guzmán & R. Martorell. Indicadores mínimos del estado nutricional. *Rev. Col. Méd. (Guatemala), 26:*5-27, 1975.

2. De Ville de Goyet, C. Principes méthodologiques de l'intervention en cas de famine. *Ann. Soc. belge Méd. Trop., 56:*271-292, 1976.

3. Foege, W. Epidemiological surveillance of PCM and of specific deficiencies. *Ann. Soc. belge Méd. Trop., 56:* 305-318, 1976.

4. *Nutritional Evaluation of the Population of Central America and Panama. Regional Summary.* Institute of Nutrition of Central America and Panama (INCAP) and Nutrition Program, Center for Disease Control (formerly Interdepartmental Committee on Nutrition for National Development). Washington, D.C., U.S. Department of Health, Education and Welfare, 1972, 165 p. (DHEW Publication No. (HSN) 72-8120).

5. Klatzmann, J. Queques remarques sur l'appreciation de la situation alimentaire. *Revue Tiers Monde, 16*(63): 603-606, 1975.

6. Lechat, M.F. The epidemiology of disasters. *Proc. Roy. Soc. Med., 69:* 421-426, 1976.

7. Mason, J.B. Nutritional surveillance. *Food Nutr. (FAO), 1*(4): 24-27, 1975.

8. Mason, J.B. Surveillance and prediction of food shortage and malnutrition. *Ann Soc. belge Méd. Trop., 56:* 253-262, 1976.

9. Pan American Health Organization. *Elements of a Food and Nutrition Policy in Latin America.* Report of a Technical Group Meeting held in Washington, D.C., May 19-23, 1969. Washington, D.C., PAHO, 1970, 27 p. (Scientific Publication No. 194).

10. Puffer, R.R. & C.V. Serrano. *Patterns of Mortality in Childhood.* Report of the Inter-American Investigation of Mortality in Childhood. Washington, D.C., Pan American Health Organization, 1974, 492 p. (Scientific Publication No. 262).

11. *Methodology of Nutritional Surveillance.* Report of a Joint FAO/UNICEF/WHO Expert Committee. Geneva, Switzerland, World Health Organization, 1976, 55 p. plus 2 Annexes. (WHO Technical Report Series No. 593).

Comments on the Paper

EARLY WARNING ALARM SYSTEMS OF NUTRITIONAL DETERIORATION IN EMERGENCY PERIODS*

*Juan José Urrutia***

Institute of Nutrition of Central America and Panama (INCAP), Guatemala, C.A.

SUMMARY

The guidelines presented by Drs. Lechat and de Ville de Goyet, in their paper "Early warning alarm systems of nutritional deterioration in emergency periods", are commented.

Utilization of other parameters to be used in relation to the basal evaluation of the nutritional status, the identification and description of vulnerable groups, as well as the environmental and socioeconomic factors is suggested. The usefulness of the proposed indicators is discussed. Finally, preliminary information of a post-disaster surveillance system of the nutritional status currently being conducted in a Guatemalan highland village destroyed by the earthquake of February 4, 1976, is presented.

INTRODUCTION

Dr. Lechat has presented the actual knowledge on the indicators that can be used to predict deterioration of the nutritional status of a given population in emergency situations. In my opinion, the selection of the main indicators, especially of the criteria on precocity and reliability of same are adequate.

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, November 21-27, 1976.

** Chief, Nutrition and Infection Program, Division of Biology and Human Nutrition of INCAP.

Nevertheless, the work is oriented to predict deterioration of the nutritional status before an emergency state occurs, but *no mention* is made of the measures to be taken in post-disaster cases. In this regard, it seems convenient to establish surveillance norms adequate for these conditions, particularly during emergency situations of short duration such as earthquakes or floods, since up to this moment their late effects are unknown.

After commenting Dr. Lechat's paper, a preliminary presentation is included on some of the parameters that form part of a surveillance system established for the purpose of determining changes in the nutritional status of a population in the Guatemalan highlands which was destroyed by the earthquake of February 4, 1976.

COMMENTS

With regard to the initial evaluation that must be done in order to learn the type of nutritional problems prevalent in a country, I consider it of utmost importance to learn also the habits, beliefs and knowledge of the affected population, concerning its food pattern. This information may constitute the basis for planning nutritional intervention programs and also for determining the type of foods which should be sent to a population affected by disasters. There are many examples of distribution of foods which do not form part of the dietary pattern of a population in moments of disaster. Recently in Guatemala it was common to observe how vegetable oil was provided to populations where grease is not used for cooking, or wheat meal, where facilities to prepare bread did not exist.

Identification and description of the vulnerable groups must not be based only on groups traditionally considered as such: preschool and school children, pregnant women and lactating mothers. Within each one of these groups, selection must be made of those considered to be more at risk. For example, in the rural areas, the breast-fed child in the weaning process and the child under one year of age living in urban zones where maternal lactation tends to disappear,[1] should receive priority. Other group to which no attention is paid is that of the adult wage-earner agricultural laborer, who is exposed to heavy tasks, thereby forced to use all of his caloric stores. In these cases, it is common to observe clinical malnutrition more in the adult men than in the adult women, in spite of the fact that the dietary intake of the latter is lower than in the former (F. Viteri, personal communication).

In relation to the environment, it is quite common to consider the inhabitants of rural areas as the at-risk groups. Nevertheless, residents of marginal urban areas oftenly are not considered as vulnerable, in spite of the fact that many a time these groups live in situations even worse than those of the rural areas.

Socioeconomic factors are determinants of the nutritional status of a community. Among them crowdiness should be mentioned, since it contributes to a greater dissemination of infectious agents. Other factor worthy of consideration

is the internal migration produced within a city or the same country which may be the cause of unexpected population increments.

Finally, it is worthwhile mentioning the information sources to obtain data on the nutritional situation of a given area, which, as mentioned by Dr. Lechat, vary from country to country. Is is imperative that this approach be of a multi-sectoral nature and that it comprises not only the official sources but also the field informants. The latter aspect makes it necessary for the personnel who obtain the information, to have adequate knowledge of the situation in their working area.

In regard to the level of the indicators, the distribution recommended by WHO is adequate.

Among the indicators related to ecology (level A), the incidence and prevalence of infectious diseases already identified as causal factors of nutritional injuries such as whooping cough, measles and gastroenteritis, can constitute a useful variable which may permit prediction of deterioration of the nutritional status. This acquires more importance when such diseases affect principally those children under three years of age, who are more susceptible to suffer nutritional injury.[2-5] The truth is that the specific nutritional injury of many infectious diseases has not been determined. For example, in 1968 and 1969 in the southern part of Mexico and in Guatemala, El Salvador, Honduras and Nicaragua, a serious bacillar dysentery epidemic caused by the Shiga bacillus (*Shigella* A_1) was observed.[6,7] This epidemic caused the death of more than 20,000 persons, but the nutritional injury resulting from it was not determined, an omission which could well have caused its lethality.

In countries where protein-calorie malnutrition is prevalent, one must not forget that infectious diseases are a concomitant factor in the nutritional injury. For this reason, its surveillance must be an integral part of a nutritional status surveillance system.

Concerning the indicators of economic nature grouped in level C, I believe that consumption of food by the adult working man should be added to the availability area at family level. The fact that a reduction in his intake were to be determined and that he continued subjected to the same physical activity, could perhaps be a more sensible indicator. An important aspect in this regard would be that of carrying out longitudinal-type surveys at the level of a same group of families, to determine the changes occurring in the course of time, and thus increase the precocity level of this indicator. Also, at this same level, the changes in the breast-feeding pattern and weaning practices could be included as an indicator, since it is known that a reduction in breast feeding and a shortening of the weaning phase, are associated to a deterioration of the nutritional status of the breast-fed child.

It is true that in spite of their high reliability, the indicators included in level D, which are the resultant of the action of the indicators already mentioned, have a very limited precocity as alarm signs. However, in view of the relative easiness

of their implementation, these should form a very important part of a nutritional surveillance system.

SURVEILLANCE OF THE NUTRITIONAL STATUS IN SANTA MARIA CAUQUE, GUATEMALA

For the purpose of measuring the nutritional injury induced in a population by the recent earthquake of February 4, 1976, a surveillance system was organized in the village of Santa María Cauqué, located at a distance of 35 km from the city of Guatemala, and at an altitude of 1,900 meters. This village was totally destroyed and a 5% mortality was observed in a population of 1,600 inhabitants. During the months of February, March and April, the inhabitants of this village lived in inadequate shelters, where crowdiness and deterioration of personal hygiene and of the environment were observed. During this period, the temperature fell to 4°C. In spite of the fact that the water system was repaired during the first 4 fays following the earthquake, water was scarce because it was the dry season of the year. By the end of April and beginning of May the majority of the families had built more ample and sheltered wooden houses or corn-cane dwellings.

The surveillance system includes: a survey of food availability at family level which is carried out every 3 months; weekly visits to all the families with preschool children, lactating mothers and pregnant women, to determine the incidence and duration of infectious diseases; fecal culture in children suffering from diarrhea for identification of enteropathogen bacteriae; study of death causes; updating of the population census every 3 months; in addition, births and deaths are reported every time they occur. Anthropometric measurements of children below five years of age are taken every 3 months to determine the nutritional status of each child. Determination of changes in the breast-feeding and weaning pattern through fortnightly visits to the lactating mothers is also performed. Finally, surveillance of pregnancies, abortions and births plus the study of intrauterine growth, and measurement of newborns within the first 24 hours of life are included.

