Improving nutrition in Mexico: the use of research for decision making

Juan A Rivera

This article addresses “research with a mission in nutrition” and begins by defining it as the development of an investigative effort aimed at improving the nutritional conditions of the population through application of the scientific method. A brief description is presented of the application of this principle for developing a research agenda to address malnutrition in Mexico. This framework uses scientific evidence as the basis for decision-making in public nutrition. Factors analyzed include the conditions of nutrition and health in the population and the organized social response (policies, programs, and actions) for preventing and controlling those conditions. The results yield a framework that has proved to be useful for the definition of “research with a mission.”

© 2009 International Life Sciences Institute

INTRODUCTION

The National Institute of Public Health in Mexico (Instituto Nacional de Salud Pública, INSP), an institution devoted to public health and nutrition research, has defined its vocation as research conducted with the aim of improving health conditions in the population. This type of research, referred to by Frenk as “research with a mission”, has been defined as “the development of a research effort to modify reality through producing knowledge and technology”. The “mission” is precisely that change in reality.

The aim of research with a mission in public health is to improve the health conditions of the population through application of the scientific method to the study of several objects and levels of analysis. The objects are the health conditions and the organized social response (policies, programs, and actions) for preventing and controlling those conditions. The levels of analysis include subcellular particles (molecular biology), individuals (clinical research), populations (epidemiological research), and health systems (systems research). A multidisciplinary approach is used in order to generate knowledge directed toward solving the public health challenges.

An important aspect of research with a mission is the use of scientific evidence for decision-making in public health, including that which affects the design and evaluation of health and nutrition policies.

The Centre for Research on Nutrition and Health (Centro de Investigación en Nutrición y Salud or CINyS) at INSP, inspired by the philosophy of research with a mission, has developed a guideline for defining the research agenda at CINyS.

The research sequence as applied to malnutrition problems (Figure 1) starts with a study of the nutritional conditions (magnitude and distribution of malnutrition problems in the population and its determinants) and the social responses (policies and programs with potential impact on malnutrition), and it continues with the following investigations: studies about the functional consequences or health impact of malnutrition on populations in order to determine the relevance of the problems; studies about the etiology and the social and biological mechanisms of malnutrition; studies about the design and testing of small-scale actions or interventions; efficacy studies (conducted under controlled conditions of delivery and utilization of interventions); and effectiveness studies or large-scale program evaluations.

Affiliation: JA Rivera is with the Instituto Nacional de Salud Pública, Centro de Investigación en Nutrición y Salud (CINyS), Cuernavaca Morelos, México.

Correspondence: JA Rivera, Instituto Nacional de Salud Pública, Centro de Investigación en Nutrición y Salud, Avenida Universidad No. 655, Col. Santa María Ahuacatitlán, CP 62508, Cuernavaca Morelos, Mexico. E-mail: jrivera@correo.insp.mx.

Key words: malnutrition, mission-oriented research, nutrition policies, public health nutrition, research agenda

doi:10.1111/j.1753-4887.2009.00161.x

Nutrition Reviews® Vol. 67(Suppl. 1):S62–S65
conducted under regular program operating conditions and including evaluations of the process and cost-effectiveness of interventions. The process ends with the design and evaluation of policies and programs in order to provide feedback for decision making. The results of these evaluations are useful for identifying operational or design problems that generate new research questions. Such questions, when answered, nurture the research-with-a-mission cycle at some point within the process (Figure 1).

During the process, it is imperative that researchers and government stakeholders in charge of designing and operating nutrition and public health policies interact actively. The following is a summary of how the use of this research framework has provided results that have been applied to the design of policies and programs aimed at preventing malnutrition in Mexico. Several results that have been useful in reducing malnutrition also have served to provide fundamental knowledge in the field and have been published in peer-reviewed journals. Given space limitations, only some of the stages are described.

**MAGNITUDE AND DISTRIBUTION OF NUTRITION PROBLEMS IN MEXICO (STUDY OF THE CONDITIONS)**

An important function of CINyS is the implementation and analysis of national probabilistic surveys that collect data about the nutritional status of the Mexican population and those determinants that affect the nutritional status. Three national nutrition surveys have been conducted and/or analyzed by CINyS, in 1988, 1999, and 2006. Through publications and presentations aimed at officials in charge of the design and operation of policies and programs, the results of the 1999 survey prompted several actions, policies, and public programs to prevent malnutrition. For example, following the 1999 survey that identified the most important micronutrient deficiencies in the Mexican population, milk, which had been distributed by a federal program to low-income populations for several decades, was fortified with those micronutrients and became a vehicle for improving the micronutrient status of the population.

**ORGANIZED SOCIAL RESPONSE: NUTRITION POLICIES AND PROGRAMS IN MEXICO**

Mexico has a long history of implementing programs and policies oriented toward improving nutrition in vulnerable groups, and it has invested large amounts of financial resources in food-assistance programs. At the beginning of the 1990s, the Mexican government spent about 2 million dollars daily in food-aid programs, including programs that subsidized consumption. Nevertheless, rates of malnutrition, anemia, and micronutrient deficiencies remained high, and the decline in the prevalence of stunting, an indicator of chronic malnutrition, was less than what was expected during the 1990s, despite the high investment in food-aid programs.

These observations led to the analysis in 1988 of several aspects of governmental food aid. Valuable findings from a survey conducted that year, which assessed the magnitude and distribution of food aid as well as the nutritional needs of the population, were used by CINyS to influence the design of nutrition policies during the 1990s.