We shall now present the intrafamily availability of black beans and beef, the consumption of which depends on the purchasing power of the families. Results obtained in 40 families were compared in October, 1976, with those observed in October, 1973 in the same families. The mean bean consumption per person was 42.8 g in 1973 and 50.9 in 1976; the *per capita* mean consumption value of beef was 36.6 in 1973, compared with 42.5 g in 1976. These results are presented in the accompanying Table. As it can be observed, contrary to our expectations no reduction in regard to these two foods was observed. It is important to mention that the survey in question was carried out 8 months after the earthquake, when availability of foods depended totally from the family income. These findings suggest that — up to this moment — the earthquake has not caused any change in the traditional economy of the community.

TABLE 1

AVAILABILITY OF TWO FOODS AMONG 40 FAMILIES LONGITUDINALLY STUDIED IN SANTA MARIA CAUQUE

Date	Foods	
	Beans	Beef
October 1973	42.8 14.4*	36.6 22.5
October 1976	50.9 17.4	42.5 18.7
t	2.043 (P .10)	0.805 (N.S.)

* Daily average per person expressed in grams, ± one standard deviation.

Figure 1 shows the incidence of four infectious diseases observed during the months of January, February, March, April and May, 1976, that is, a month before the earthquake took place and during the four months that followed this event. A decline of two respiratory infectious epidemics, as well as of diarrheal diseases that initiated their course in December of the preceding year, was observed during the month of January. However, it is a curious fact that during the weeks following the earthquake, cases of these two diseases continued to be observed; these increased during the month of March and the first half of April. By the end of this month few cases were reported. Other respiratory infections and diarrheal disease epidemics developed during the month of May, but these were of short duration. It can be assumed that the infectious agents responsible for the two epidemics which were in their final phase in January, found a favorable medium of dissemination as a consequence of the environmental deterioration. On the contrary, the two epidemics that started in the first week of May took less time in disappearing. The factor responsible for this change could well have been the improvement of housing conditions.

In relation to conjunctivitis, no significant increase of cases was observed, although the fact that the profile of the curve was similar to that of respiratory infections called our attention. Contrary to expectations, no important increase in skin infections occurred, in spite of the personal hygiene deterioration.

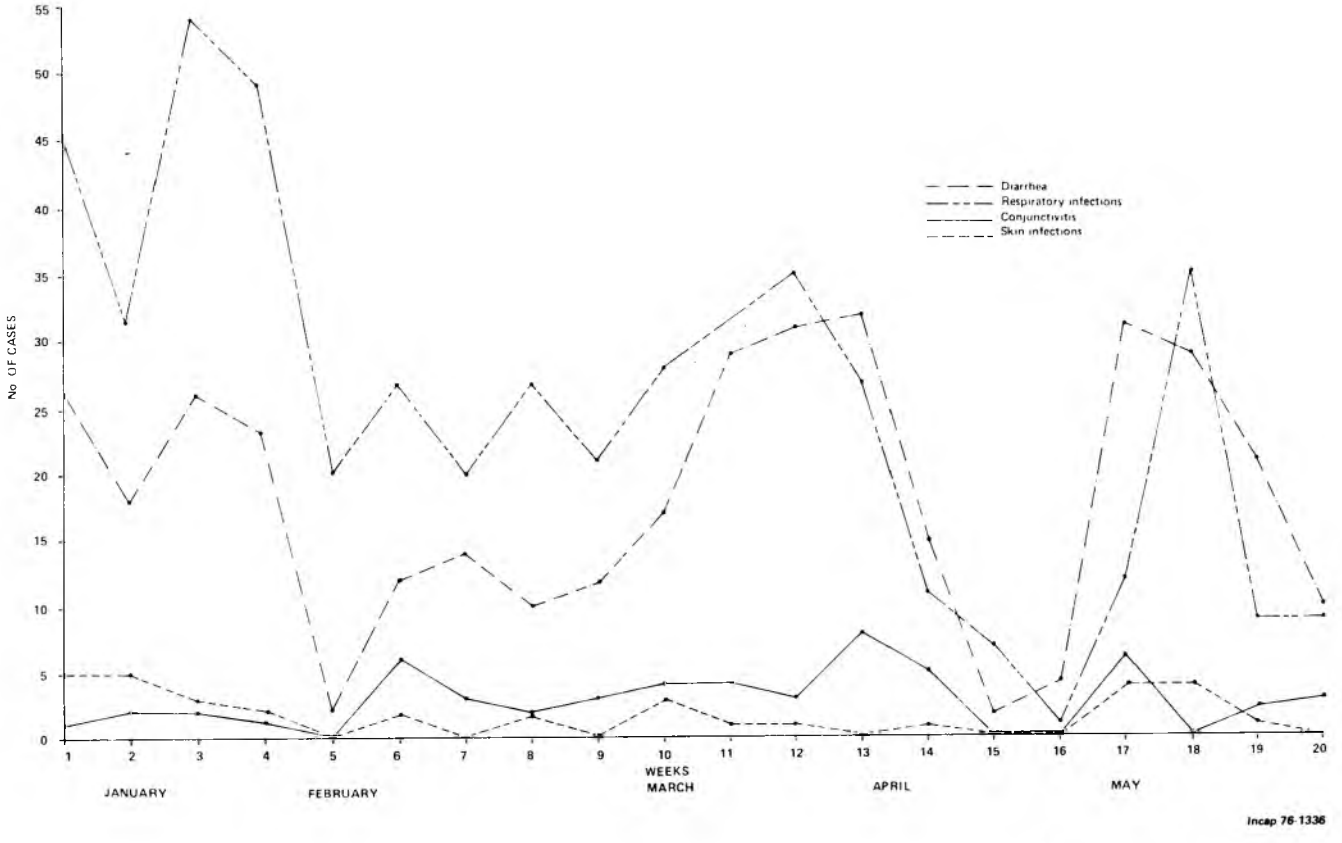

Fig. 1. ***Surveillance of infectious diseases in preschool children. Santa María Cauqué, January 1 — May 31, 1976.***

Up to the present moment, no nutritional injury has been observed in the preschool children of Santa María Cauqué. Only a clinical protein-calorie malnutrition case has been reported. This is not different from observations of previous years. Neither has any increment of malnutrition cases in other areas affected by the earthquake been reported (Otto Zeissig, personal communication). This information confirms what Dr. Lechat indicated: during emergency situations of short duration, the nutritional injury is minimum. However, surveillance must be maintained for a longer period in order to determine the tardy effects of a disaster such as the one Guatemala suffered.

RESUMEN

SISTEMAS DE ALARMA PRECOZ DE DETERIORO NUTRICIONAL EN PERIODOS DE EMERGENCIA

Se comentan los lineamientos presentados en el trabajo "Sistemas de alarma precoz de deterioro nutricional en períodos de emergencia", de los Dres. Lechat y de Ville de Goyet. Se sugieren otros parámetros a ser utilizados en relacion a la evaluación inicial del estado nutricional y en la identificación y descripción de los grupos vulnerables, los factores ambientales y las fuentes de información. También se comenta la utilidad de los indicadores. Finalmente se presenta información preliminar sobre un sistema de vigilancia post-desastre del estado nutricional, en una comunidad del altiplano de Guatemala que fue destruida por el terremoto del 4 de febrero de 1976.

BIBLIOGRAPHY

1. Organización Panamericana de la Salud. *El Valor Incomparable de la Leche Materna.* Washington, D.C., OPS, 1972, 68 p. (Publicación Científica No. 250).

2. Scrimshaw, N. S., C. E. Taylor & J. E. Gordon. *Interactions of Nutrition and Infection.* Geneva, World Health Organization, 1968, 329 p. (WHO Monograph Series No. 57).

3. Mata, L. J. *The Children of Santa María Cauqué: A prospective field study of health and growth.* Cambridge, Mass., The MIT University Press, 1978, 400 p.

4. Mata, L. J., J. J. Urrutia, A. Cáceres & M. A. Guzmán. The biolc[illegible]c environment in a Guatemalan rural community. In: *Proceedings, Western Hemisphere Nutrition Congress III, August 30 - September 2, 1971, Miami Beach, Florida.* Philip L. White (Ed.). Mount Kisko, New York, Futura Publishing Company, Inc., 1972, p. 257-264.

5. Urrutia, J. J. & L. J. Mata. Complicaciones del sarampión: experiencia en una zona rural de Guatemala. *Bol. Of. San. Pan.*, *77:* 223-230, 1974.

6. Mata, L. J., E. J. Gangarosa, A. Cáceres, D. R. Perera & M. L. Mejicanos. Epidemic Shiga bacillus dysentery in Central America. I. Etiologic investigations in Guatemala, 1969. *J. Infect. Dis.*, *122:*170-180, 1970.

7. Gangarosa, E. J., D. R. Perera, L. J. Mata, C. Mendizábal-Morris, G. Guzmán & L. Barth Reller. Epidemic Shiga bacillus dysentery in Central America. II. Epidemiologic studies in 1969. *J. Infect. Dis.*, *122:*181-190, 1970.

INTERPRETATIVE MODELS FOR SELECTION OF NUTRITION PRIORITIES*

*LOCAL LEVEL***: L. Fajardo, A. Pradilla, D. Wilson, G. Acciarri, J. Eckroad, R. Muñoz, F. Victoria, G. Quintero and B. de Ramírez

*NATIONAL LEVEL****: A. Pradilla, I. Beghin, J. del Canto, V. Bent and M.T. Menchú

SUMMARY

The evolution of a theory of a causality model of malnutrition which permits the analysis and diagnosis of malnutrition for the planning process, and serves as the starting point for a nutritional surveillance system, is presented. The model has been utilized at local and national level, allowing the establishment of bases for the development of Food and Nutrition Policies. Although not verified, its utilization under real life conditions has permitted its modification, the determination of its possible defects and advantages, and the planning of its verification in some countries.

INTRODUCTION

One of the basic elements for adequate nutrition planning is the diagnosis of the magnitude of the problem and of its conditioning or associated factors. The majority of interventions of economic nature count with models and quantifiable indicators (econometric models, etc.) that not only permit adequate planning but also periodic readjustments and predictions of changes.[1] Another situation is faced in the social planning area where not even consensus exists on the definition of welfare and, therefore, where indicators are a subject of great controversy.[2]

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November, 1976.

** Nutrition Project, Universidad del Valle, Fundación para la Educación Superior, Community Systems Foundation, Cali, Colombia.

*** Division of Applied Nutrition, Institute of Nutrition of Central America and Panama (INCAP), Guatemala, C.A.

The phenomenon of how nutritional status of a population is the resultant of the general life conditions of a given population (income, education, health, etc.) becomes increasingly clear[3,4] and it seems possible that this factor is taken as a global indicator of them, indicator which is both quantifiable and concrete. Therefore, it would then be necessary to develop models that, as happens with those of econometric nature, permit the planning and programming of interventions as well as prediction of the expected results. This, in turn, permits selection of those more effective and efficient programs by means of which it would be possible to reach the goals and evaluate results.

The definition of the problem and the understanding of its mechanisms require the development of a series of hypotheses based on generalizations of real or experimental situations (a model) to define the indicators, qualify the individual effects of a given action, and forecast the expected changes. We shall now discuss the utilization of theoretical models for the diagnosis and selection of priorities at local and national level. Parts of this work have been previously presented.[5-7]

I. LOCAL LEVEL

The development and verification of a methodology for nutrition planning is presented. Briefly, the methodology includes the following:

1. A theory that considers the relations between a cluster of variables which affect the prevalence of malnutrition in a community, such as agricultural production (land area, selection of crops, technology and production, etc.), marketing (importation and exportation of foods from the and to the community, loss of crops before and after harvest (rodents, birds, deterioration, etc.), food distribution among the families (local marketing, income, etc.), food distribution among family members (food habits), environmental sanitation and health.[8, 9]

2. A diagnostic procedure which includes field measurements and methodology for data analysis and rationalization of conclusions in regard to the efficacy of the proposed solutions.

3. Design of solutions. An analysis of the proposed alternatives; for example, if the diagnosis indicates the need of a solution involving drinking water, the alternate solutions should be compared as to their effectiveness, implementation time, cost and stability of the solution.

4. Evolution of the solutions once they are implemented. This is a procedure to compare the predicted effects in the design phase, with the effects observed in the course of time.

A. Theory

The theory is presented as a model that can be described in two sections. The first one includes three variables: nutritional status, health status and the nutrient gap (difference between the required* and consumed nutrients) (Fig. 1).

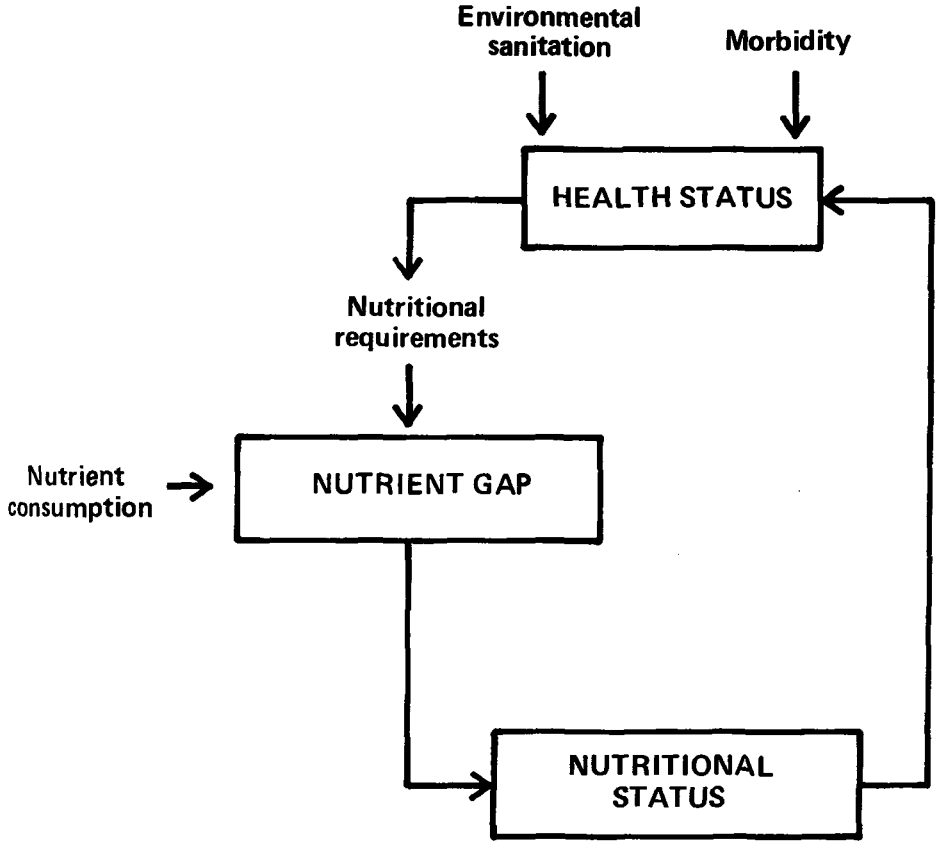

Fig. 1. *Association between nutritional status, health and nutrient intake (in foods). Health status refers mainly to the presence or absence of diarrheal disease.*

Requirements refer to increased needs due to metabolic process during disease and recovery; increased losses and decreased intake during illness.

This section of the model or theory enunciates that nutritional status is a function of the nutrient gap, the health status and their interrelations. A reduction in the nutrient gap improves the nutritional status; an improvement in nutritional status improves health status, and an improvement of the health status will translate into a reduction of the required nutrients.

The second section is the consumption model (Fig. 2), similar to the food balance sheets which FAO has used for various years. It states that the nutrients consumed by a population depend on the nutrients produced plus the imported nutrients, less the nutrients* lost or exported. The nutrient losses occur in various stages: loss in the collection of crops, losses in storage and transportation, losses by rodents, insects and deterioration, losses on account of poor marketing, losses due to an unequal distribution among the families of the community (income), losses in the preparation of foods (at commercial and family level), and losses due to an unequal distribution of nutrients among the family members.

The output of this section of the model (nutrients consumed) feeds the first part of the model. The nutrients consumed are subtracted from the required nutrients in order to calculate the nutrient gaps (for individuals, families and communities). The third section is the biological utilization model related to disease frequency and duration, and its conditioning factors.

There exists another connection of the first section with the second section of the model, and this is a feedback from the starting point of health status: an improvement of the health status would increase production and, in its turn, this would produce an increase in income, which would translate itself into an increase in the nutrient consumption.

Description of the model may be better understood if the way how the analysis is carried out is illustrated. Considering first the flow of nutrients and cross-sectioning at community, family and individual level, it is possible to compare the flow of nutrients at each level with those required by it, and to estimate the communitary gaps of families and individuals.

B. Analysis

The logical framework for analysis is derived from the gap theory to which a decision scheme is added (Fig. 3). In other words, once the bottleneck in the nutrition flow is identified by measurement of the different gaps, the decision scheme emerging from each gap permits to analyze why and how said particular gap is produced and how it can be closed. A general statement concerning the gap theory indicates that when proceeding from the highest level gap (communitary gap) to that of the lowest level (individual gap), its size may remain constant or increase due to

---

* Nutrients refer to the calorie and protein content of the food items.

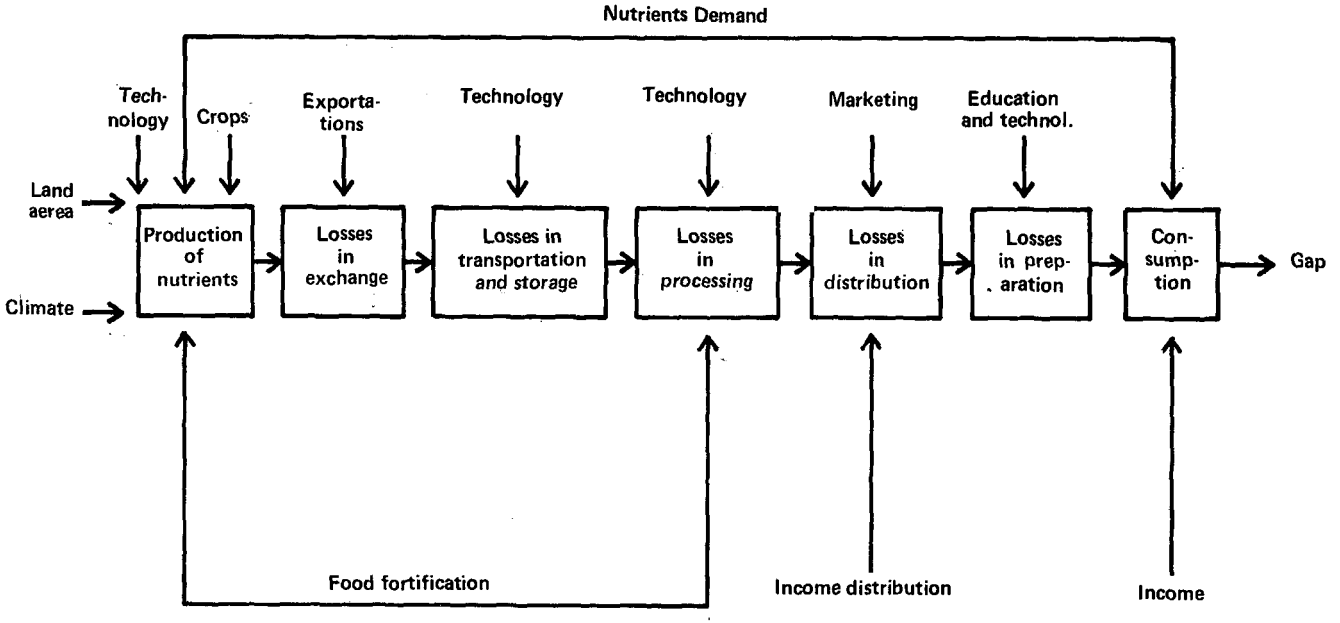

Fig. 2. *Nutrient flow model. (The output feeds the first section of the model).*