It came to light that one of the reasons for the low efficacy of nutrition programs in Mexico was the lack of appropriate targeting. For example, of almost 2 million children with stunting in 1988, close to 45% were living in the southern, poorest area of the country, while less than 9% of stunted children lived in Mexico City. In contrast, 51% of the families with children younger than 5 years of age who were beneficiaries of the food-aid program were living in Mexico City, while only 15% were from the southern area, the region with the highest prevalence of stunting (Figure 2).

Besides an emphasis on urban areas, a lack of targeting was found for regions with the highest prevalence of
malnutrition as well as for the poorest families, the indigenous groups, and children younger than 2 years of age. It was found that the food distributed was inadequate for children between 6 and 24 months of age, that there was a lack of coordination between programs, leading to duplicity of efforts and benefits, and that the educational component was weak.

These results were useful for modifying the basis of nutritional policies and programs at the end of the 1990s.

EFFECTIVENESS STUDIES TO EVALUATE ACTIONS AND PROGRAMS

Presented here is information on the evaluation of the effectiveness of the program Oportunidades and its impact on the nutritional status of participating children.² The benefits provided by the program include the distribution of a micronutrient-fortified food supplement, which was specifically designed to meet nutrient deficits in infants 6–23 months of age.

The program initially included approximately 300,000 homes. As it was not possible at that time to immediately cover the total target population, an evaluation study was planned with a randomized design. Several localities were randomly assigned to one of two interventions, the first one consisting of receiving program benefits for 2 years, and the second consisting of receiving benefits after 2 years, when the study was concluded. The study design was followed rigorously for the first year (1998–1999). Nevertheless, although it was unplanned, both groups received the benefits of the program in the period 1999–2000. For this reason, the group that received the benefits of the program from the beginning was deemed the intervention group, while the other, which received the benefits only in the second year, was classified as the "crossover intervention group", as it started out as a control group but later became the intervention group during the second year. Despite the change in the original study design, it was still possible to evaluate the effects of the program over 2 years, since the intervention group received the benefits for 2 years, while the crossover intervention sample received them for half the time. Moreover, the intervention group received the benefits during the critical first two years of life, while the crossover intervention group did not receive benefits during a substantial part of that period. The greatest impact was expected for infants younger than 6 months in 1988, reflecting those who belonged to the intervention group that received the benefits of the program during the critical first 2 years of life. In contrast, those infants in the crossover intervention group received benefits for only 1 year, starting at 12–18 months of age; thus, they did not receive benefits during most of the critical period. It was also expected that the greatest effects would be found in children from the lowest income level, since the prevalence of malnutrition was greatest in that group. For these reasons, all comparisons were made after groups were stratified by age (<6 months and 6–12 months at enrollment) and socioeconomic level (lower than average or higher than average).

The effects of the program (Figure 3) were significantly higher in the intervention group compared with the crossover intervention group, but only in the group of infants younger than 6 months of age in 1998 from fami-

![Figure 3](image-url)

* Adjusted for age and height in 1988 (random effect models). ** P < 0.05

Figure 3 Adjusted increment in height (1998–2000) in children <6 months of age at baseline who were exposed to the Oportunidades program for 2 years (intervention group) versus those exposed during the second year only (crossover intervention group).

Data from Rivera et al. (2004).²
lies of the lowest socioeconomic level \((P < 0.046)\). There was no effect found in the group of infants from higher socioeconomic levels, nor in the group of older children.

With regard to anemia, since the effects take place over shorter periods, it was possible to evaluate the impact of the program in 1999, when the intervention group had already received the benefits of the program for 1 year, whereas the crossover intervention group had not. After adjusting for age, the prevalence of anemia was found to be significantly higher in the crossover intervention group (which had been a control group in the first year of the study) than in the intervention group (Figure 4). The effect of the program was 10.6 percentage points, almost 20\% in relation to the crossover intervention group.

The results of this effectiveness study of a program with current coverage of 5 million homes provided a sound basis for reaffirming the success of the program and supporting its continuation. Other results have also been useful for evaluating the program, providing feedback to the program, and suggesting modifications to its design. What follows is an example of how the evaluation results have been used to modify the program.

**USE OF THE RESULTS OF THE EVALUATIONS FOR MODIFYING PROGRAM DESIGN**

One result from the effectiveness evaluation that led to modification of the program’s design was the lower-than-expected impact of the program on the reduction of anemia as evidenced by the lack of improvement in iron levels in children using the supplements.\(^2\) CINyS had identified that the type of iron used was reduced iron, which is absorbed to a substantially lower degree than other forms of iron. As a result of this information, a study on the absorption of two other forms of iron (ferrous sulfate and ferrous fumarate) used to fortify food supplements were carried out and showed adequate levels of absorption.\(^3\) Sensory and stability evaluations showed that the food supplements fortified with these new forms of iron complied with standards. This information led to a recommendation to modify the formula by exchanging the reduced iron form for one of the other fortificants. As a result, the food supplements are currently fortified with iron sulfate.

**CONCLUSION**

The manner in which the principles of research with a mission\(^1\) have been applied to the design of the research agenda at CINyS has been described. Applying these principles has generated useful knowledge to influence the design of new policies and public nutrition programs and to modify current programs and policies.

The evidence presented demonstrates the usefulness of applying research results from CINyS toward the design of new policies and nutrition programs in Mexico. Briefly, CINyS is conducting strategic research with an effective mission, thanks to the combination of 1) an institutional framework that provides INSP with an advisory role in the health sector; 2) a favorable environment of more than 10 years of experience, characterized by a staff with a vision for the role of research in making decisions about public policies; 3) institutional authorities committed to doing research with a mission; and 4) the dynamism, diligence, and high standards of a research group that has achieved credibility from the authorities responsible for public health nutrition policies.

**Acknowledgment**

Declaration of interest. The author has no relevant interests to declare.

**REFERENCES**