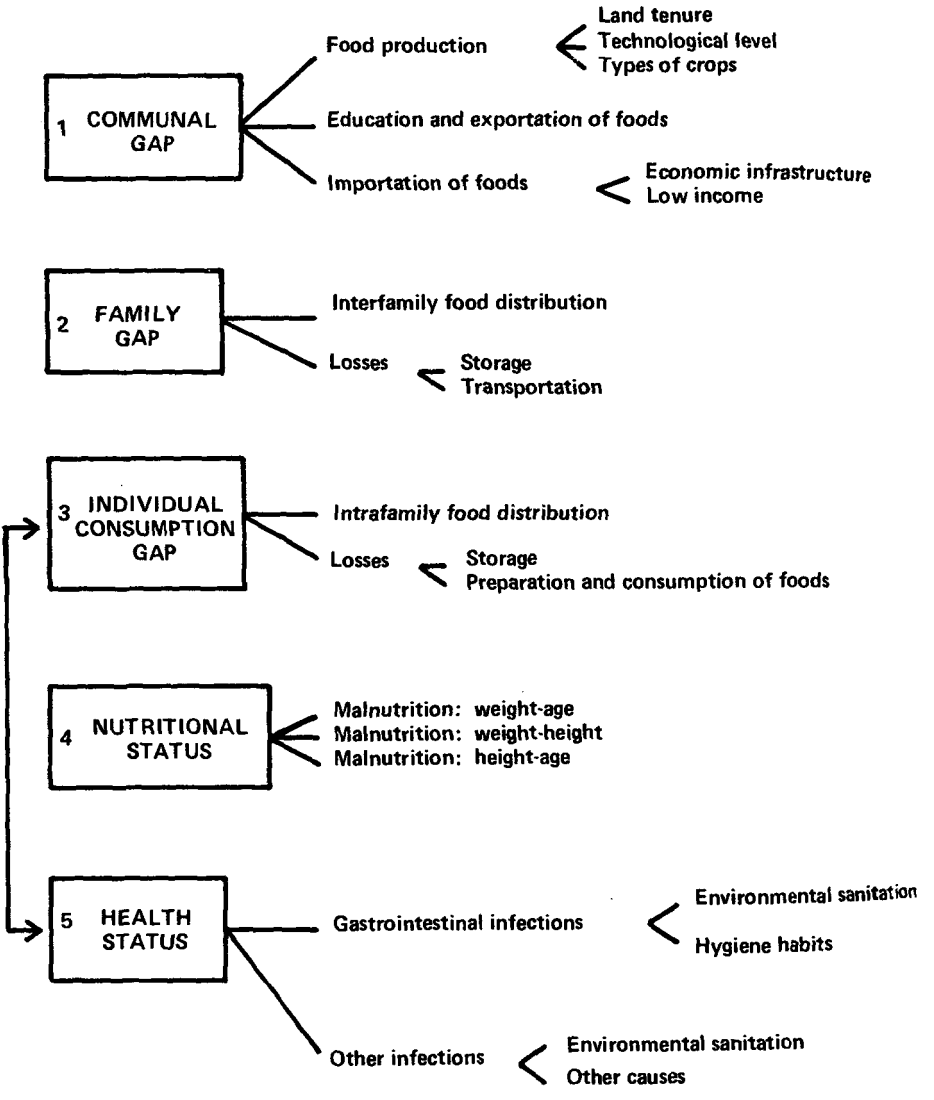

Fig. 3. *Decision scheme for the selection of analytical steps.*

the losses analyzed in the decision scheme (a biassed food distribution among the family members and among the families of a community is considered as a loss).

A sequential procedure is followed for the diagnosis and analysis:

1. The first variable measured and analyzed is nutritional status. If there is no malnutrition, no nutrition interventions are required nor is the measurement of the other variables of the model necessary. If a malnutrition rate that justifies an intervention is found, then the family gap is analyzed.

2. Analysis of the family gap. If the families are consuming more than the normally required nutrients (taking into account the individual requirements of the family members), and if malnourished persons in these families are found, the requirements for these families are abnormally high or the distribution of nutrients among their members is not proportionate to the requirements of each of the members of the family. This analysis would indicate that the following measurements would be those concerning the intrafamily distribution of nutrients:

- If a poor intrafamily distribution does not explain the high malnutrition rates, then the next factor to analyze is diarrhea incidence.

- If a low diarrhea incidence is found, a general morbidity analysis should be considered.

3. Analysis of the communitary gap, if the nutritional gap in the community is 0, but there are positive gaps at family or individual level, the existence of a poor interfamily distribution in the community or among the family individuals is indicated.

In this case, the appropriate interventions would be of economic type (re-distribution of income or of foods).

If the average community family has a nutrient deficit, the following variables should be analyzed at community level:

Nutrient production

Nutrient importation

Nutrient exportation

When availability of nutrients is greater than nutrient consumption, this indicates the existence of losses within the process and studies to determine these losses at the marketing and family level are required.

If availability of nutrients is almost equal to the consumption of same, interventions should be oriented towards the production or importation of nutrients.

C. Example Case

The results of the diagnosis procedure designed for the population of Villa Rica, Colombia (with an area of approximately 30 km^2), are presented in a summarized form. The anthropometric survey showed that the malnutrition percentage among preschool children is of approximately 60% when calculated on the basis of a weight-for-age deficit (Gómez method) and approximately 55% when calculated as a deficit of weight for height. This high rate of malnutrition can be related to:

- Deficient nutrient intake (a positive nutrient gap).

- Deficient health status which reduces the biological utilization of food and increases nutrient requirements at individual level.

Analysis is made of how both deficitary states have been generated, as well as their proximate magnitude.

The individual gap for all age and sex categories is an average of 30% both for calories and proteins. As the nutrient gap for the families is also of 30%, it can be assumed that there does not exist any nutrient loss within the family, except that related to intrafamily distribution.

Analysis of the intrafamily food distribution shows that preschool children of Villa Rica receive a portion of the foods available to the family which is in agreement with their requirements (Fig. 4). In contrast, lactating mothers and pregnant women as well as school children receive a nutrient quantity (in relation to their requirements and family availabilities) significantly lower. The other categories of individuals proportionally receive more nutrients.

If 60% of the preschool children are malnourished and they receive an adequate proportion of the nutrients available to the family, it can be inferred that their nutrient intake deficit is due to a deficit in the availability of foods at family level, which in the case presented is in the magnitude of 96 g of protein and 4,000 calories per family to close the nutrient gap.

The nutrient deficit is not the same for all the families: 22% of them consume more than their requirements (they have a negative gap) while 78% of the families have a positive nutrient gap of approximately 50%. If the excess of nutrients consumed by the 22% of the families could be channeled towards those families with a positive gap, the result would be that the gap for this latter group would be reduced in 20% (from 50% to 30%). This is the measurement of the bias in the intrafamily food distribution.

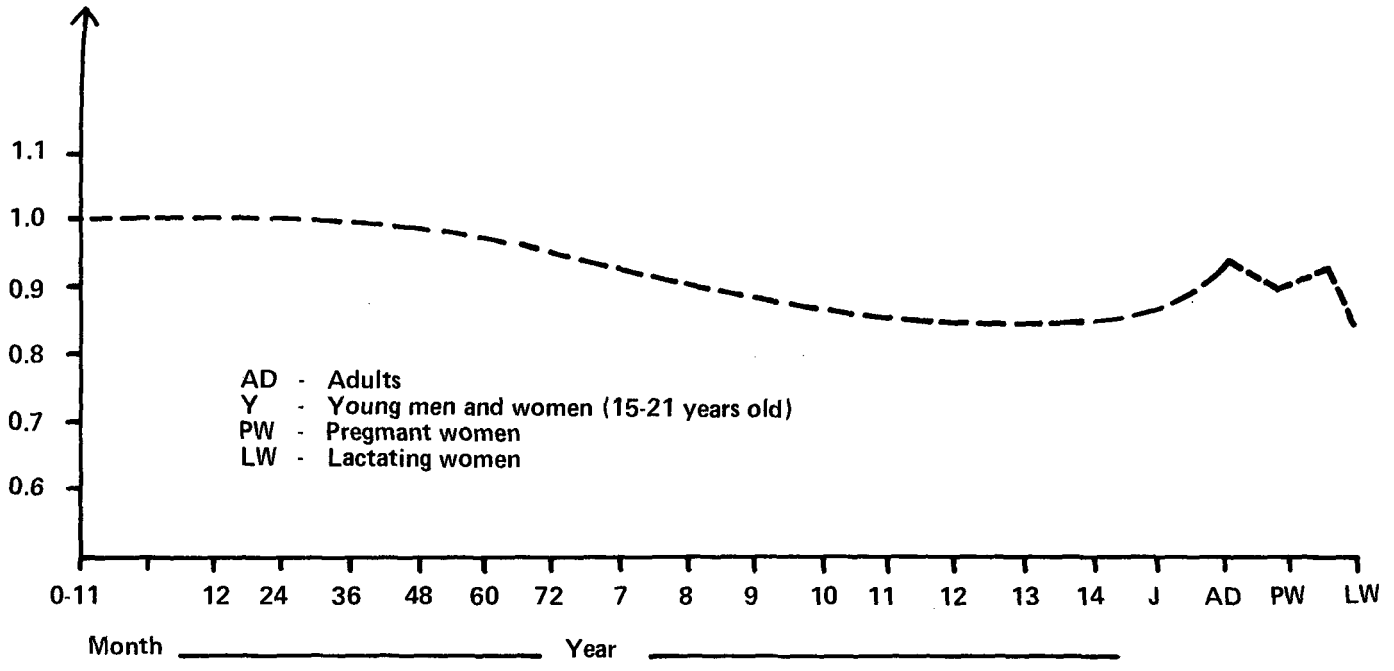

Fig. 4. *Intrafamily nutrient (calories and protein) distribution. Ideal distribution will give 1.0 for all members, regardless of the amount.* $I = \frac{Ci/Ri}{Cf/Rf}$ *where I is intake, C, consumption of individuals (i) and family (f), and R, requirements.*

In practice, this bias is measured by calculating the excess in the amounts of nutrients necessary at community level, to ensure that no family has a positive nutrient gap. This calculation is made on the basis of two hypotheses: first, if it is assumed that the tendencies in the interfamily distribution of nutrients is not changed, an excess of nutrients of the order of 45% would be required with respect to the calculated nedds. If a controlled food distribution is assumed, only an increase of 11% would be required in the amount of the needs calculated for each family. These two quantities are important since for each intervention the real value would be found between these two extremes.

By adding all foods available at the family level and comparing it with the foods available at the community level (production plus imports less exports) information is obtained as to the losses that occur during the flow of nutrients in the community (transportation, storage, distribution). These losses are of the order of 10 to 12% in food availability at the community level in the present sample.

In conclusion, it can be stated that the family nutrient gap in Villa Rica is a direct consequence of the existence of a nutrient gap at the community level, aggravated by a poor interfamily distribution of foods. For the urban sector, the family gap could be explained by a low purchasing capacity of the families, while in the rural sector the causes could be the inadequacy of: land tenure system (95% of the peasants own only 30% of the land), low level of technology, scarce and inadequate technical assitance and lack of credit and infrastructure.

Nutritional conditions worsen in the area even more, due to the tendency of exporting foods produced in the area (soybean, beans), to import others of lower quality (rice), thus raising the cost of the nutrients available for family consumption.

The second malnutrition cause in Villa Rica is found in the high morbidity observed: 65% of the children under 6 years of age suffered one or more episodes of diarrhea in a 15-day period; the hygiene conditions which explain this high prevalence lie in the wretched environmental conditions prevailing in the area. Suffice it to say that only 50% of the population use letrines (the rest does not use any built facility). The main source of water consumption is derived from the family open cisterns without any protection.

From the previous analysis a pertinent question arises: "Which is the problem responsible of malnutrition considered as the most serious and, therefore, worthy of prioritary attention?"

Results of the analysis demonstrate that when the prevalence of infectious diseases is high, the relation between the intake level of nutrients and the nutritional status of the children is quite low. On the other hand, when the prevalence of infectious diseases is low, the nutritional status of the children is determined mainly by their intake level. Consequently, reduction of morbidity and improvement of the sanitary conditions in this community are the prioritary interventions. A second priority, of course, is that related with an adequate food consumption.

II. NATIONAL LEVEL

A. Basic Assumptions

1. Although various sectors of human activities (and in this case in particular of the Government) should participate in the analysis and solution of the problem, not all of them have to do so in each of the stages. In some moments or circumstances, one or two sectors will have to play the main role, while in other places other sectors will have to do it. Acceptance of this assumption make it possible to establish an order of importance and a sequence of restrictions which should be eliminated to simplify the analytical and planning work.

2. Countries which require an adequate diagnosis of nutritional status are precisely those with less resources to carry it out. This is why complicated surveys and sophisticated analysis of data processes should be reduced, using a maximum of the structures and information already available.

3. In the majority of cases, available information can be utilized to obtain valid conclusions in regard to nutritional status and associated factors.

4. In most of the developing countries there are regional, district or geographic differences as to the prevalence and severity of malnutrition and its causal factors. Disaggregation of the information at each level makes it possible to identify sites of greater risk, as well as the sequence of restrictions that should be eliminated to solve this problem. The previous statements imply disaggregating information from each sector to the smallest territorial component (geographic, political, etc.) and re-grouping it by each of the geographic units. If it is possible to identify areas at greater risk, interventions can be more effective and efficient. Determination of the main causes in each region can then lead to the design of adequate interventions for each one of them.

5. It is an accepted fact that a simplified model must be utilized for planning purposes. Only the sectors, causes, and more important relations should be included. The temptation of adding factors and relations leads to very complicated models that in the long run are of restricted use, and if applied to a certain limit, can become a development model for the country. In practice, a simple causal relation scheme is necessary among some quantifiable factors, the association of which with malnutrition is known.

6. Selection of the information to be compiled, analyzed and interpreted, is determined by the nature of the decisions to be adopted. This is why such decisions must be previously identified. Decisions can be related to budget, preparation of an international loan, creation of intersectoral mechanisms, basis for evaluation and surveillance, etc.

B. Model Utilized

When participation in the nutritional analysis of three Central American countries became necessary (nutrition assessment)[10-12], for which purpose only little resources and limited experience were available, decision was taken to start with a simple model. The purpose was selecting indicators, identifying the more at-risk regions and, consequently in need of prioritary actions; identify some of the existing restrictions for improvement of nutritional status and to rationally organize responsibilities among the members of the evaluation or assessment team.

All the relations used are supported by generalizations of studies carried out in different parts of the world.[5] The model had to assume causal relations between the different factors. Two general hypotheses are accepted in the model: the first is that malnutrition is due to two causes, the amount-quality of the ingested foods and their biological utilization in relation to requirements. The second hypothesis proposes that both are associated with income and education.

The conditioning factors of the biological utilization of foods correspond to the frequency and duration of illness, mainly of diarrheal disease, which in turn is conditioned by environmental factors (water, excreta disposal, crowdiness, etc.) modified by the hygiene habits of the population. In its turn, duration of the disease depends on the access to curative health systems.

Coverage of immunizations, especially for measles and whooping cough, would also have a positive effect on nutritional status.[14,15] The quality and quantity of the ingested foods is a function of the availability of foods at individual level (intrafamily distribution, purchasing power, nutrition education and local availability) and at communitary level (production, exportation, importation, losses, marketing).[16,17]

Purchasing power and education are perhaps the variables that determine and influence the greatest number of factors in this model. There exists abundant evidence in the literature that support this fact.[2,4,16,17] (See Fig. 5).

C. Indicators

In accordance to the type and validity of the available information in each one of the countries, it was necessary to choose a series of indicators for each of the steps in the theoretical scheme. Table 1 presents a list of the indicators used.

D. Analysis of the Information

By using detailed maps of the countries, ponderal scales were decided upon for each variable. All the selected geographic units were stratified (municipio) in accordance to scales previously defined for each indicator which fluctuated from adequate or sufficient to inadequate or insufficient.

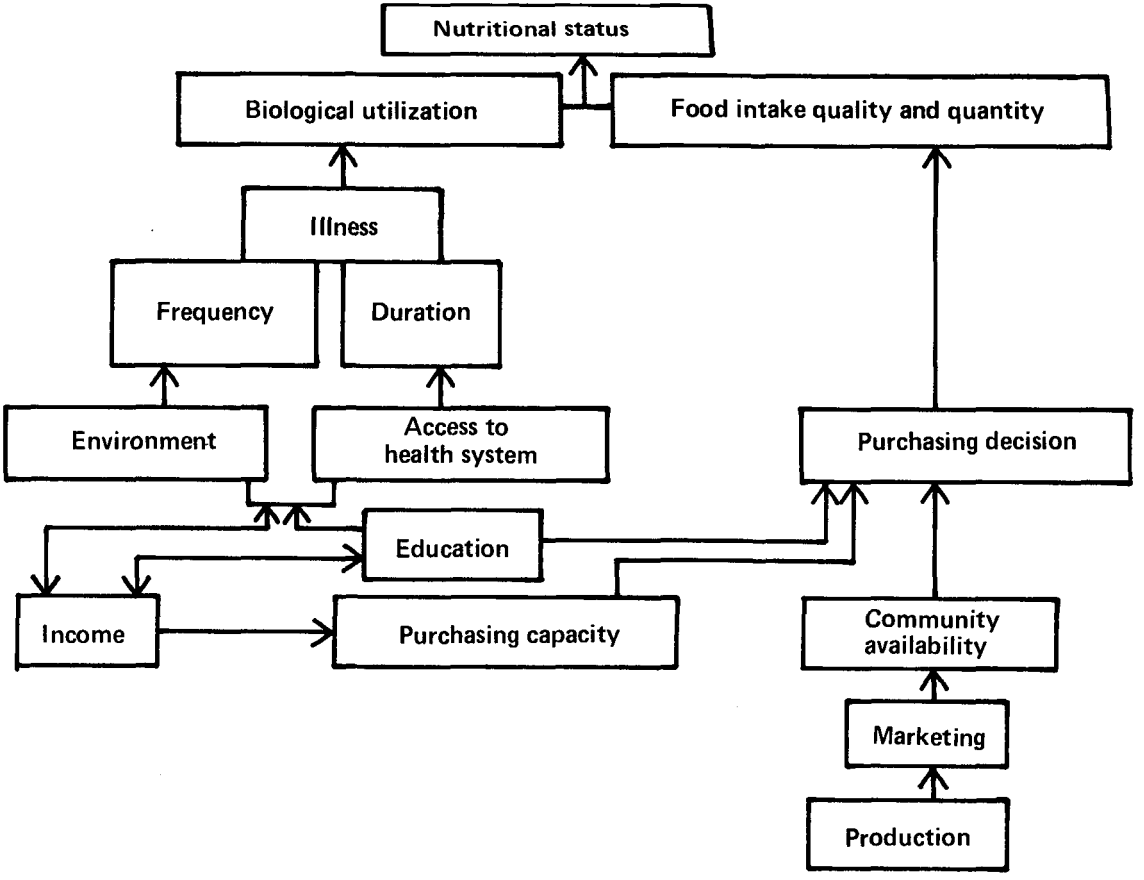

Fig. 5. *Global level diagnosis model.*

TABLE 1

INDICATORS USED FOR THE ANALYSIS OF NUTRITIONAL STATUS

Variables	Direct	Indirect
Nutritional status	Anthropometry	Demographic
Biological utilization	. . . . .	. . . . .
Frequency of illness	1. Morbidity surveys 2. Consultation rates for diarrheal disease	1. Water 2. Excreta disposal 3. Immunized population 4. Housing condition
Duration of illness	. . . . .	1. Presence of Health Service 2. Access to Health Center 3. No. of consultations per inhabitant 4. % of population on social security
Quality and quantity of ingested foods	1. Dietary surveys	
Food availability	Food balance sheets Food production per person. Per municipio. Related to per person requirements	1. Land tenure 2. Agricultural credit 3. Extension service 4. input availability
Marketing	Agricultural marketing studies	1. Access to communication means 2. Type of transportation 3. Storage systems 4. Processing plants
Income	Income and expenses surveys	1. Demographic (rural disperse population pyramid) 2. Minimum salaries 3. Index of prices 4. Food prices 5. Type of agricultural and livestock production (export)

Variables	Direct	Indirect
Education	1. Literacy 2. School matricula with relation to school population	1. Coverage and type of social promotion in the area. 2. Coverage of massive communication systems and type of propaganda 3. Number of schools and teachers in relation to school population
Infrastructure	Administrative Transportation Political Tribal etc.	

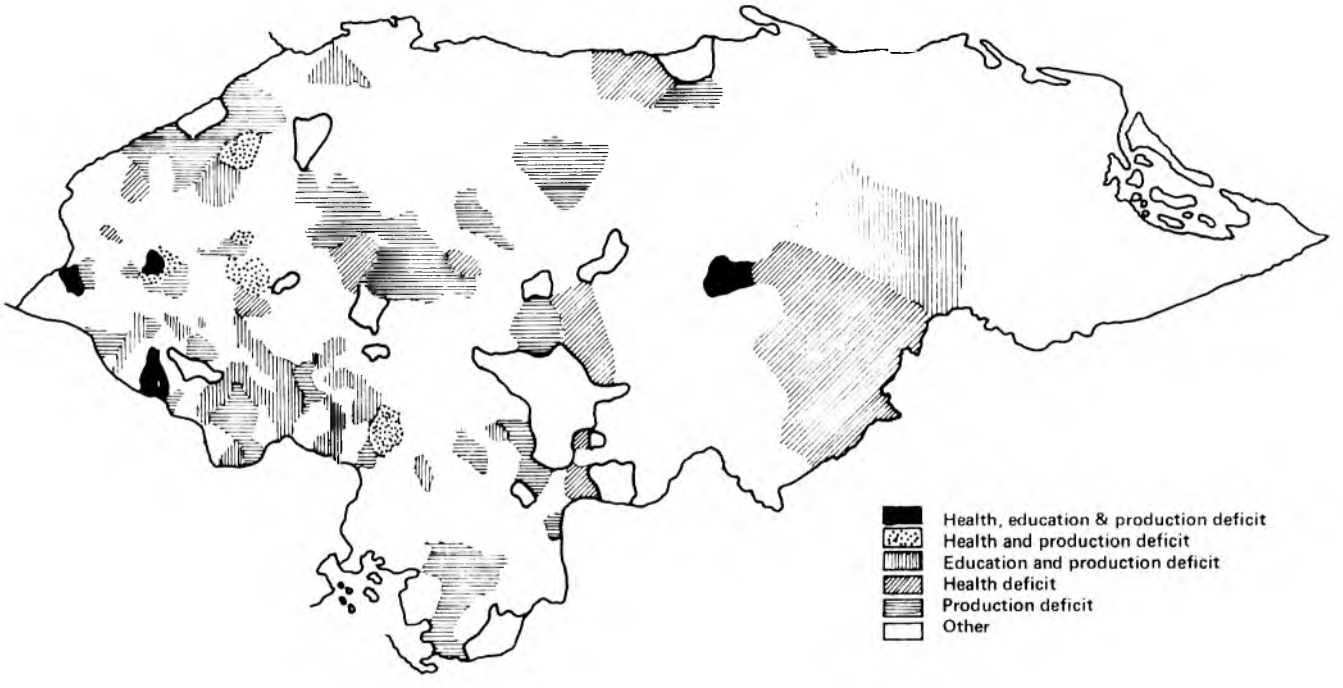

Fig. 6. *Highest mortality, 1-4 years to total. Its association with health, education and production deficits. (Clear areas have lower mortality rates).*

It then became apparent that there are places where the nutritional problem is more critical. Besides this fact, not all the associated factors appear as confluents in these same sites. There is a whole series of possible combinations of the different variables by means of which those interventions of greater impact on nutritional status are identified. Some of the associations found in a Central American country are demonstrated in the map (Fig. 6) which show the deficits of some factors associated to the nutritional problem.

The model thus served to identify geographic areas at greater risk of suffering from malnutrition, though it is not proved that these are the more affected areas (the limiting factor here is information). At least it creates a certain logic for regional monographs or for selection of samples for in-depth surveys, and for defining the type of needed surveys.

The apparent result consists in the identification and localization of information in the country, and the defects and inconsistencies of some data. It is possible to anticipate that a theoretical model is useful as a starting point for the establishment of a surveillance system which uses infrastructure and the existing indicators. Their verification is required as well as the desighn of a flowing system that permits its utilization in the different decision-taking levels. Another result of the analysis is the detection of limiting elements in the administrative structure for the adoption of decisions, institutional coordination, or for the appliance of measures oriented to solve the problem.

RESUMEN

MODELOS INTERPRETATIVOS PARA LA SELECCION DE PRIORIDADES EN NUTRICION

Se presenta la evolución de una teoría modelo de causalidad de la desnutrición que permite un análisis y diagnóstico de la desnutrición para el proceso de planificación y como punto de partida para un sistema de vigilancia nutricional. Este modelo ha sido utilizado a nivel local y a nivel nacional permitiendo sentar las bases para el desarrollo de Políticas de Alimentación y Nutrición. Aunque no está verificado, su utilización en condiciones de la vida real ha permitido modificarlo, determinar sus posibles defectos y ventajas y planear su verificación en algunos países.

BIBLIOGRAPHY

1. *Food and Nutrition Planning.* Rome, Italy, Food and Agriculture Organization of the United Nations, 1975. (Nutrition Consultant Report Series No. 35).

2. Berg, A. D. *The Nutrition Factor. Its Role in National Development.* Washington, D.C., The Brookings Institution, December, 1973, 290 p.

3. *Metodología para un Análisis Multidisciplinario de la Desnutrición.* Instituto de Investigaciones Tecnológicas (IIT) Bogotá, Colombia, 1973.

4. Levinson, F. *"Morinda", an Economic Analysis of Malnutrition among Young Children in Rural India.* Cornell/MIT (International Nutrition Policy Series 1974).

5. Pradilla F., A., M.T. Menchú, J. del Canto & V.W. Bent. Planificación de las actividades de nutrición a nivel de los servicios descentralizados de salud. In: *Programas de Nutrición en los Servicios Descentralizados de Salud Pública en América Central.* (Memorias de un Seminario Subregional para América Latina celebrado en el Instituto de Nutrición de Centro América y Panamá (INCAP), ciudad de Guatemala, del 10 al 14 de noviembre de 1975). José Aranda-Pastor and Bernd Breuer (Eds.). Guatemala, C.A., INCAP, 1978, p. 33-45.

6. Pradilla F., A., R.E. Stickney & M. Baez. Application and approach in community work. Country level. Presented at: *International Conference on At Risk Factors and the Health of Young Children, held in Cairo, Egypt, 23-29 June, 1975.*

7. Beghin, I.D., V.W. Bent, J. del Canto, M.T. Menchú & A. Pradilla. Assessment of nutritional status: diagnosis for planning in Central America. *Fed. Proc., 35:* 598, 1976. (Abstract No. 2160).

8. Wilson, D. & R. Lema. Un Sistema para Mejorar la Desnutrición en Colombia. Cali, Colombia, Facultad de Ingeniería, Universidad del Valle, 1970.

9. Wilson, D., A. Pradilla & C. Francis. Propuestas de Investigación a la Agencia para el Desarrollo Internacional (AID). Cali, Colombia, 1973.

10. *Lineamientos para una Política Nacional de Nutrición.* Unidad Salud, Sección de Recursos Humanos, Secretaría General del Consejo Nacional de Planificación Económica. Guatemala, C.A., agosto de 1974.

11. *Política Nacional de Alimentación y Nutrición.* Ministerio de la Presidencia de Costa Rica e INCAP. San José, Costa Rica, C.A., diciembre de 1974.

12. *Evaluación de las Areas Prioritarias del Problema Nutricional de Honduras y sus Posibles Soluciones.* Secretaría Técnica del Consejo Superior de Planificación Económica, Sistema de Análisis y Planificación de la Alimentación y Nutrición (SAPLAN). Tegucigalpa, Honduras, C.A., octubre de 1976.

13. Martorell, R.C., C. Yarbrough, H. Delgado, A. Lechtig, J.P. Habicht & R.E. Klein. Acute morbidity and physical growth in rural Guatemalan children. *Am. J. Dis. Child., 129:*1296-1301, 1975.

14. Urrutia, J.J. & L.J. Mata. Complicaciones del sarampión: experiencia en una zona rural de Guatemala. *Bol. Of. San. Pan.*, 77:223-230, 1974.

15. Mata, L.J., J.J. Urrutia & A. Lechtig. Infection and nutrition of children of a low socioeconomic rural community. *Am. J. Clin. Nutr.*, 24:249-259, 1971.

16. Schwefel, D. Who Benefits from Production and Employment? Berlin, West Germany, German Development Institute, 1975.

17. *Nutrition, National Development and Planning.* Proccedings of an International Conference held in Cambridge, Mass., October 19-21, 1971. Alan Berg, Nevin S. Scrimshaw and David L. Call (Eds.). Cambridge, Mass., and London, England, The MIT Press, 1973, 401 p.

Comments on the Paper

INTERPRETATIVE MODELS FOR SELECTION OF NUTRITION PRIORITIES*

*J. Toro, R. Chateauneuf, J. Ariza and R. Ferreyra***

INTRODUCTION

A socio-economic model is just a simplified system of relations meant to explain the functioning of a given reality in order to consider it as a whole, and act upon it. It is assumed that this reality, which is limited by one or several phenomena, operates according to the system of relations adopted in each case. Hence, the need to have a hypothesis "based on either actual or rationally constructed relations." To verify these hypotheses it is necessary to gather information, pertinent to the subject and object of the model, resulting in a limitation of the number of variables to be considered. Observation of the direction of the relations existing among them, and of their linking will indicate which ones are dependent, which ones are independent and, in general, their degrees of interdependence.[1] The identification of the strategic variables and the clear distinction of whether the model is to be employed for static or dynamic analysis, is of great importance for action.

Before commenting on the interpretative models, the subject of this document, it seems convenient to define, as indispensable point of reference, the meaning of a food and nutritional surveillance (FNS) system to which said models would be applied.

Food and nutritional surveillance is understood as the permanent and continuous process of compiling, analyzing and distributing information needed to maintain an updated knowledge of production, supply, distribution and consumption of foods, and on the nutritional status of the populations; identify its changes, causes and tendencies; predict their possible variations and recommend, according to the case and

---

* Presented at: Colloquium on "Nutritional Epidemiological Surveillance Systems", IV Latin American Nutrition Congress, Caracas, Venezuela, 21-27 November 1976.

** Interagency Project of Promotion of National Food and Nutrition Policies (CEPAL, FAO, PAHO/WHO, UNESCO, UNICEF), Santiago, Chile.

at the right moment, the indispensable preventive or corrective measures.[2,3] The information gathered *describes* reality; the analyses of causes, changes and tendencies, *explain* what is going on and why; the prediction of probable evolutions of the situation *foresees* and, on those bases, *recommendations* according to priorities and resources can be made. In summary, an FNS system describes, explains, foresees and recommends based on a rapid and permanent flow of information provided by very sensible indicators.

According to the previous elements, appropriate models for an FNS should permit - within the geographic area under consideration - to describe the food and nutritional situation, to explain it, to foresee its evolution and variations, and to recommend appropriate, rapid and timely measures at reasonable costs.

The following comments refer to the document "Interpretative Models for Selection of Nutrition Priorities".

COMMENTS ON THE MODEL FOR USE AT LOCAL LEVEL

The relations system which supports this model is based on the interaction of three major variables: health status, nutrient consumption and nutritional status. The first influences the second through the nutrient needs and their conjunction gives rise to the nutritional status which, in turn, influences the health status. On the other hand, the consumption of nutrients is a subsystem of the same model which follows the flow of food from its production or importation to its consumption. The model becomes dynamic by the application of the so-called communal, family and individual gaps theory (requirements-consumption) and by the employment of the mechanism called "decisions tree." Also, sets of ordered variables to measure both the nutritional and the health status are presented in a separate picture.

In considering the flow of foods up to the consumption phase, quantities that do not reach a family because of its low purchasing capacity relative to the community, and those that do not reach the individual because of poor intrafamily distribution, are called "losses." This name, not altogether appropriate, can give rise to confusion. The same happens with the expression "nutritional requirements", equivalent in the model not only to the recommendable amounts of nutrients for each person according to sex, age, weight and other biological conditioning factors, but also to those other indispensable to compensate for vomits, diarrhea, parasites, etc., which contradicts that concept as expressed by recognized nutritional authorities.[4,5]

Nutritional status is the first variable measured. It would therefore seem that it refers only to protein-calorie malnutrition. Being so, consideration of other nutritional problems very common in the Region would be excluded, such as nutritional anemias, hypovitaminosis A, endemic goiter. Undoubtedly, recognition of all of them implies greater research, information, costs and time. Their exclusion should be the object of specific decisions in each case.

If the malnutrition level found justifies it (the tolerance limits not specified), the nutrient consumption gaps are measured. According to the results of these measurements, the way in which certain variables operate is explored, and explanations of malnutrition at community or family level are searched for, whether through failure in consumption or on the basis of the medical-sanitary conditions; and orientation for interventions is deduced from them.

Several points merit special comments: i) it is not clear whether information is gathered all at once or if it is obtained according to the requirements of the analytical process of the so-called "decisions tree"; ii) in the analytical process of nutrient consumption, emphasis is placed mainly on offer, losses and availability of foods, and it seems that insufficient attention is paid to income, prices and purchasing capacity, which are strategic variables in a market economy. Nothing is gained by increasing the availability of food without a parallel improvement in the effective demand; on the contrary, by doing so prices fall, losses increase, and producers are discouraged. That underestimation of the demand leads to the omission of very valuable and explanatory calculations such as the relation between income and food costs. iii) It appears also that insufficient attention is being paid to education both in food and nutrition and in health and hygiene. iv) The influence of governmental measures, sometimes a variable of strategic value, is not considered. v) It is not clear how the application of the model at a local level would be linked to the intermediate and central levels. vi) The amount of human, financial and technical resources that the application of the model would require is unknown. If the cost is high, its generalized use in a great number of localities would be limited, and vii). The model does not permit the dynamic analysis that would be needed.

In spite of these comments, the model *describes* a nutritional reality, although not completely; *explains* the causes of malnutrition according to its analytical mechanism, but not all of them, and consequently, it *recommends* interventions only in certain directions. It would not be said to what extent it *foresees* and *alerts* on the probable evolutions of the situation because it neither includes permanent indicators nor does it make it clear whether all the information is gathered for a given time or for a period. It does not state how to establish economically a permanent system capable of providing with fluidity and at a reasonable cost, all of the data indispensable for the use of the model.

The characteritics of the model indicate that it must have been conceived for programming actions for a given moment or period, rather than as an instrument for a regular and continued process of follow-up, alert and warning in a food and nutritional surveillance system.

The limited space allowed for these comments does not permit to consider in detail the application of the model in Villa Rica, Colombia. Nevertheless, it would be impossible not to observe some contradictions in the gaps analysis, which induce confusion. Also, when presenting the result of the analysis carried out, it is said that "when prevalence of infectious diseases is high, the intake level of nutrients has

very little relation with the nutritional status of the children." This conclusion is surprising, considering those of other important studies on the nutrition-infection relationship.[6,7]

COMMENTS ON THE MODEL FOR USE AT GLOBAL LEVEL

The model is based on a relations system, whose interactions are very well illustrated in the graph (Fig. 5) which accompanies the text. Two are its basic hypotheses: first, malnutrition is due to the amount and quality of the ingested food and to its biological utilization in relation to the requirements; second, both the quantity and quality of the ingested foods as well as their biological utilization are associated to income and education.

Each of thse hypotheses has further causal implications: the quantity and quality of the foods consumed depend on the availability of foods at the individual and community levels, and purchasing power and education are interrelated and act on the environment, the health system and the purchasing decisions. This relations system makes it necessary to collect and handle a certain number of variables.

According to the text, the model has already been used in the identification of greater nutritional risk areas of a Central American country, in the selection of the most adequate indicators for such a purpose and in the identification of certain restrictions for the improvement of the nutritional status existing in the same areas. To achieve this objetive, detailed maps of the country were used together with indices made from relevant variables.

As the text states, the model has been conceived to identify problem areas in countries with little resources and great needs, where it is necessary to concentrate efforts on the high priority zones and proceed with the least possible complexity. The authors achieved these goals; the first application of the model already shows undisputable achievements.

The model is simple, realistic and pragmatic. Its use, associated with that of maps of the region under study, constitutes a positive contribution to the identification and location of the regional nutrition problems.

But, if the model is viewed as a basis for a food and nutritional surveillance system, it is only a starting point. This is said because the text does not indicate the information dynamics, what indicators would be used for periodic studies,[8] and which for a continuous flow of reports. Which would be the more sensitive indicators, what would be their tolerable variation, and which the critical limits that successfully would imply immediate action? In this sense, a revision of the table of indicators would be adequate. Perhaps it is still too early to do it, but experience should lead to a revision in this direction.

Obviously, the model *describes* the reality and explains what happens and why, and possibly permits to *recommend* certain interventions and measures. But, as deducted from the text, the model still does not permit forecasting, due to the lack of a continuous flow of information, and of better-defined indicators to show variations and announce, in time, future aggravation of the situation.

Within a more dynamic perspective, it would seem useful to introduce some not considered variables, such as the influence of governmental measures, alterations of the agricultural calendar for basic products, etc. In the same way, a dynamic analysis would require identification of the sequence of action of the variables considered and of the time that each one of them would possibly take to produce results.

On the basis of the previous considerations, with certain small revisions, this model could be recommended for the initial study propounded by experts for the initiation of a food and nutritional surveillance system.[9]

SUMMARY AND GENERAL CONCLUSIONS

1. A Food and Nutritional Surveillance System (FNS) requires the use of a model for the integration, organization and interpretation of information to *describe* reality; *explain* what is happening and why; *alert* and *predict* probable evolutions of the situation and *recommend* measures and interventions according to priorities and resources. A model of such a nature must permit to proceed with the greatest dexterity, rapidity and opportunity in a continuous way and at a reasonable cost.

2. An FNS system for a given country should recognize and observe continuously the food and nutrition situation at the local, intermediate and central levels; therefore, the model or the models to be used should be adjusted to these needs, be operationally linked to an institutional structure that also operates at the same three levels, and permit a dynamic analysis.

3. Circumstances of the developing countries make it advisable not to establish an FNS system all at once for the whole country, but in a stepwise form in those areas identified as problem areas. Alarm systems are always installed in the points at greater risk.

4. The model for the local level commented herein *describes* and *explains* the local situation although not completely, and would serve as a basis for recommending interventions in certain fields. Its use as an alarm system appears difficult.

5. The model commented for the global level has been conceived according to the needs and possibilities of the developing countries. It permits a good description of the food and nutritional situation and to identify priority areas; to explain the causes and to recommend actions and measures. However, it seems that it could not be employed as yet to predict and alert on variations and changes. For this last

purpose a flowing system and some changes in the way of considering and handling the indicators would be required. Its use is therefore recommended for a study to be carried out prior to the establishment of an FNS system.

6. On the basis of the previous comments, it would seem necessary to give more careful thought to overall aspects of the system, to the handling of continuous information, and to the determination of the more sensible indicators and their margins of variation. It is recommended to take into account experiences of "studies of juncture" which precisely operate as a follow-up and short-term forecasting system of the economic situation.[9]

BIBLIOGRAPHY

1. Piatier, A. Statistiques et Observation Economique P.U.F., Coll. Thémis. 1968, Vol. 2, p. 478-516.

2. *Methodology of Nutritional Surveillance.* Report of a Joint FAO/UNICEF/WHO Expert Committee. Geneva, 1-10 October, 1975. Geneva, World Health Organization, 1976, 66 p. (WHO Technical Report Series No. 593).

3. Boletín PIA/PNAN. Santiago, Chile, Vol. 1, No. 2, segundo trimestre 1976.

4. *Energy and Protein Requirements.* Report of a Joint FAO/WHO Ad Hoc Expert Committee. Geneva, World Health Organization, 1973. (WHO Technical Report Series No. 522; FAO Nutrition Meetings Report Series No. 52).

5. Harper, A.E., P.R. Payne & J.C. Waterlow. Assessment of human protein needs. *Am. J. Clin. Nutr.*, 26:1168-1169, 1973.

6. Scrimshaw, N.S., C.E. Taylor & J.E. Gordon. *Interactions of Nutrition and Infection.* Geneva, World Health Organization, 1968, 329 p. (WHO Monograph Series No. 57).

7. Viteri, F.E. & M. Béhar. Efectos de diversas infecciones sobre la nutrición del preescolar especialmente el sarampión. In: *Simposio Centroamericano sobre el Sarampión y su Vacuna.* Washington, D.C., Organización Panamericana de la Salud, 1975, p. 43-56. (Publicación Científica No. 301).

8. Mason, J.B. Nutritional surveillance. In: *Food and Nutrition, FAO, 1* (4): 24-27, 1975.

9. Mosse, E. *Comment va l'Economie?* Paris, France, Serril, 1971

RECOMMENDATIONS OF THE

IV LATIN AMERICAN NUTRITION CONGRESS

The IV Latin American Nutrition Congress recommends:

1. That denomination of the process "to watch over with great attention, authority, and often with suspicion" and responsibility, the nutritional situation, be unified as a "Food and Nutritional Surveillance System" (FNSS).

2. That SLAN integrate a Permanent Working Group on the FNSS which, among other responsibilities, should also contemplate the following:

2.1 Preparation of an operational definition of the FNSS.

2.2 Collection and maintenance of an updated bibliography on the FNSS, informing of this action to the persons integrating the Permanent Working Group through their correspondents in each country.

2.3 Maintenance of information exchange on the different experiences in each one of the countries.

2.4 Coordination and stimulation of research in the different components of the FNSS process.

3. That SLAN request the corresponding international organizations to study the feasibility of organizing an Information and Documentation Center in Food and Nutrition, in compliance with the recommendation issued in this respect at the World Food Conference by Resolution V, paragraph 13 (Rome, 1974).

4. That SLAN take the necessary steps for PAHO/WHO and other UN international agencies to finance and organize jointly with the Society, orientation and training activities on the FNSS in Latin America.

5. That SLAN organize a specific meeting to consider and evaluate the experiences obtained with the FNSS in the countries.

6. That SLAN support the activities and collaborate with the agricultural and livestock information systems currently developed in Latin America, such as those being carried out in the Central American Isthmus, and suggest - through the most convenient channels - their extension to the other countries of the Region. This is a necessary action since such enterprises fulfill a badly-felt need and are important components of an FNSS, as they will allow a dynamic, permanent, reliable, updated and comparable flow of agricultural and livestock information of socioeconomic nature.

Impreso en la Unidad de Ayudas Audiovisuales
del INCAP

SOCIEDAD LATINOAMERICANA DE NUTRICION (SLAN)

La Sociedad Latinoamericana de Nutrición (SLAN) fue creada el 10 de noviembre de 1965 en ocasión de celebrarse el Primer Congreso de Nutrición del Hemisferio Occidental. La actual Junta Directiva de la SLAN está constituída por los siguientes miembros:

Dr. Werner G. Jaffé – Presidente
Dr. Héctor Bourges – Vicepresidente
Dra. Margot Moya de Medina – Secretaria
Lic. Nut. Elvira de Ramírez – Tesorero
Dr. Nelson de Souza – Vocal
Dr. Carlos Payva Carbajal – Vocal
Dr. Enrique Yánez – Vocal
Lic. Edith Valentín – Vocal
Dr. Juan Adolfo Aguilar – Vocal
Dr. Leonardo Sinisterra – Vocal
(Junta Directiva 1977–78)

Dirección actual hasta el 31 de diciembre de 1978:
c/o. Instituto Nacional de Nutrición
Apartado 2049
Caracas – Venezuela

DIRECTORIO DE ARCHIVOS LATINOAMERICANOS DE NUTRICION

Integrado por los Miembros de la Junta Directiva de la Sociedad Latinoamericana de Nutrición
Editor General: Dr. WERNER G. JAFFE

Comité permanente de la Sociedad Latinoamericana de Nutrición para Archivos Latinoamericanos de Nutrición: Dr. Werner G. Jaffé, Dr. Guillermo Arroyave, Dr. José Félix Chávez y Dra. María Ester Río

MIEMBROS DEL CUERPO EDITORIAL PERIODO 1977–1978

Dr. Jaime Ariza
Dr. Juan Rodolfo Aguilar
Dr. Jorge Alvarado
Dr. Conrado F. Asenjo
Dr. Antonio Bacigalupo
Dr. Francisco Beas
Dr. Moisés Béhar.
Dr. José María Bengoa
Dr. Edgar Braham
Dr. Ricardo Bressani
Dr. Alvaro Oscar Campana
Dra. Marta Cancio de Toro
Dr, Nelson de Souza
Dr. Adolfo Chaves
Dr. Nelson Chaves
Dr. Eugelio Chacón Nieto
Dr. Eric Cruickshank
Dr. Carlos Hernán Daza
Dr. Mario Desio de la Vega
Dr. Francisco De Venanzi
Dr. J. E. Dutra de Oliveira
Lic. Luis G. Elías
Dr. Rafael Enderica Vélez
Dr. Nelson A. Fernández
Lic. Marina Flores
Dr. Silvestre Frenk
Dr. Eduardo González Jiménez
Dr. Alberto Guzmán Barrón
Dr. Miguel Guzmán F.
Dr. Alfredo Lam-Sánchez
Dr. Miguel Layrisse
Dr. Aaron Lechtig
Dr. Reynaldo Martorell
Dr. Leonardo J. Mata
Dr. Fernando Monckeberg
Dr. Carlos Pérez H.
Dr. Emilio Picón Reategui
Dr. Oscar Pineda
Dra. M. L. Pita M. de Portela
Dr. Alberto Pradilla
Dr. M. Ruphael Divo
Dra. María E. Sambucetti
Dr. Juan Claudio Sanahuja
Dr. Roberto Schneider
Dra. Esther Seijo de Zaya
Dr. Leonardo Sinisterra
Dr. Carlos Tejada
Dr. Juan J. Urrutia
Dra. Mirta E. Valencia
Dr. Enio C. Vieira
Dr. Fernando Viteri
Dr. Enrique Yánez

ARCHIVOS LATINOAMERICANOS DE NUTRICION

ORGANO OFICIAL DE LA
SOCIEDAD LATINOAMERICANA DE NUTRICION

VOL. XXVII | SUPPLEMENT 1 (First part) JUNE 1977 | No. 2

English Edition

CONTENTS